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Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks

Plant Association Descriptions and Identification Keys

Natural Resource Technical Report NPS/NCCN/NRTR—2009/211



ON THE COVER
Clockwise from upper left: Photos demonstrate the range of plant communities in these three large parks: 1) An herbaceous meadow at Mount Rainier, 2) imperiled Sitka spruce- False Lily of the Valley Forest association found only on the coastal strip at Olympic National Park, 3) White Mountain Heather-Pink Mountain-heather Dwarf-shrubland at North Cascades National Park, a subalpine heather association also found commonly in all three parks, and 4) Subalpine Fir-(Pacific Silver Fir)/Big Huckleberry/ Sitka Valerian Forest one of the most sampled forest associations in all three parks.
Photograph by: National Park Service 2005-2007 field crew

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Executive Summary

The Mount Rainier (MORA), North Cascades (NOCA) and Olympic National Parks (OLYM) vegetation classification project was a collaborative effort between the NCCN and the Washington Natural Heritage Program (WNHP) to create a vegetation classification at the association level for these three large parks. The association level is the finest scale of the National Vegetation Classification System (NVC). The system is hierarchical and uses both structural characteristics and species composition to classify vegetation types.

The vegetation classification for these parks was developed to a great extent from existing national, regional and local vegetation classifications. Previous classification work incorporated into this study included: 1) the 2005 coastal forests correlation project (CFCP Meidinger et al. 2005), 2) the 2005 version of the NVC (FDGC 2008, NatureServe 2005) and 3) the WNHP state vegetation classification.

Vegetation plots used in re-enforcing, validating, and developing the classification units included legacy plots collected on the parks, and map assessment plots and plant classification inventory plots collected by NPS field crews between 2005 and 2007. Plot data collected during the course of the project were assigned to previously defined associations and plots not falling within the variation of existing types were used to define new classification units when appropriate

The final classification evaluated 3396 plots: 2479 legacy plots and 917 classification plots from NPS crews. Based on this classification, a total of 311 upland and forested wetland associations are described. Over half (188) of the described associations are tree-dominated, 53 are shrub-dominated, 43 are herbaceous-dominated and 27 are sparse vegetation types. Of those associations, forty-nine may occur in the parks based on description from literature in adjacent areas but are not represented by current plot data from within park boundaries. 50 herbaceous and shrub-dominated wetland types are classified separately.

The association descriptions include scientific name, common name, a NatureServe Code when present, acronym (that cross-references to synthesis tables), NVC hierarchy levels including alliance, classification confidence, range in Washington, environmental features, USFWS wetland classification, vegetation description, state conservation rank, rank justification, comments, and plant association synonyms in previous classifications.

Along with the association descriptions, a field key to plant association identification was also generated, with a separate key for the wetland types. Additional supporting information includes synthesis tables of constancy and cover values, and tabular environmental data.

The plant associations described in this report reflect the most current and comprehensive vegetation classification not only for the parks, but for the region. The field keys and descriptions which comprise this report create a new framework for measuring, monitoring and mapping vegetation in the NCCN.

Acknowledgements

This project was completed through the effort and dedication of many individuals and organizations.

Numerous individuals collected plot, observation point, and field data that were incorporated in the classification. We appreciate the hard work of the NPS 2005-2007 vegetation mapping project field crews, which included W. Arneson, J. Chenoweth, W. C. Clark, I. Cunningham, P. Del Zotto, A. Francis, D. Graham, R. Gwodz, M. Immen, S. Johnson, S. Koenig, L. Koepke, M. Lee, C. Meredith, C. Meston, T. Morrison, L. Moulton, A. Nabors, K. O'Neil, G. Pappas, A. Peterson, E. Pruiksma, J. Runge, J. Waite, D. Wallace-Senft and M. Whisman. The NCCN vegetation group S. Acker (OLYM), M. Bivin (NOCA), L. Kurth (MORA), R. Rochefort (NOCA), and L. Whiteaker (MORA) assisted with project oversight, logistics support and reviewing drafts of this report.

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Introduction

Vegetation Classification Project

The Mount Rainier (MORA), North Cascades (NOCA) and Olympic National Parks (OLYM) vegetation classification project was organized and coordinated by the North Coast Cascades Network (NCCN) Inventory and Monitoring Program between 2005 and 2008. The purpose of this project was to describe existing plant associations and their environs at MORA, NOCA and OLYM, and to provide this information in written, tabular, and digital formats for vegetation mapping, park resource managers, and others. The basic project components consist of a vegetation classification including descriptions, field key, and supporting synthesis tables of plant associations.

A major purpose of the classification is to provide a platform for future National Park Service (NPS) vegetation mapping for all three parks. The final classification meets the national vegetation standards to the association level and documents the current organization of associations into alliance or other appropriate higher classification levels in anticipation of mapping at these higher levels. In 2005, the NCCN launched a multi-year project to complete vegetation classifications network park units. Project work was coordinated with the USGS-NPS Vegetation Mapping Program and NatureServe. Vegetation plot and observation point data collection occurred between 2005 and 2007. This report documents the methods, results and discussion of the NCCN vegetation classification project.

National Vegetation Classification Standard

This project utilizes the Federal Geographic Data Committee (FGDC 1997, FDGC 2008) - adopted National Vegetation Classification (NVC) standard. The NVC evolved from work conducted primarily by The Nature Conservancy (TNC), NatureServe, and the Natural Heritage Program network over more than two decades (Grossman et al. 1998). The structure of the NVC is based in part on an earlier international vegetation classification developed by the United Nations Educational, Cultural, and Scientific Organization (UNESCO 1973, Driscoll et al. 1984). Use of a standardized classification system helps to ensure data compatibility throughout the National Park Service and other agencies. The FGDC Vegetation Subcommittee continues to keep the NVC standard current and relevant. Substantial revisions to the upper levels of the NVC hierarchy were adopted by the FGDC in February 2008 (FDGC 2008).

Vegetation classification systems attempt to recognize and describe repeating assemblages of plants in similar habitats. The NVC (FGDC 1997) is a hierarchical system. The seven levels in the terrestrial vegetation classification are defined by both physiognomic characters and floristic criteria. The five upper levels (class, subclass, group, subgroup, and formation) are primarily based on physiognomic features. They have a broad geographic perspective and the floristic units have utility in local and site-specific applications (Grossman et al. 1998). Upper, physiognomic levels additionally contain physical, structural, and environmental characteristics identifiable from satellite imagery, aerial photography, or ground observations. In contrast to the upper levels, differences in floristic composition distinguish the two lowest levels of the 1997 NVC, alliance and association. The alliance and association levels form the base of the NVC hierarchy and are determined by the most abundant or diagnostic species comprising the various layers of a

homogenous vegetation community. Species composition differentiates associations. An alliance is a physiognomically uniform group of associations sharing one or more diagnostic (dominant, differential, indicator, or character) species which, as a rule, are found in the uppermost stratum of the vegetation. (FDGC 1997). An association is defined as a plant community type with a consistent species composition, uniform physiognomy, and similar habitat conditions (Flahault and Schroter 1910).

The 2008 FGDC standard substantially revises the 1997 hierarchy. As stated in the 2008 standard (FGDC 2008):

> "The revised hierarchy addresses the following issues, among others: a) uses vegetation criteria to define all types (de-emphasizing abiotic criteria, such as hydrologic regimes in wetland types), b) provides a clear distinction between natural and cultural vegetation wherever these can be observed from broad growth form patterns (rather than combining natural and cultural vegetation initially and separating them at lower levels), c) for natural wherever these can be vegetation, defines the upper levels based on broad growth form patterns that reflect ecological relationships (rather than detailed structural criteria, which are more appropriate lower down in the hierarchy), d) provides a new set of middle-level natural units that bridge the large conceptual gap between alliance and formation, e) integrates the physiognomic and floristic hierarchy levels based on ecologic vegetation patterns, rather than developing the physiognomic and floristic levels independently and then forcing them into a hierarchy, f) provides detailed standards for plot data collection, type description and classification, data management and peer review of natural vegetation, and g) for cultural vegetation provides an independent set of levels that addresses the particular needs of cultural vegetation."

The 2008 natural vegetation hierarchy consists of eight levels, organized into three upper levels that include levels 1 through 5 in the 1997 standard, three middle levels not in the 1997 levels, and the same two lower levels as in the 1997. The FGDC 2008 standard fully discusses the rationale and criteria of each hierarchy level which are summarized in Table 1 (http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/NVCS V2_FINAL_2008-02.pdf). In general, dominant growth form is more important in upper levels and diagnostic species and composition are more important in lower levels. The new middle level consider biogeographic and mesoclimatic factors along with diagnostic species and life forms.

Table 1. Criteria and rationale applied to each hierarchical level in the 2008 FGDC vegetation classification standard.

Hierarchy Level	Criteria
Upper:	**Physiognomy plays a predominant role**.
L1 – Formation Class Example – Mesomorphic Tree Vegetation	Broad combinations of general dominant growth forms that are adapted to basic temperature (energy budget), moisture, and substrate/aquatic conditions.
L2 - Formation Subclass Example –Temperate Forest	Combinations of general dominant and diagnostic growth forms that reflect global macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate/aquatic conditions.
L3 – Formation Example- Cool Temperate Forest	Combinations of dominant and diagnostic growth forms that reflect global macroclimatic factors as modified by altitude, seasonality of precipitation, substrates, and hydrologic conditions.
Middle:	**Floristics and physiognomy play predominant roles**
L4 – Division Example – Western North American Cool Temperate Forest	Combinations of dominant and diagnostic growth forms and a broad set of diagnostic plant species that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
L5 – Macrogroup Example - Vancouverian Lowland and Montane Rainforest	Combinations of moderate sets of diagnostic plant species and diagnostic growth forms, that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
L6 – Group Example - North Pacific Maritime Douglas-fir-Western Hemlock Forest	Combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect regional mesoclimate, geology, substrates, hydrology and disturbance regimes.
Lower:	**Floristics plays a predominant role**
L7 – Alliance	Diagnostic species, including some from the dominant growth form or layer, and moderately similar composition that reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes.
L8 – Association	Diagnostic species, usually from multiple growth forms or layers, and more narrowly similar composition that reflect topo-edaphic climate, substrates, hydrology, and disturbance regimes.

The alliance and association levels of the revised hierarchy are essentially the same as the 1997 FGDC hierarchy. However, the distinctions between these two lower levels and the levels above have been clarified. The 2008 standard provides the following expanded definitions (FDGC 2008):

> **Alliance:** A vegetation classification unit of low rank (7_{th} level) containing one or more associations, and defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation (Jennings et al. 2006). Alliances reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes.

Association: A vegetation classification unit of low rank (8th level) defined on the basis of a characteristic range of species composition, diagnostic species occurrence, habitat conditions and physiognomy (Jennings et al. 2006). Associations reflect topo-edaphic climate, substrates, hydrology, and disturbance regimes.

NatureServe coordinates plant association data for the NPS vegetation mapping projects. Associations are added to the NVC and older concepts are refined as new data become available. Modifications to the NVC hierarchy are currently managed by NatureServe.

Project Overview

General Approach and Timeline

The vegetation classification for these parks was developed to a great extent from existing national, regional and local vegetation classifications. Plot data collected during the course of the project were assigned to previously defined associations and plots not falling within the variation of existing types were used to define new classification units when appropriate. Vegetation plots used in re-enforcing, validating, and developing the classification units included legacy plots collected on the parks, and map assessment plots and plant classification inventory plots collected by NPS field crews between 2005 and 2007. A preliminary classification was developed in 2005, and applied by field crews. NPS field data and legacy plot data were incorporated in 2006. NPS field crews directed efforts to fill known gaps in regional and local classifications and in legacy data during the 2006 and 2007 field seasons. The classification was modified following each field season and then used and verified by field crews in the following year. The overall sampling density is relatively limited considering the large areas encompassed by these parks, representing 1 plot per approximately 670 acres, although all major vegetation types were sampled. The final classification was completed in 2009.

Primary Partners and Project Roles

This project was a collaborative endeavor between the National Park Service, North Coast Cascades Network Inventory and Monitoring Program and the Washington Natural Heritage Program. NatureServe has also played a role. The NCCN staff generated the initial proposal for funding the three year project. NPS provided project oversight, field staff, developed a field data protocol and created and maintained the database used to store and manage plot data. The WNHP was selected as a partner for the classification analysis because of their extensive work to develop classifications of native plant communities throughout Washington State. WHNP staff has extensive experience in all phases of development of vegetation classifications and employs the same national system of classification used by the NPS. Thus, the project advances the objectives of both NPS and WNHP, and takes advantage of the strengths of both organizations. The WNHP was responsible for analyzing field data, updating the draft classification annually and preparing the final report. In 2008, NatureServe joined the effort and was primarily responsible for developing the upper levels of classification in the context of the new hierarchy.

Study Area

Location and Setting

Mount Rainier, North Cascades, and Olympic National Parks are located in western Washington. Regionally, these parks occur in the coastal ranges in the Pacific Northwest: the Cascade and Olympic Mountains. All three parks are primarily montane forest environments, however each park hosts unique features discussed in sections below. While occurring in the same broader setting, each park does contain unique characteristics due to differences in geological history, local climate, and past land use. These differences are reflected in the ecoregions in which each park resides (Figure 1).

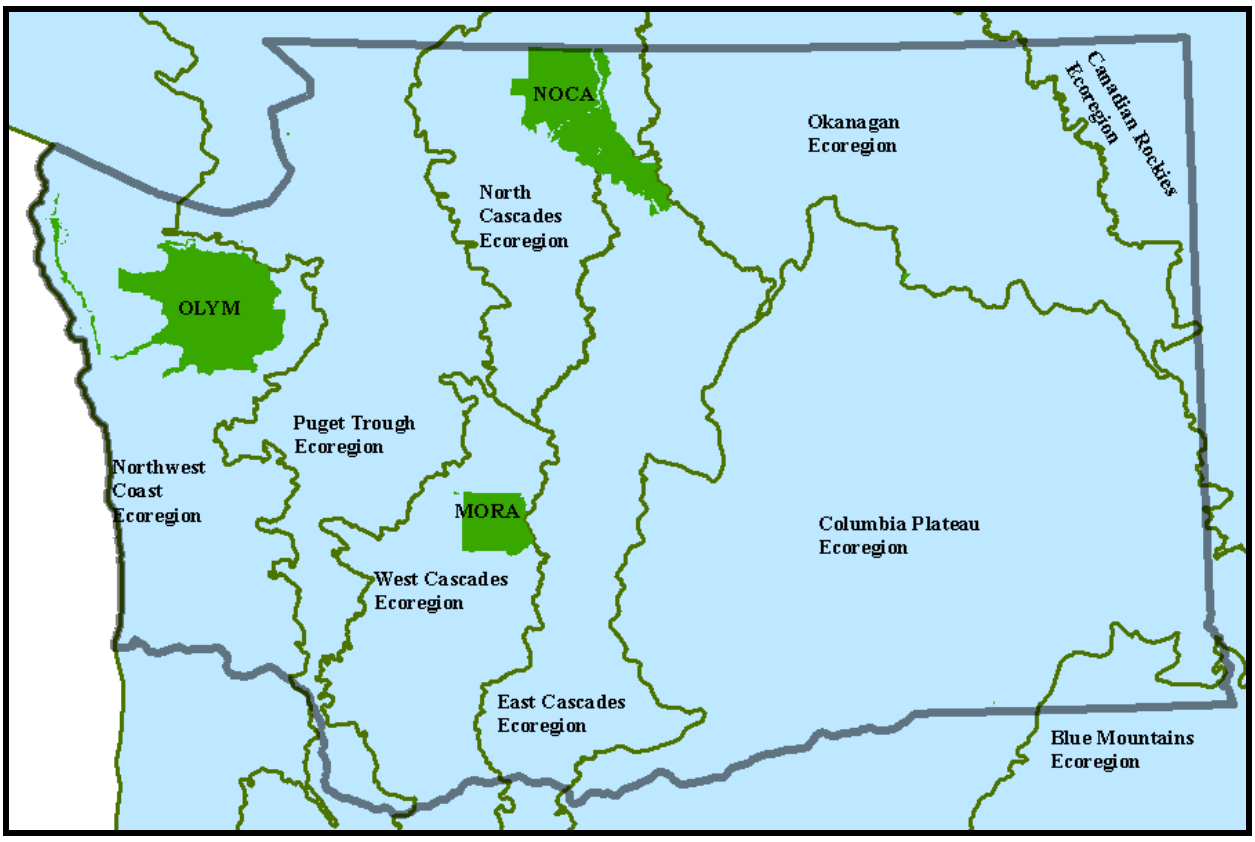


Figure 1. Location of Mount Rainier (MORA), North Cascades Complex (NOCA), and Olympic National Parks with respect to the eight ecoregions of Washington State.

Mount Rainier National Park

Mount Rainier National Park (MORA), the nation's fifth national park, was established by an act of Congress in 1899 (NPS 2008a). MORA boundaries encompass 235,625 acres entirely west of the Cascade Range crest. The park is located in Pierce and Lewis counties, about 50 miles southeast of the Seattle-Tacoma metropolitan area (NPS 2008a; Figure 1). National Forest lands, including four wilderness areas, surround MORA to the north, east, and south while private lands occur to the west, much of which has been intensively logged (Biek 2000).

MORA is in the West Cascades ecoregion which, in Washington, includes the Cascade Mountains south of Snoqualmie Pass and west of the Pacific crest to the Oregon border (Figure 1) (WADNR 2007). The ecoregion extends southward to the Oregon-California border. Typical elevation range of the West Cascades is 500 to 7,000 feet with Mount Rainier (14,410 feet) as the high point and Columbia River Gorge (50 feet) as the lowest elevation. Mount Rainier, an active volcano that last erupted approximately 150 years ago, is the most prominent peak in the Cascade Range and dominates the landscape of a large part of western Washington State (NPS 2008a).

North Cascades National Park Service Complex

The U.S. Congress established North Cascades National Park Service Complex (NOCA) in 1968 to preserve "certain majestic mountain scenery, snowfields, glaciers, alpine meadows, lakes and other unique glaciated features" … "for the benefit, use and inspiration of present and future generations" (NPS 2008b). NOCA includes 684,237 acres of federally protected land near the crest of the Cascade Mountains from the Canadian border south to Lake Chelan (Figure 1). NOCA is approximately 62 miles (100 km) long and 31 miles (50 km) wide (Agee and Kertis 1987). NOCA was envisioned primarily as a wilderness park and 634,614 acres, or 93%, of the complex has been designated as the Stephen Mather Wilderness Area (NPS 2008b). NOCA is the core of over 2 million acres of federally designated wilderness in north-central Washington and is one of the largest such areas in the lower 48 states (NPS 2008b).

NOCA is in the North Cascades ecoregion which includes the Cascades Mountains north of Snoqualmie Pass and west of the Pacific Crest and extends into British Columbia (Figure 1). Most of the ecoregion lies between 1,000 and 7,000 feet elevation with the highest peaks rising to over 10,000 feet and valley bottoms at 500 feet (WADNR 2007). These mountains contain various metasedimentary rocks and display many glacially carved U-shaped valleys and cirques and a few volcanic peaks.

Olympic National Park

Olympic National Park (OLYM) was created in 1938 and covers 922,651 acres that span a rich and varied terrain. OLYM includes an outer coast strip comprised of rocky shorelines, beaches and coastal forests as well as one of the richest old-growth forests in the world (McNulty 2003). The Park is located on the Olympic Peninsula in northwestern Washington and is surrounded by Olympic National Forest and Washington Department of Natural Resource lands (Figure 1). OLYM is in the Northwest Coast ecoregion which includes the coast ranges from Oregon north to Vancouver Island, British Columbia (Figure 1). The Olympic Peninsula is bordered by the Pacific Ocean to the west, the Strait of Juan de Fuca to the north, and Hood Canal to the east while the southern flanks adjoin the lowlands of Grays Harbor basin (WADNR 2008).

Geology

The geologic history of each park shapes current vegetation patterns through its effects on topography, soils, and disturbance regimes. The following provides a brief geological history of the region and then specific geological processes related to vegetation patterns for each park.

Collision and accretion of terranes and volcanic activity at the leading contact of the North American plate underlie the geological history of the three national parks (Williams 2002). About 150 million years ago, the western edge of the North American continent, located approximately where Idaho, Oregon, and Washington meet today, began to collide with the easterly track of the Pacific plate resulting in the "docking" of new rocks to the North American continent (i.e. Superterrane I) and thereby extending the western edge of North America into eastern British Columbia and northeastern Washington (Williams 2002). About 50 million years ago, Superterrane II docked against the Superterrane I rocks extending the edge of the North American continent into most of contemporary British Columbia and northern Washington, including the area now occupied by NOCA (Williams 2002). Approximately 20-30 million years ago, as the San Juan de Fuca plate subducted under North America, ocean floor basalts and their overlying sediments began pushing up against the North American plate and were uplifted to form the Olympic Mountains (Williams 2002).

As the subduction of the Pacific oceanic plate continued under North America, a series of volcanic eruptions began creating the foundation of the Cascade Mountains around 40 to 17 million years ago. Around nine million years ago, uplift of this foundation along with renewed volcanic activity built and continues to build the contemporary Cascade Range (Williams 2002). Granitic rocks and welded fragmental volcanic rocks resistant to erosion now comprise many of the higher peaks in the South Cascades (Pringle 2008). The character series of stratovolcanoes, a large, steep volcano built up of alternating layers of lava and ash or cinders also called composite volcanos, currently found in the Cascade Range including Mount Rainier (the oldest in Washington), Mount St. Helens, and Mount Adams, emerged through and built atop the older volcanic Cascades. More northerly stratovolcanoes such as Mount Baker and Glacier Peak emerged through the older landscapes in the North Cascades (Williams 2002).

Erosive actions of gravity, wind and water erosion have steadily modified the mountains resulting in the steep topography of contemporary landscapes. Glaciation is a major modifier of landscapes and during the ice age the development and movement of ice and ice melt had great effects on the coastal and Cascade ranges. Alpine glaciers modified and continue modify the Cascades and the Olympic Mountains. The last maximum ice advanced 14,000 years ago during which the Canadian continental ice sheet covered the North Cascades and advanced to surround the Olympics on the east and north.

Mount Rainier National Park

Mount Rainier is a stratovolcano in the volcanic-arc that forms the Cascade Mountains. It is situated 15 miles east of the Cascade Crest where the range is 60 to 90 miles wide (Pringle 2008). At 14,410 feet, Mount Rainier is superimposed on the eroded foundation of the older volcanic, intrusive, and sedimentary rock of the Cascade Mountains (Pringle 2008). The pyroclastic cone of Mount Rainier began forming approximately one million years ago. About 700,000 years ago, eruptions of andesitic flows began rapidly building the mountain even higher. Relatively recent eruptions (between 6,600 and 5,700 years ago) have modified the morphology of the summit. In the last 10,000 years, Mount Rainier has been estimated to have erupted more than 40 times (Pringle 2008). Early settlers noted eruptions of the volcano between 1820 and 1894 (Pringle 2008). Such volcanic activity has a large impact on vegetation patterns as a result of direct disturbances and subsequent effects on soil development and drainage patterns as

documented at Mount Helens (Dale et al. 2005). For example, these eruptions have been the source of numerous mudflows (or lahars) which have flowed down the mountain's major river drainages. Since Pleistocene glaciations, more than 60 lahars are thought to have flooded these river valleys (Pringle 2008). These lahars typically destroy much of the vegetation within their path. Forest development soon initiates following these events. The lahars also restructure the geomorphology of the drainages and thus the template upon which valley bottom vegetation develops. Gigantic rock avalanches and other mass wasting events such as rock and talus slides are other geologic disturbances affecting vegetation patterns (WADNR 2008). These events can destroy existing vegetation and set the template for future vegetation development. Volcaniclastic deposits effect soil characteristics such as porosity and nutrients. In relation to these geologic events, vegetation patterns are correlated to soil drainage characteristics and time since the last.

Glaciation has had an important role in eroding the mountain and many of the contemporary river valleys at MORA (Pringle 2008; WADNR 2008). Mountain glaciations have occurred repeatedly over the last 120,000 years. Glacial action, glacial outwash, and alluvial landforms all have a significant effect on contemporary vegetation patterns (Franklin et al. 1988). The variety of geomorphic templates, soil textures, and resulting drainage patterns has a profound influence on the type of vegetation that develops in areas affected by past glaciations.

North Cascades National Park Service Complex

North Cascades National Park is embedded in the Cascade Range, a vast mountain chain that extends from northern California to British Columbia (WADNR 2008; Tabor and Haugerud 1999). The Cascade Mountains consist of an active volcanic arc superimposed upon Paleozoic to Tertiary age bedrock. From the Pliocene (5 to 2 million years ago) to the recent, uplift has created high topographic relief around the active volcanoes (WADNR 2008). The vertical distance from valley floor to the North Cascade peaks ranges between 4,000 to 6,000 feet making the North Cascades one of the steepest mountain ranges in the conterminous United States (Tabor and Haugerud 1999). A complex mix of volcanic arcs, deep ocean sediments, basaltic ocean floor, ancient continents, and submarine fans create the geologic foundation of the North Cascades (Tabor and Haugerud 1999; WADNR 2008). Subsequent uplift, erosion, metamorphosis, plutonic intrusion, additional uplift, and the formation of volcanic arc modified these pieces into the contemporary geologic mosaic that currently comprises the North Cascades (Tabor and Haugerud 1999). Two Quaternary stratovolcanoes, Mount Baker at 10,781 feet and the second most active volcano in Washington and Glacier Peak at 10,451 feet, rise above and dominate the volcanic arc which formed in the North Cascades (WADNR 2008). Both volcanoes are thought to be less than one million years old. Glaciations, landslides, and fluvial erosion have created the steep terrain, jagged peaks, and deep canyons currently found in the North Cascades (Tabor and Haugerud 1999). Past volcanism, uplift, and mass wasting have been both a destructive and creative force in the development of vegetation patterns in NOCA.

During the Holocene glaciations, the Cordilleran Ice Sheet flowed over most of the North Cascade range and greatly modified the North Cascade landscape. Today, the North Cascades has over 300 glaciers and contain the greatest concentration of alpine glaciers in the conterminous United States (over half of those found in the lower 48 states) (WADNR 2008;

NPS 2008b). Glacial landforms such as eroded valleys, till, glacial outwash, and alluvial landforms have a significant determinant of the type of vegetation.

Olympic National Park

The Olympic Mountains, within which Olympic National Park is mostly embedded, form the core of the Olympic Peninsula. The Olympic Mountains were formed from the uplift of sedimentary (e.g. sandstones, mudstones, and shales) and volcanic rocks which were deposited over millions of years on a seafloor off the continental shelf (McNulty 2003). During the middle to late Miocene (18-9 million years ago), as these sedimentary and volcanic rocks were carried by the Farallon plate toward the North American continent, some were uplifted instead of subducted underneath the North American plate (Alt and Hyndman 2001; WADNR 2008; McNulty 2003). This collision caused the uplifted sedimentary rocks to be forced underneath and behind the uplifted basalts on the eastward edge of the Farallon plate (Henderson et al. 1989; McNulty 2003). Those sedimentary rocks which were subducted were subject to metamorphism resulting in the formation of semischist, slate, and phyllite (McNulty 2003). The basalts were forced into their present day horseshoe-like distribution around the eastern edge of the Olympics.

Pleistocene glaciations, associated with both alpine and continental ice, dramatically eroded the Olympic Mountains into the jagged, steep topography characteristic of the contemporary landscape (McNulty 2003). Alpine glaciers tended to further erode drainages already begun by fluvial erosion resulting in a widening, straightening, and flattening of preexisting river valleys into characteristic U-shaped valleys. The headwaters of these glaciated valleys are often very steep and jagged. Continental ice sheets descended into western Washington numerous times during the Pleistocene (McNulty 2003). These ice advances wrapped around the northern and eastern base of the Olympic Mountains and, along with outwash streams flowing around the southern flank of the mountains effectively isolated the Olympics from nearby landforms. This isolation resulted in the Olympic Mountains serving as a refugium during the Ice Age for many species, especially plants (McNulty 2003; Buckingham et al. 1995). The northern and eastern lobes of the continental ice dammed many of the rivers draining off of the Olympic Mountains creating fjord-like lakes in the river valleys. As with the other two parks, uplift and glaciations have had dramatic effects on vegetation patterns in the OLYM. Unlike the other two parks, volcanism is not a part of OLYM geologic history.

A portion of the OLYM also occurs along the rocky coast of the Olympic Peninsula. During the Oligocene and early Miocene (50-18 million years ago), deposition of marine nearshore clastic sediments occurred around the periphery of the Olympic Peninsula (WADNR 2008). Erosion-resistant sandstones and conglomerates today form the characteristic islands, sea stacks, and headlands along the western coastline of the Olympic Peninsula (WADNR 2008; McNulty 2003).

Climate

Pacific Northwest climate is created by the interactions between seasonally varying weather and the region's mountain ranges (Climate Impact Group 2008). Winter rain and snow and summer drought characterize the temperate, maritime climate of the Pacific Northwest. High pressure systems which develop in the Pacific Ocean have a strong influence on the seasonal tracks of precipitation. Typically, two-thirds of the precipitation occurs between October and March when

the Pacific high pressure system moves south allowing low pressure systems to approach from the Pacific Ocean on the dominant westerlies (Franklin and Dyrness 1998). During that time the Pacific storm track brings frequent rain in the lowlands and snow in the mountains. Mount Rainier and Mount Baker vie for the honor of receiving the most snow than anywhere else on earth. A high pressure area develops off the coast of Oregon and Washington and, when persistent, generally keeps the Pacific Northwest fairly dry during late spring into early fall.

Climate in the low elevations west of the Cascades is characterized by mild year-round temperatures, abundant winter rains, and dry summers. Average annual precipitation in most places west of the Cascades is more than 30 inches. The western slopes of the Olympic and Coast mountain ranges typically receive about 118 inches per year, with some locations on the Olympic Peninsula exceeding 200 inches per year. Average annual precipitation in the Cascades typically exceeds 100 inches or more.

The Cascade and Olympic mountains are barriers to eastward moving storms resulting in rainshadow development on the eastside of the mountains, sometimes significantly reducing precipitation. The Olympic rainshadow is the most dramatic with 119 inches average annual precipitation at Point Grenville on the Pacific Coast, over 200 inches/year at Mount Olympus 45 miles to the northeast and 17 inches/year at Sequim another 30 miles northeast in the rainshadow. Equally important are rainshadows at Mount Rainier, Mount Baker and in the North Cascades. Temperatures are also lower and the number of sunshine days is greater on the east side of the Cascade Crest

Mount Rainier National Park

Climate varies with elevation and local topography. At lower elevations (mostly below 3,000 feet) mild temperatures occur year round and rain is the major form of precipitation. Mean annual precipitation is near 59 inches while mean winter temperatures are near 32^0 F and mean summer temperatures 79^0 F (Franklin and Dyrness 1988). The highest amount of annual rainfall in MORA occurs in this elevation zone in the northwest part of the park (e.g. Carbon River valley) where 180-210 inches of rainfall produces rainforests similar to those found on the Olympic Peninsula (Biek 2000). Between 2,500 and 4,700 feet, climate is predominantly temperate and receives an annual precipitation of approximately 102 inches, considerably more precipitation than lower elevations, and much of which falls as snow, an average annual of approximately 28 feet (Franklin and Dyrness 1998). Another climatic characteristic of this elevation zone is the occasional rain-on-snow events which can occur during winter months. Mean annual summer temperatures are near 58^0 F and mean winter temperatures near 26^0 F. Over 4,000 feet elevation, cold temperatures and snowfall define the climatic regime of the subalpine. At the Paradise Ranger Station in MORA, summer temperatures average 52^0 F while winter temperatures 26^0 F. Mean annual precipitation at Paradise is 104 inches (Franklin and Dyrness 1988). Snow depths average more than 50 feet at Paradise (Biek 2000). In 1971-1972, the second highest world record for annual snowfall occurred at Paradise with an accumulation of 93 feet. This amount held the world record until 1999, when annual snowfall at Mount Baker surpassed it by a few inches (NOAA 2008). In the northeast portion of MORA, where Mount Rainier creates a rainshadow, the subalpine is slightly drier and colder version than other subalpine areas in the park. Cold winters, deep snowpack, and cool summers characterize these areas (Franklin and Dyrness 1988). The climate in these areas is more characteristic of high elevations in eastern Washington. Above the subalpine (usually above 6,000 feet) temperatures become extremely

cold and at the highest elevations, where year round cold temperatures predominate and snowfall exceeds snowmelt, glaciers and permanent ice have formed.

Special microclimates generated by local landforms and weather patterns also influence vegetation patterns (Biek 2000). For example, snow depth can be limited in alpine areas and ridgelines due to desiccating winds producing drier vegetation patterns that might otherwise be expected. Conversely, during summer months when precipitation is sparse, fog and clouds can be important sources of moisture for some forest types along high ridges (Biek 2000). Aspect also plays a strong role in the development of microclimates. Cold-air drainage off of snowfields or down into valleys has a large influence on local climate.

North Cascades National Park Service Complex

Climate in the North Cascade National Park Service Complex (NOCA) varies greatly between the western and eastern portion of the complex due to the barrier imposed by the North Cascade range on westerly storms. Average annual snowfall also varies with approximately 70 inches in western lowlands, 516 inches at high elevations west of the Cascade crest, to 123 inches at Stehekin on Lake Chelan (Douglas 1969). As mentioned above, the world record for annual snowfall was recently recorded at Mount Baker with over 93 feet of snowfall (NOAA 2008). Precipitation is seasonally distributed with the majority of the total annual precipitation falling between late fall and early spring.

Precipitation at low elevations mostly consists of rain, high elevations have significant snowpack for many months, and middle elevations have significant snowpack which fluctuates over the course of the winter due to rain-on-snow events (Iachetti et al. 2006). However, due to the width of the North Cascades, the rainshadow effect develops west of the Cascade crest in contrast to the southern Cascades where rainshadows are typically observed east of the Cascade crest (except rainshadow effects due to the much larger stratovolcanoes such as Mount Rainier). Temperatures also vary from west to east with colder winters and warmer summers occurring in the eastern portion of the NOCA (Agee and Kertis 1987). Local rainshadow effects, aspect, and cold-air drainage also create microclimates. For example, an average of 100 inches precipitation falls at Upper Baker Dam while only 35 inches accumulates on Desolation Peak on Ross Lake, 25 miles to the east.

Olympic National Park

The climate of Olympic National Park (OLYM) varies according to elevation and location on the peninsula. The Olympic Mountains create a very strong rainshadow resulting in drastic changes in precipitation within only 25 miles. Over 200 inches of annual precipitation falls on the west side of the Olympic crest while only 20 inches occurs in the northeast portion of the peninsula (e.g. near Sequim) due to an intense rainshadow effect (Henderson et al. 1989). This is one of the steepest precipitation gradients in the world with only 34 miles separating the wettest location in the continental United States from the driest location along the Pacific coast, north of southern California (Buckingham et al. 1995). As with the other two parks, the seasonal movement of high pressure systems produces a wet-dry climatic cycle. Starting in late fall and continuing through early spring, southwesterly storms bring wet, mild weather to OLYM (Henderson et al. 1989). As these storms hit the Olympic Mountains and begin to rise, the moisture laden airs begins to drop much of its moisture. By the time these storms pass over the mountains they have

lost much of their moisture resulting in a dramatic drop in annual precipitation in the northeastern part of the Olympic Peninsula. The wettest areas of OLYM occur at the highest elevations and in the southwest corner of the Park while the driest areas occur in the northeast. About 93% of annual precipitation falls between September and May leaving the summer months relatively dry (Henderson et al. 1989).

Rain is the predominant form of precipitation below approximately 985 feet elevation. Coastal areas in OLYM have the mildest climate in the Pacific Northwest, meaning it has the least amount of variation in temperature and moisture than other areas (Franklin and Dyrness 1988). Along the coast, annual precipitation averages between 79-118 inches and frequent fog and low clouds occur during the relatively drier summer months (Franklin and Dyrness 1988). Rain and snow are predominant between 985 to 2460 feet and snow is the major form of precipitation at higher elevations (Buckingham et al. 1995). Snow depth can reach over 20 feet in subalpine meadows (Henderson et al. 1989)

Soils

Soil formation is controlled by five factors: climate, organisms, relief, parent material, and time (Jenny 1941). These factors are quite variable across the three parks resulting in a diversity of soil types with unique chemical and physical properties such as moisture and nutrient availability. Extensive mapping and classification has not been conducted by the Natural Resources and Conservation Service within the parks thus much of this discussion is limited to broad patterns observed in each park.

Five major Soil Orders can be identified as likely being the most common in the three parks (Soil Conservation Service 1994; Henderson et al. 1989). These include: (1) Spodosols which form in coarse-texture, acid, parent material, are subject to leaching, and are commonly found underneath forest vegetation. Except for drier areas (e.g. areas within rainshadows), conditions favorable for Spodosol development exist in most areas of the three parks (Henderson et al. 1989); (2) Inceptisols are immature soils which show a moderate degree of soil development but not enough to show equilibrium with the environment in which they are found. In other words, with more time they will develop into another Soil Order. Inceptisols are likely very common throughout the region; (3) Entisols are the youngest and least developed soils. Two major types are recognized: Orthents, which develop on colluvium such as recently eroded slopes, landslides, etc. and Fluvents, which are common in floodplains; (4) Histosols are organic soils formed when organic matter accumulation is greater than decomposition due to anaerobic condition. Histosol are found in bogs, fens, and along some streams; and (5) Andisols, which are soils developed in volcanic ejecta (Henderson et al. 1989). Another characteristic of high elevation soils is the development of cryptobiotic soil crusts which bind soils particles together thereby increasing soil stability, increasing infiltration, reducing erosion, and aiding vegetation establishment via an increase in available nutrients and water for plants (NPS 2005).

In addition to the general patterns just described, each of the matrix forest Groups (see Vegetation section below) exhibit some common soil features. The North Pacific Maritime Douglas-fir-Western Hemlock Forest Group generally has moderately deep soils (shallower on steep slopes) that are of medium acidity, well aggregated, sandy loam to clay loam in texture, moderate (e.g. Cascades) to high (Olympic Peninsula) organic matter, and forest floors or O

horizons 3-6 inches deep (Franklin and Dyrness 1988). Soils in the North Pacific Mesic Western Hemlock-Silver Fir Forest Group are often exhibit podzolization, meaning Spodosols are quite common. Forest floor depths range from 1-3 inches and in northern Washington can reach up to 12 inches (Franklin and Dyrness 1988). Spodosols are also quite common in the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group but the degree of podzolization varies greatly. Forest floor depths range from 2-4 inches (Franklin and Dyrness 1988). Soils in the Northern Rocky Mountain Whitebark-Limber Pine Woodland Group are also mostly Spodosols but generally have thinner forest floor depths than those found in the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group (Franklin and Dyrness 1988).

Mount Rainier National Park

Hobson (1976; as cited in NPS 2005) developed a soils classification for MORA based on geological origin, topography, and drainage features. According to this classification, four major soil groups support forests at MORA: (1) Tephra soils are derived from pyroclastic deposits. These are common in the subalpine and alpine meadows as well as in forests throughout the park (Franklin et al. 1988). According to *Keys to Soil Taxonomy* these soils would be classified as Andisols (Soil Conservation Service 1994); (2) Colluvial soils consist of coarse, unconsolidated material from a variety of sources. These soils are typically found on slopes at all elevations, especially on steep slopes and south-facing aspects. Younger colluvial soils would most likely be classified as Orthents and older soils could vary in type such as Inceptisols or Spodosols (Soil Conservation Service 1994); (3) Alluvial soils form from fluvial deposition resulting from historic glacial floods and contemporary flooding regimes. Thus, alluvial soils are found along stream and river valleys and alluvial slopes and fans (NPS 2005). More recent alluvium would be classified as Fluvents while older deposition could vary depending on moisture regime and vegetation (Soil Conservation Service 1994); and (4) Mudflow soils are derived from lahars and consist of a mixture of tephra, alluvium, and colluvium (NPS 2005). Many forest soils are classified as Spodosols. Histosols are found in bogs and fens and possibly along some streams at high elevations (Franklin et al. 1988). Many areas in the subalpine and alpine consist of bare rock and talus slopes with no soil development. Heavy recreation use in many subalpine meadows is resulting in the destruction of the cryptobiotic soil crust resulting in increased bare ground and erosion in many of these areas (NPS 2005).

North Cascades National Park Service Complex

The Natural Resources Conservation Service is currently mapping soils in NOCA (Toby Rogers, NRCS, personal communication 2009). Andisols and Spodosols are major soils and are associated with older soils. Andisols are formed from volcanic ash and posses what are called andic properties (high water-holding capacity and ability to fix and make unavailable to plants, phosphorous.) Younger soils, such as Inceptisols and Entisols, are typically associated with recently eroded slopes, riparian environments, landslides, etc. and are less influenced by volcanic ash since the origin these soils post-date past volcanic eruptions which deposited appreciable amounts of ash. As with much of the montane forest of western Washington, Spodosols are likely a common soil type underneath forests, Histosols are to be found in bogs and fens, Entisols are expected in areas recently exposed to erosion (Orthents) or deposition (Fluvents), Inceptisols are likely common in many forests, and Andisols may be associated with past volcanic eruptions.

Olympic National Park

Soil patterns for OLYM are briefly described here. More detailed discussion can be obtained in Henderson et al. (1989). As with the other two parks, soils have not been explicitly classified or mapped for OLYM. Complex geology, glacial history, range of precipitation, and a variety of relief have resulted in a rich diversity of soil types with many of the same general patterns described above for MORA (Henderson et al. 1989; NPS 2005). Spodosols and Inceptisols are common Soil Orders underneath forest within OLYM. Most Inceptisols on the Olympic Peninsula are likely developing toward Spodosols (Henderson et al. 1989). Orthents are common on colluvium and Fluvents are a common soil type along floodplains. Histosols are found in bogs and fens. Andisols are likely found in the OLYM as well but their extent is less clear (Henderson et al. 1989).

Hydrology and Water Resources

The variety of water resources found in each park is briefly described below.

Mount Rainier National Park

Approximately 400 lakes, 470 streams, several mineral and thermal springs, and about 3,000 acres of wetlands have been mapped at MORA (NPS 2008a). These aquatic resources support a diversity of plant and animal species and are critical habitat for several native amphibian and fish species, eight which are listed as endangered, threatened, or species of concern (NPS 2008a). In addition, other wildlife species are dependent on these aquatic ecosystems for a portion of their life cycle. Of the nine major rivers and their tributaries in the park, the Nisqually, Puyallup, Mowich, Carbon, West Fork, White, and Muddy Fork rivers are supported by seasonal precipitation and the mountain's 26 major glaciers (covering 35 square miles). The Ohanapecosh and Huckleberry drainages do not originated with glacial melt-water. All the park's rivers flow into Puget Sound near Tacoma, Washington except the Muddy Fork and Ohanapecosh Rivers that flow into the Cowlitz River and eventually into the Columbia River (NPS 2008a). Hot springs are found at Ohanapecosh and on mountain slopes near Paradise and Winthrop glaciers, a thermal lake is found in the firn caves on Mount Rainier's summit crater, and a mineral spring at Longmire (NPS 2008a). The ecological characteristics of these unique water resources remain relatively unknown. Various wetlands such as bogs, fens, marshes, wet meadows, aquatic beds, and riparian forests and shrublands are found throughout the park. Although they occupy a very small portion of the landscape, wetlands often support a disproportionately high percentage of landscape biodiversity (Flinn et al. 2008; Van Dyke 2008; Apostol and Sinclair 2006).

North Cascades National Park Service Complex

NOCA has a diverse array of water resources including over 500 lakes and ponds scattered throughout the landscape. Many of these are tarns, which are remnants of the alpine glaciers. Many of the lakes and ponds are surrounded by marshes and wet meadows (NPS 2008b). As at MORA, wetlands such as bogs, fens, marshes, wet meadows, and riparian wetlands provide important habitat and support a significant number of species. An impressive complex of wetlands (one of the largest in NOCA) occurs along the lower reaches of the Chilliwack River (NPS 2008b).

Five major rivers drain the NOCA landscape. The Chilliwack River flow originates in the northwest portion of the park and flows north into British Columbia's Fraser River, which is the largest watershed along the west coast of North America (NPS 2008b). The Nooksack River also originates in the northwest portion of the park and carries drainage from the north flanks of Mount Baker and Mount Shuksan (the only part of this watershed within NOCA) westward to the Puget Sound. The Baker River drains the Picket Range and the southeast slopes of Mount Baker and then flows into the Skagit River which continues westward through the middle of NOCA before flowing into Puget Sound (NPS 2008b). The Skagit River watershed, which originates in British Columbia, is the largest drainage emptying into the Puget Sound (NPS 2008b). The reach above the confluence with the Baker River drains a significant portion of the northeastern and middle sections of NOCA. Three hydroelectric dams, Gorge, Diablo and Ross, were built in the early 20th century along the Skagit River (2008b). The Stehekin River drains the southeast section of NOCA and flows into Lake Chelan, a glacially carved, long, deep (third deepest in the United States) lake. Lake Chelan's outlet drains into the Columbia River (NPS 2008b). Hundreds of small streams and headwater wetlands, which received melt-water from seasonal snowpack and glaciers, feed into all of these rivers.

Olympic National Park

Olympic National Park supports over 3,000 miles of rivers and streams, hundreds of lakes, a variety of wetland types, and 73 miles of coastline along Pacific Ocean (NPS 2008c). These habitats support a rich diversity of aquatic flora and fauna ranging from unique bog plants, endemic amphibians, salmon, to a diversity of marine life (McNulty 2003). A few large lakes occur within or border OLYM boundaries including Lake Crescent, Lake Ozette, Lake Quinault, and Lake Cushman. These lakes were created when deep troughs were carved by glaciers and remnant ice and melt-water filled the lakes or were impounded behind terminal moraines. During more recent glacial activity (i.e. Fraser Glaciation), Lake Ozette is thought to have been an important refugium for many aquatic and wetland species (Buckingham et al. 1995). Massive landslides created an earthen dam across a portion of Lake Crescent and in the process created Lake Sutherland (Williams 2002). Lake Cushman resides in glacial trough and formed when the Skokomish River was impounded from a terminal moraine. Contemporary Lake Cushman is larger than the glacially-derived lake due to the construction of a dam near its mouth. Lake Quinault sits in the glacially carved valley of the Quinault River.

The Olympic Mountains form a central core within OLYM and each of the ten major rivers on the Olympic Peninsula radiate out from glaciers, seasonal snowfields, headwater wetlands and lakes. Generally, the rivers found in the western portion of the park are broad, glacially-carved U-shaped valleys with wide floodplains while those on the north, south, and east are often embedded in confined, narrow, steep-walled valleys (NPS 2008c). The Elwha River, the largest watershed within OLYM, originates deep in the Olympic Mountains and flows north into the Strait of Juan de Fuca. In the early 20th century, two dams, one of which occurs in OLYM (Glines Canyon Dam), were constructed along the Elwha River to supply power to local communities. However, the dams destroyed one of the richest runs of salmon outside of Alaska (ten different runs of anadromous fish). In 1992, the U.S. Congress passed the Elwha River Ecosystems and Fisheries Restoration Act which aims to restore the ecological integrity of the Elwha River watershed through partnerships of the National Park Service, the Lower Elwha Klallam Tribe, local communities, and the dam owners (NPS 2008c).

The Sol Duc River drains the northeastern corner of the park with headwater located along the northern flank of Bogachiel Peak and southern flank of Mount Appleton. The Bogachiel River drains the western flank of Bogachiel Peak flowing west toward the town of Forks then further to the Pacific Ocean. The Hoh and Queets rivers drain the flanks of Mount Olympus and then flow west toward the Pacific Ocean. In the southwest corner of OLYM, the Quinault River flows toward the Pacific Ocean upon travelling down a glaciated valley from its headwaters in near the central core of the Olympic Mountains. The Bogachiel, Hoh, Queets, and Quinault river drainages all support the so-called temperate rainforests which grow along the river terraces of these glaciated valleys (NPS 2008c; Franklin and Dyrness 1988). Only the upper most tip of the Wynoochee River that drains south into Chehalis River and Grays Harbor, occurs on OLYM. The Skokomish River drains the southern flanks of Mount Duckabush and western flanks of Mounts Skokomish and Henderson before flowing into Lake Cushman and then onto the Hood Canal. The Duckabush and Dosewallips rivers both drain the eastern side of the crest of the Olympic Mountains and flow eastward into the Hood Canal. The Dungeness River drains the northeastern portion of the park and flows just west of the town of Sequim before emptying into the eastern end of the Strait of Juan de Fuca.

Land Use and Settlement History

Historical and contemporary land use can have a significant effect on the vegetation patterns found in any particular location. Continual use of vegetation by native peoples can affect vegetation patterns by controlling succession through fire and altering species composition via selective use. Significant impacts from Euro-American settlers and contemporary human use include the introduction of non-native plants, mining, dam construction, fire suppression, and widespread logging. A brief description of historical and recent land use within or affecting each park is given below.

Mount Rainier National Park

Historical use of MORA by Native American tribes such as the Nisqually, Puyallup, Squaxin Island, Muckleshoot, Yakama, and Cowlitz included seasonal use (e.g. summer and fall) to hunt, gather berries, collect medicinal plants, and gather other useful resources (NPS 2008a). Archeological evidence does not suggest that native people established permanent residence in the current MORA rather use was associated with seasonal resource extraction (Catton 1996). Many of these tribes continue to use the park today for many of the same reasons as their ancestors. As early as 15,000 to 10,000 years B.P. (before present), when much of Mount Rainier was under permanent ice, many local people lived in the lowlands surrounding Mount Rainier (NPS 2008a). As the ice began to recede between 9,000 to 8,500 years B.P., many of the contemporary vegetation patterns began to develop. Elk, deer, mountain goats and sheep, pika, bear, ptarmigan, grouse, and huckleberries were all likely important food sources for native peoples, all of which tend to be most abundant in early seral forests, shrublands, or meadows (Burtchard 1998). The subalpine and alpine zones were likely the most common place to find these habitats in abundance. Archaeological evidence suggests that by 4,000 years B.P. (and possibly much earlier) native peoples were utilizing (e.g. hunting, gathering, collecting) resources found in the mid-upper elevation forests, wetlands, and meadows (NPS 2008a). Archeological studies at MORA didn't begin in earnest until the late 1990's and at present, only about 3.5% of MORA has been inventoried (NPS 2008a). To date, over 75 archaeological sites

and isolated artifacts have been documented throughout the park. These data do not provide much information about the full range of resources that were used nor do they indicate fluctuations or change in resource utilization through time (Burtchard 1998).

These studies have also revealed over 35 historic sites and isolated artifacts dating back to late 19th to early 20th century mining, recreation, and early park development. Such remains include old camp sites, trash, abandoned roadbeds, mine adits, and structural remains (NPS 2008a). Tent camps were established in this time period at Paradise to accommodate early tourists (Burtchard et al. 2008). During the mid- to late-19th century, the timber industry became established and grew with the development of the transcontinental railroad system providing a connection to eastern markets. These developments also resulted in the establishment and growth of urban centers in the region (Catton 1996). Much of MORA was set aside as a forest reserve in 1893 and thus was not subject to the intensity of timber harvest as other areas in the region (Catton 1996).

During the first four to five years after the park's creation, no more than 500 people visited the mountain each summer. Longmire and Paradise were the most popular destinations. Spray Park and Crater Lake (Mowich Lake) were also tourist destinations in the northwest portion of the park (Catton 1996). Visitor use climbed from 1,786 in 1906 to 34,814 in 1915 with most use concentrated in the southwest portion of the park (Catton 1996). Over 1.1 million tourists visited MORA in 2007 (http://www.nature.nps.gov/stats/).

North Cascades National Park Service Complex

The following discussion is adapted from NPS (2008b).

Historically, five Salishan-speaking tribes lived within NOCA. These tribes included the Nooksack, living along the Nooksack River; the Chilliwack, along the lower Chilliwack River and Chilliwack Lake; the Chelan, along the Stehekin River and Lake Chelan; the Upper Skagit, along the Skagit River below Newhalem Gorge; and the Lower Thompson, in British Columbia and along the Skagit River above the Newhalem Gorge. Native peoples used all zones of the mountains but permanently inhabited sites were limited to lowlands. Within NOCA, camps or villages have been discovered at the head of Lake Chelan, along the lower portions of the Chilliwack River, and along the Skagit River. The oldest site located is near the headwaters of the Skagit River, at Hozomeen, near the north end of what is now Ross Lake. Archaeological evidence suggests this site may have been occupied continuously or intermittently for over 8,000 years. Archaeologists are not certain whether the people living at Hozomeen are ancestors of contemporary tribes. Native peoples traveled into the mountains to trade and obtain local resources. Hunting camps, stone artifacts, and quarry sites have been found at high as 6,600 feet. Approximately 260 prehistoric sites have been identified, some dating older than 8,500 years. Mountain goats were a very important resource as they provided food and wool. Deer, elk, bear, marmots, and salmon were also important food sources. A trade network connecting people living east in the Columbia River Basin with those living west in the Puget Lowlands was established across many of the mountain passes within NOCA. For example, Cascade Pass was a crossroads for native peoples living in Lake Chelan and in the upper Skagit watershed. The Chilliwack and Lower Thompson native peoples may have used Whatcom Pass as a route across the northern portion of the North Cascades.

Commercial exploitation of the North Cascades began with fur trappers who were soon followed by miners, loggers, and builders. Fur traders were among the first Euro-Americans to explore the North Cascade region, although they are thought to have only explored lower reaches of the range. As settlement continued in the 19th century, fur trapping of beaver, bear, cougar, wolf, lynx, fisher, marten, and fox was conducted to supplement income and necessities. Exploration of the North Cascades by Euro-Americans began in the mid- to late 19th century. Although many expeditions occurred, most were restricted to major river valleys and mountain passes. In 1846, Washington Territory was opened to homesteading resulting in settlements being established along the Cascade, Skagit, and Stehekin river valleys. Most settlers made their living as shopkeepers and innkeepers for the trappers and miners who came to the area. Gold prospecting began along the Skagit River in the 1850s, and with the discovery of gold along Ruby Creek, a rush of miners descended into the valley. By 1880, miners began to focus on other minerals such as silver and lead, which were located at higher elevations. Claims were established near Cascade Pass in places such as Doubtful Lake, Boston and Horseshoe Basins, and Bridge Creek. Logging has not affected much of NOCA. However, once the natural logjam blocking along the lower Skagit River was cleared, logging operations began to work their way up the valley into the mountains. Some logging also occurred in the Stehekin Valley where small mills were established for local lumber use (e.g. apple boxes). For the most part, the absence of an adequate transportation system limited effort to expand logging over much of the NOCA landscape. Miners and settler built some roads, bridges, tunnels, and cabins throughout the area. In the early 20th century, two hydroelectric dams were built by Seattle City Light along the Skagit River: Diablo in 1930 and Ross Dam in 1940. The construction of these dams has not only impacted the aquatic environment of the river but also resulted in intensive logging in the valley. Over 81 unique and nationally recognized buildings and structures are found within the park. There are also remnants of at least 23 historic cultural landscapes within park boundaries. Vistor use is limited with less than 19,000 visitors in 2007 (http://www.nature.nps.gov/stats/).

Olympic National Park

The earliest known inhabitants of the Olympic Peninsula date back to about 13,000 years B.P. Modern native cultures became established about 4,000 to 6,000 years B.P. when contemporary vegetation patterns developed (Henderson 1989). Eight tribes are known to have been established on or utilized lands now within OLYM (NPS 2008c). These include the Hoh, Jamestown S'Klallam, Elwha Klallam, Makah, Port Gamble S'Klallam, Quileute, Quinault, and Skokomish (NPS 2008c). Archaeological studies in OLYM have been limited; however, available data suggests that native peoples likely used the high county much as those in NOCA or MORA did (McNulty 2003). The archaeological data clearly shows that native peoples developed a sophisticated culture around maritime resources. These peoples relied heavily on salmon, shell-fish, sea mammals as well as salal, huckleberries, camas, bracken fern, and salmonberry as food resources. Western redcedar was a very important resource for building materials, tools, baskets, clothing, etc. (NPS 2008c; Henderson et al. 1989). Many of these tribes still maintain their traditions. To date, about 650 archaeological sites have been documented in the park.

Euro-American settlement began in the mid-19th century. Settlement of the Olympic Peninsula occurred in the mid- to late-1800's (Henderson et al. 1989). Early settlements were mostly along the coast, near Hood Canal and present-day Port Townsend, Sequim, Port Angeles, and Neah

Bay (NPS 2008c). Some scattered homesteading occurred along some of the major river valleys, such as the Humes Ranch in OLYM (NPS 2008c). There are 130 historic structures in the park associated with early settler activity (NPS 2008c). Early logging on the Olympic Peninsula began in the northwest corner and near Grays Harbor (Henderson et al. 1989). The first sawmill was built at Port Discovery in 1858. Logging in the southern portion of the Peninsula began in the 1870's (Henderson et al. 1989). In 1885, Lieutenant J.P. O'Neil led an expedition to explore the northeastern Olympic Mountains which traveled the Dungeness drainage, Hurricane Ridge, and the Elwha River. The interior of the Olympic Mountains remained relatively unexplored by Euro-Americans until 1889 when the Press Expedition traversed up the Elwha drainage over the mountains and exited via the Quinault River (NPS 2008c). In 1890, Lieutenant O'Neil led another expedition exploring the South Fork and North Fork of the Skokomish River to O'Neil Pass. Thus, most of the interior of OLYM was relatively free of major human impacts. However, near the turn of the century, concern over excessive logging of the Olympic Peninsula was beginning to grow. The Olympic Forest Reserve was established in 1897 as a response to such concern. Twelve years later, President Theodore Roosevelt designated a portion of the reserve as Mount Olympus National Monument in order to provide further protection to the resident herd of Roosevelt elk (NPS 2008c). However, within a decade the monument size was cut in half due to pressure from the logging industry, opening much of the lowland forest to timber harvest (NPS 2008c). In 1938, President Franklin Roosevelt established Olympic National Park. In 1953, a strip of land along the coast was added to OLYM (NPS 2008c).

In 1935, 2,200 tourists visited Mount Olympus National Monument and in 1939 and that number grew to 404,125 in 1950, 2,289,200 in 1975, and 3,142,774 by 2005 (NPS 2008c). In 2005, 31,000 people spent time camping in the park's backcountry (NPS 2008c). OLYM has 16 developed campgrounds, 64 trailheads, 611 miles of hiking trail, 168 miles of road, and 457 buildings associated with the management and support of the park's resources (NPS 2008c). Visitor records for OLYM document over 3 million users in 2007, third most in the National Park system (http://www.nature.nps.gov/stats/).

Vegetation

The mild, wet climate of western Washington favors forest development. As such, the coniferous forests which dominate this region often attain a longevity and size which is unparalleled in most other forested regions of the world (Franklin and Dyrness 1988). In most mesic, temperate regions of the northern hemisphere conifers play a pioneer role in the landscape and, although they may be found in mature forests, are typically only dominant in early seral communities. However, in the Pacific Northwest, this pattern is reversed with deciduous, hardwood trees serving as the dominant early seral trees (Franklin and Dyrness 1988). This phenomenon is thought to be due to two factors: (1) historical biogeographic patterns and (2) the temporal distribution of precipitation (Franklin and Dyrness 1988). Historical climatic events may have selected the predominance of conifers from the Arcto-Tertiary forests of the Miocene (Brubaker 1991; Whitlock 1992; Franklin and Dyrness 1988). The contemporary climate of year-round mild temperatures along with a seasonal distribution of precipitation (e.g. wet winters and relatively dry summers) conveys a competitive advantage to conifers as they can continue growth through winter months as well as endure dry summer months (Franklin and Dyrness 1988). Fine-scale variation of environmental variables (e.g. soils, hydrology, aspect, geology, etc.) results in non-forested vegetation types such as wetlands, riparian areas, balds, prairies, oak

woodlands, etc. Disturbances such as fire, windthrow, lahars, avalanches, flooding, insect damage, disease, and human activity all strongly affect vegetation patterns throughout the region.

Vegetation patterns in the Pacific Northwest are often described using the Forest Zone concept, which is based on the climatically defined dominance of major tree species (Franklin and Dyrness 1988; Gavin et al. 2005). For this report, we describe broad vegetation patterns found within the three parks using mid-level units of the National Vegetation Classification (NVC), specifically the Macrogroup and Group units (FGDC 2008; Table 1), which occur at roughly similar scales to the Forest Zone concept. Macrogroups are defined by moderately broad sets of diagnostic plant species and growth forms that reflect biogeographic variation in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008; Table 1). Groups are defined by relatively narrow sets of diagnostic plant species, broadly similar composition, and diagnostic growth forms that reflect biogeographic variation in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008; Table 1). In the discussion below, Forest Groups that occupy most of the landscape (e.g. matrix forests) are described for each of the three parks. Thereafter, descriptions of the smaller scale vegetation types embedded within these matrix forests are provided within the context of Macrogroups and Groups. Specific patterns of distribution of the Macrogroups and Groups are then described for each park.

At low elevations along the coast, Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and western redcedar (*Thuja plicata*) dominate forests in areas with strong maritime influence where annual precipitation is generally greater than 100 inches and summer fog predominates (Henderson et al. 1989). These forests are classified as the North Pacific Hypermaritime Sitka Spruce Forest Group or the North Pacific Hypermaritime Western Redcedar -Western Hemlock Forest Group which, collectively, are synonymous with the Sitka Spruce Zone (Franklin and Dyrness 1988). The primary difference between these two Forest Groups is the dominance of Sitka spruce (over 10% cover) in the former and the high constancy of western redcedar in the Western Redcedar -Western Hemlock Forest Group. Sitka spruce is a dominant or codominant in the North Pacific Hypermaritime Sitka Spruce Forest Group with western hemlock, and western redcedar. Bigleaf maple (*Acer macrophyllum*), and rarely Pacific silver fir (*Abies amabilis*) or Douglas-fir (*Pseudotsuga menziesii* ssp. *menziesii*) may be present as forest canopy associates. Western hemlock and western redcedar are the dominant tree species in the North Pacific Hypermaritime Western Redcedar -Western Hemlock Forest Group. Red alder (*Alnus rubra*) dominates disturbed sites within both Forest Groups. Understory species composition in both Groups varies according to local site conditions but includes red huckleberry (*Vaccinium parvifolium*), Alaska huckleberry (*Vaccinium alaskaense*), salmonberry (*Rubus spectabilis*), salal (*Gaultheria shallon*), vine maple (*Acer circinatum*), sword fern (*Polystichum munitum*), lady-fern (*Athyrium felix-femina*), oxalis (*Oxalis oregana*), false lily-of-the-valley (*Maianthemum dilatatum*), Siberian miner's lettuce (*Claytonia sibirica*), and foamflower (*Tiarella trifoliata*) (Henderson et al. 1989). Along the Hoh, Quinault, Queets, and Bogachiel River valleys, old growth temperate "rain forests" are found on old alluvial terraces. Although species composition is similar to other forests in these Groups, the temperate "rainforests" are considered distinct by some researchers due to higher rainfall (140-167 inches), the immense size of the trees, the abundance of epiphytes, and herbivory associated with Roosevelt elk (*Cervus canadensis roosevelti*) (NPS 2008c).

The most extensive low elevation forest type in western Washington, the North Pacific Maritime Douglas-fir-Western Hemlock Forest Group is dominated by Douglas-fir, western hemlock and western redcedar. These forests are synonymous with the Western Hemlock Zone of Franklin and Dyrness (1988) and occur from southern British Columbia south through the Puget Trough, low lying areas on the Olympic Peninsula, and along the base of the west Cascades. Depending on latitude, elevation of this zone ranges from sea level to approximately 3300 ft. Western hemlock is the most shade tolerant of these species and thus is the characteristic dominant of mature forests. Douglas-fir is an early, long-lived seral species in this zone. However, due to the longevity of Douglas-fir, even old growth stands have a conspicuous amount of Douglas-fir present. Western redcedar is typically found on moist to wet sites. Common understory species include salal, oceanspray (*Holodiscus discolor*), Oregongrape (*Mahonia nervosa*), Pacific rhododendron (*Rhododendron macrophyllum*), sword fern, salmonberry, vine maple, various huckleberries (*Vaccinium* spp.), and oxalis (*Oxalis oregana*). Pacific Madrone (*Arbutus menziesii*) and Oregon white-oak (*Quercus garryana*) are found in dry sites throughout the area. Lodgepole or shoreline pine (*Pinus contorta* vars. *contorta* and *latifolia*) are found on stressful sites such as dry sites, lahars, and bogs. Hardwoods such as red alder and bigleaf maple are common on disturbed sites.

In the montane regions, the North Pacific Mesic Western Hemlock-Silver Fir Forest Group is the predominant forest type. These forests, equivalent to the Silver Fir Zone (Franklin and Dyrness 1988), occur on the western slopes and isolated upper eastern slopes of the Cascades and the Olympic Mountains, except for the northeastern portion. Elevation ranges from approximately 2000 feet to 4250 feet. Pacific silver fir, western hemlock, and Douglas-fir are major dominants of this zone. Noble fir (*Abies procera*), western redcedar and rarely western white pine can be dominant although these species usually occur as minor canopy associates. Near its upper elevation limit, mountain hemlock (*Tsuga mertensiana*) and Alaska yellow-cedar (*Cupressus nootkatensis)* may be present in this Group. Geography and site conditions (e.g. wet vs. dry) results in variable composition of these forests however huckleberries, false azalea (*Menziesia ferruginea*), salal, rhododendrons, pipsissewa (*Chimaphila* spp.), wintergreen (*Pyrola* spp.), bunchberry (*Cornus unalaschkensis*), queen's cup (*Clintonia uniflora*), twinflower (*Linnaea borealis*), beargrass (*Xerophyllum tenax*), brambles (*Rubus lasiococcus, R. pedatus*) and trailing yellow violet (*Viola sempervirens*) are common under a range of moisture conditions. Foamflower, rosy twistedstalk (*Streptopus lanceolatus*), vanilla leaf (*Achlys triphylla*), oak fern (*Gymnocarpium dryopteris*), inside-out flower (*Vancouveria hexandra*), and star flowered false Solomon's seal (*Smilacina stellata*) are common in mesic sites. In the Olympic Mountains, oxalis *(Oxalis* spp.*)* and deer fern *(Blechnum spicant)* are often common understory species. Douglas-fir and/or noble fir are typical early seral trees but give way to western hemlock and Pacific silver fir over centuries.

The North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group, which ranges from approximately 4,250 to 6,050 feet, is the highest closed forest type in western Washington. The dominant trees in this group include mountain hemlock and silver fir. Those species are often early seral trees on moist sites while lodgepole pine and subalpine fir serve the seral role on drier sites. Site temperature, moisture, and snow accumulation influence species composition of these forests. Big huckleberry (*Vaccinium membranaceum*), oval-leaf blueberry (*V. ovalifolium*),

beargrass, one-sided wintergreen (*Orthilia secunda*), brambles (*Rubus lasiococcus, R. pedatus*), white rhododendron (*Rhododendron albiflorum*), false azalea, Sitka valerian (*Valeriana sitchensis*), trailing yellow violet, northwestern twayblade (*Listera caurina*), and avalanche lily (*Erythronium montanum*) are common understory species. Following fires, forest development can be slow due to harsh environmental conditions. Repeated burning of these areas leads to relatively permanent shrublands dominated by big huckleberry, mountain ash (*Sorbus* spp.), beargrass, and spiraea (*Spiraea* spp.).

At higher elevations, the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group and Northern Rocky Mountain Whitebark-Limber Pine Woodland Group typically appear as parklands with tree islands interspersed with extensive low shrublands and meadows. Mountain hemlock, Alaska yellow-cedar, subalpine fir, and Pacific silver fir dominate the tree islands in the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group. While subalpine fir, whitebark pine, subalpine larch (*Larix lyallii*), and the occasional Engelmann spruce are dominant and form woodlands and tree islands in Northern Rocky Mountain Whitebark-Limber Pine Woodland Group (limber pine (*Pinus flexilis*) does not occur in Washington but is part of this widespread floristic unit in the Rocky Mountains). Understory species in the tree islands of both Groups include many species found in adjacent meadows (i.e. the North Pacific Alpine-Subalpine Dwarf-shrubland and Heath and the Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow Groups) such as pink big huckleberry, mountain-heather (*Phyllodoce empetriformis*), white mountain-heather (*Cassiope mertensiana*), and blueleaf huckleberry (*Vaccinium deliciosum*). The extensive subalpine meadows are often dominated by subalpine lupine (*Lupinus arcticus* ssp. *subalpinus*), false hellebore (*Veratrum viride*), Sitka valerian, showy sedge (*Carex spectabilis*), alpine bistort (*Polygonum bistortoides*), partridgefoot (*Luetkea pectinata*), avalanche lily, and woolly pussytoes (*Antennaria lanata*) (Chappell et al. 2001). Another subalpine forest type within this group, occurs in the northeastern portion of OLYM and MORA and in NOCA. Subalpine fir (*Abies lasiocarpa*) is the dominant tree while Engelmann spruce (*Picea engelmannii*), and whitebark pine (*Pinus albicaulis*) can be codominants. Common understory species in these forests include rattlesnake plantain (*Goodyera oblongifolia*), smooth woodrush (*Luzula glabrata*), white rhododendron, false azalea (*Menziesia ferruginea*), mountain boxwood (*Paxistima myrsinites*), beargrass (*Xerophyllum tenax*), thimbleberry (*Rubus parviflorus*), and mountain ash (*Sorbus* spp.).

In contrast to the Rocky Mountains, the alpine zone in the Cascades and Olympic Mountains is limited due to a narrow belt between treeline and permanent snow/ice, as well as the steep, rugged terrain resulting in an abundance of bare rock and talus. Extreme cold, windy sites with moderate to deep snowpack form alpine environments (Chappell et al. 2001). Alpine plants have adapted to constant wind, intense solar radiation, drought, and infertile and poorly developed soils (Biek 2000). The distribution of alpine vegetation types is controlled by length of the growing season, slope, and aspect (Edwards 1980). Vegetation consists of krummholz stands of tree species which also occur in the subalpine and a mosaic of dwarf-shrublands, turf, fell-fields, and sparsely vegetated snowbed communities. This collectively comprises the North Pacific Alpine Herbaceous Meadow and the North Pacific Alpine-Subalpine Dwarf-shrubland Groups. Characteristic species include white mountain-heather, pink mountain-heather, green mountain-heather (*Phyllodoce glanduliflora*), partridgefoot, Tolmie's saxifrage (*Saxifraga tolmiei*),

crowberry (*Empetrum nigrum*), common juniper (*Juniperus communis*), evergreen kinnikinnick (*Arctostaphylos uva-ursi*), shrubby cinquefoil (*Pentaphylloides floribunda*), willows (*Salix cascadensis, S. reticulata* ssp. *nivalis*), alpine fescue (*Festuca brachyphylla*), sedges (*Carex spectabilis, C. nigricans, C. breweri, C. capitata, C. nardina, C. phaeocephala, C. pseudoscirpoidea*), spreading phlox (*Phlox diffusa*), Lobb's lupine (*Lupinus sellulus* var. *lobbii*), mountain avens (*Dryas octopetala*), Piper's woodrush (*Luzula piperi*), and louseworts (*Pedicularis contorta, P. ornithorhyncha*) (Chappell et al. 2001).

Throughout each of the three parks, smaller scale vegetation types are found within the Forest Groups described above. For example, bigleaf maple, Sitka spruce, black cottonwood (*Populus balsamiferia* ssp. *trichocarpa*), red alder, Oregon ash (*Fraxinus latifolia*), salmonberry, devil's club (*Oplopanax horridus*) and a variety of other shrubs and herbaceous species are characteristic of the North Pacific Lowland Riparian Forest and Woodland Group (Chappell 1999). Riparian groups are in typically well-drained areas with overbank flooding, groundwater discharge or high water tables associated with flowing water. The North Pacific Lowland-Montane Riparian and Wet Slope Shrubland Group occurs at higher elevations and is dominated by mountain alder (*Alnus incana* ssp. *tenuifolia*), Sitka alder (*A. viridis* ssp. *sinuata*), Booth's willow (*Salix boothii*), undergreen willow (*S. commutata*), Sierran willow (*S. eastwoodiae*), and blueberries (*Vaccinium uliginosum* or *V. deliciosum*). Red alder and western redcedar, along with understory species such as deer fern (*Blechnum spicant*), skunk cabbage (*Lysichiton americanum*), slough sedge (*Carex obnupta*), salmonberry, and water-parsley (*Oenanthe sarmentosa*) dominate the North Pacific Hardwood-Conifer Swamp Group which mostly occurs at low elevations. The North Pacific Lowland Bog and Fen Group is found at low elevations in poorly drained river valleys, along lakes and in depressions throughout western Washington where various species of sedges (*Carex* spp.), ericaceous shrubs (*Kalmia microphylla, Ledum groenlandicum, Vaccinium oxycoccos*, etc.), and *Sphagnum* moss predominate (Kulzer et al. 2001). Shore pine (*Pinus contorta* var. *contorta*), sweet gale (*Myrica gale*), and hardhack (*Spiraea douglasii*) are occasionally found in these peatlands. The North Pacific Montane Fen Group also occurs in the subalpine zone. These peatlands are dominated by variety of species including bog-laurel (*Kalmia microphylla*), sedges (e.g. *Carex aquatilis, C. utriculata, C. echinata* ssp. *echinata*), Thurber's bentgrass (*Agrostis thurberiana*), cottongrass (*Eriophorum* spp.), tufted clubrush (*Trichophorum cespitosum*), marsh violet (*Viola palustris*), northern star flower (*Trientalis arctica*), Oregon saxifrage (*Saxifraga oregana*), elephant head (*Pedicularis groenlandica*) as well as *Sphagnum* and brown mosses (Chappell et al. 2001). The Temperate Pacific Freshwater Emergent Marsh Group is abundant throughout western Washington and is comprised of sedges (*Carex* spp.), bulrushes (*Scirpus* and *Schoenoplectus* spp.), cattail (*Typha latifolia*), spike-rushes (*Eleocharis* spp.), rushes (*Juncus* spp.), burreeds (*Sparganium* spp.), pondweeds (*Potamogeton* spp.), various grasses, and aquatic plants (Chappell et al. 2001). In the subalpine, the Temperate Pacific Subalpine-Montane Wet Meadow Group is interspersed in throughout the subalpine parklands and dominated by marsh marigold (*Caltha leptosepala*), tufted hairgrass (*Deschampsia caespitosa*), bluejoint reedgrass (*Calamagrostis canadensis*), black sedge (*Carex nigricans*), Holm's Rocky Mountain sedge (*C. scopulorum*), Sitka sedge (*C. aquatilis* var. *dives*), and Northwest territory sedge (*C. utriculata*) (Chappell et al. 2001).

Small patch upland vegetation types include the North Pacific Hypermaritime Shrub and Herbaceous Headland Group located along the outer coast in OLYM subject to strong winds and

salt spray that result in a stressful environment supporting small grasslands in a mosaic with stunted trees and shrublands. Shrubs such as salal, crowberry *(Empetrum nigrum*), evergreen huckleberry (*Vaccinium ovatum*) are common along with grasses such as (*Calamagrostis nutkaensis*) and Sitka brome (*Bromus sitchensis*) (Rust 1992; Chappell et al. 2001). The North Pacific Herbaceous Bald and Bluff Group appear in the lowland up into the montane. This Group consists of distinct, small patches of non-forested areas within the forest matrix which occur on steep slopes with relatively shallow soils overlaying a restrictive layer of bedrock (Chappell 2006). Balds are dominated by herbaceous vegetation, dwarf-shrubs, and/or mosses and lichens and are often fringed by Vancouverian Dry Douglas-fir-(Madrone) Forest and Woodland Group (Chappell 2006). Talus or scree slopes (e.g. North Pacific Montane Massive Bedrock, Cliff, and Talus Group) have variable composition but vine maple, oceanspray, trailing snowberry (*Symphoricarpos hesperius*), parsley fern (*Cryptogramma crispa*), beaked hazelnut (*Corylus cornuta* var. *californica*), and redstem ceanothus (*Ceanothus sanguineus*) are common associates. Snow creep and/or avalanches maintain shrublands dominated by Sitka alder (*Alnus sinuata*). Due to frequent avalanches these shrublands are fairly stable with Alaska yellow-cedar being the only tree to survive in these areas. Forbs are often abundant in these shrublands due to high moisture levels.

Mount Rainier National Park

Spatial and temporal climatic variation, volcanism, glacier activity, elevation changes (gradient of over 12,000 feet), large-scale disturbances (fire, windthrow, insects, avalanches, etc.) and various geologic substrates and soils types have resulted in a rich diversity of vegetation across relatively short distances at MORA (NPS 2008a). This diversity is expressed both in the number of plant species (over 890 vascular and 260 non-vascular plant and fungi species) as well as in the diversity of plant associations. More than 100 exotic plant species also occur in MORA, mostly along transportation corridors, near trails and campsites, and along riparian corridors (NPS 2008a).

Approximately 58 percent of the park is forested. Temperature, moisture (including snowfall), and disturbance regimes are strong determinants of the type of forest found in any given site (Franklin et al. 1988). The age of individual forest stands varies according to the time since the last major disturbance. Stands less than 100 years old occur on moraines left by receding glaciers, mudflows, or burned areas while 1,000 year old-growth stands occur in areas protected from disturbances in the Ohanapecosh, Cowlitz, Nisqually, and Carbon River drainages (Franklin et al. 1988). Summer moisture regimes appear to have a strong influence on the patterns of forest types in the lowlands (Franklin et al. 1988).

The North Pacific Maritime Douglas-fir-Western Hemlock Forest Group occurs from the park's boundary at 1,700 feet to approximately 3,000 feet in elevation and is best developed in the major river valleys (Biek 2000). One of the few examples of an inland temperate rainforest (similar to those found in the North Pacific Hypermaritime Sitka Spruce Forest Group) is found in the northwest portion of the park in the Carbon River drainage (Biek 2000). The North Pacific Mesic Western Hemlock-Silver Fir Forest Group, the characteristic forest type for MORA, is found up to about 4,700 feet. These forests are found on level to steep topography. Pacific silver fir, Alaska yellow-cedar, western white pine, and noble fir are characteristic species. These forests have a closed canopy but shorter and fewer understory shrubs and less cover of

herbaceous species giving it a more open appearance than the North Pacific Maritime Douglas-fir-Western Hemlock Forest Group forests (Biek 2000). The North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group occur in the subalpine and extends up to about 7,000 feet with closed forests giving way to subalpine parklands (mosaic of tree islands and meadows) usually between 4,500 feet to 5,000 feet and subalpine parklands transition into alpine environment around 7,000 feet (NPS 2008a). The depth and duration of snowpack strongly influences forest patterns in the North Pacific Mesic Western Hemlock-Silver Fir Forest and North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Groups (Franklin et al. 1988).

The subalpine parklands extend up to about 7,000 feet and occupy about 23 percent of the park. The meadows found in MORA's subalpine parklands have been clustered into two Groups and, as with the forest communities, are associated with the depth and duration of snowpack: (1) North Pacific Alpine-Subalpine Dwarf-shrubland and Heath Group, which are dominated by ericaceous shrubs such as mountain heather (*Phyllodoce* or *Cassiope*) or huckleberry (*Vaccinium* spp.); and (2) Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow Group which includes a) lush herbaceous meadows dominated by tall perennials such as Sitka valerian, subalpine lupine, showy sedge, and green hellebore (*Veratrum viride*), b) low herbaceous meadows dominated by fan-leaved cinquefoil (*Potentilla flabellifolia*), pussytoes (*Antennaria* spp.), and black sedge (*Carex nigricans*), and c) dry grasslands dominated by green fescue (*Festuca viridula*) and subalpine lupine located on well-drained sites more common on the east side of the park (Henderson 1974; Franklin et al. 1988). The Temperate Pacific Subalpine-Montane Wet Meadow Group dominated by sedges along with alpine aster (*Oreostemma alpigenum*) and pussytoes also occurs in these parklands.

The alpine environment extends from the upper limit of the subalpine parklands to Mount Rainier's summit. Approximately 50 percent of the alpine is covered by permanent snow and ice and glacier-modified bedrock (North Pacific Alpine and Subalpine Bedrock and Scree) while the remaining area is dominated by sparse to open alpine vegetation of the North Pacific Alpine-Subalpine Dwarf-shrubland and Heath and the North Pacific Alpine Herbaceous Meadow Groups. This vegetation includes: (1) fell-fields which consist of small rocks on gentle slopes. The rocks provide protected niches where sedges, golden fleabane (*Erigeron aureus*), Lobb's lupine, spreading phlox, mountain avens, Piper's woodrush, penstemons (*Penstemon* spp.), and louseworts; (2) snowbeds have the shortest growing season and some may not be snow-free every year. Tolmie's saxifrage, Shasta buckwheat (*Eriogonum pyrolifolium*) or Piper's woodrush are typical dominate species of snowbeds; and (3) dwarf-heath shrublands are the oldest known plant communities in MORA with some thought to have persisted for up to 10,000 years. Pink mountain-heather, green mountain-heather, white mountain-heather, and black crowberry are common dominant species (Chappell et al. 2001; Edwards 1980). Green fescue also occurs as fairly extensive grasslands above treeline in the northeastern part of the park.

North Cascades National Park Service Complex

Complex geology, climate, topography, aspect, and elevation have resulted in NOCA supporting the highest diversity of vascular plants (over 1,630 species) found in any of the National Parks in the United States (NPS 2008b). Those abiotic factors also result in a variety of vegetation types. Temperature and moisture regimes have a strong influence on the distribution of forest types in NOCA. The width of the Cascade Range within NOCA creates rainshadow effects observed

even west of the Cascade Crest. Thus, in addition to species typically found in the forests of western Washington, many plant species and communities more characteristic of the mountains of eastern Washington are found within the park (Agee and Kertis 1987). The Upper Skagit-Ross Lake area within the park is well known for the convergence of coastal species with those more typical of the interior mountains (Franklin and Dyrness 1988). Slopes on the west side of Ross Lake exhibit a vegetation sequence characteristic of western Washington while slopes on the east side of Ross Lake and in the upper Lake Chelan area show forest patterns typical of the drier interior forest types. Groups with strong Rocky Mountain floristic components typically found at NOCA include the Northern Rocky Mountain Douglas-fir-Pine Forest, Northern Rocky Mountain Ponderosa Pine Woodland, East Cascades Mesic Grand fir-Douglas-fir Forest, Northern Rocky Mountain Whitebark-Limber Pine Woodland, Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland, and Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland Groups (Agee and Kertis 1987; Franklin and Dyrness 1988).

Matrix Forest Groups in NOCA are presented in the order encountered along a west to east trajectory (unless otherwise noted, this summary is adapted from Douglas (1969)). The North Pacific Maritime Douglas-fir-Western Hemlock Forest Group is found in lowlands up to about 2,500 feet and even higher on south-facing dry slopes. In addition to the species previously described for this Group, paper birch (*Betula papyrifera*), a species not found south of Everett, Washington, appears throughout these forests in NOCA (Arno and Hammerly 2007). Impressive old-growth western redcedar stands are found on alluvial terraces of Big Beaver, Little Beaver, Baker, and Chilliwack Creeks in the park (Miller and Miller 1970). The North Pacific Mesic Western Hemlock-Silver Fir Forest Group occurs in the park between 2,500 to 4,200 feet on north slopes and up to about 5,200 feet on south slopes. In valleys with substantial cold-air drainage, these forests can extend below 2,500 feet. As at Mount Rainier National Park, this Forest Group is the most extensive forest type in NOCA and is even found east of the Cascade crest in the Upper Lake Chelan area. The North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Forest Group is found above 4,200 feet on north slopes and above 5,200 feet on south slopes. However, the upper limit is variable due to very steep topography and microclimates. For example, the highest noted treeline noted in NOCA is at approximately 6,500 feet. These forests are also found on both sides of the Cascade crest in the Lake Chelan area.

The North Pacific Alpine-Subalpine Dwarf-shrubland and Heath, Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow, and Temperate Pacific Subalpine-Montane Wet Meadow Groups intermingle with the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island and Northern Rocky Mountain Whitebark-Limber Pine Woodland Groups to form the characteristic subalpine parklands and meadows. The alpine in NOCA is extremely fragmented and most occurrences are small due to very steep topography. In addition to krummholz, heath shrublands (*Phyllodoce* ssp. and *Cassiope mertensiana*) associated with the North Pacific Alpine-Subalpine Dwarf-shrubland and Heath and North Pacific Alpine Herbaceous Meadow Groups are a major component of the alpine in NOCA. East of the high ridges in NOCA, forests typical of eastern Washington begin to dominate the landscape. The Northern Rocky Mountain Whitebark-Limber Pine Woodland Group is the first to appear (at high elevation) heading east. In the upper Lake Chelan area, North Pacific Mesic Western Hemlock-Silver Fir and Northern Rocky Mountain Douglas-fir-Pine Forest Groups occur below subalpine forests. The Northern Rocky Mountain Douglas-fir-Pine Forest Group,

found in the Ross Lake and Lake Chelan areas of NOCA, occurs along valley, stream terraces, and lower south slopes. Ponderosa pine (*Pinus ponderosa*) and Douglas-fir are early seral species. Douglas-fir dominates south slopes while grand fir dominates mesic areas. In north facing drainages, Douglas-fir, grand fir, western hemlock, western redcedar, and western white pine can co-occur as dominants.

Olympic National Park

As with the other parks, climate, topography, and elevation strongly influence vegetation patterns at OLYM. There are 1,452 species, subspecies, and varieties of plant species found on the Olympic Peninsula and the region supports 28% of the rare species tracked by the Washington Natural Heritage Program (Buckingham et al. 1995). The steep environmental gradients found in the area also support a diverse array of vegetation types.

The low elevation coastal portion of the park is dominated by the North Pacific Hypermaritime Sitka Spruce and North Pacific Hypermaritime Western Redcedar -Western Hemlock Forest Groups, both of which are found along the narrow coastal plain between the Pacific Ocean and Olympic Mountains. These forests are found below 500 feet along the coastal strip of OLYM and can reach up to 2000 feet in the river valleys on the western slope of the Olympic Mountains. These forest Groups occupy approximately 10% of OLYM (UNEP 2008). The mild climate in these areas results in extremely lush forests with dense, exuberant understory growth and an abundance of bryophytes (NPS 2008c). The North Pacific Lowland Bog and Fen Group is occasionally found along the coastal plain. The North Pacific Hypermaritime Shrub and Herbaceous Headland Group is found along the coast and is dominated by various shrubs, herbaceous species and scattered krummholz-like Sitka spruce trees (and the occasional Douglas-fir, western hemlock, or red alder) (Chappell et al. 2001).

The North Pacific Maritime Douglas-fir-Western Hemlock Forest Group occurs at the base of the Olympic Mountains in very wet to dry habitats and occupy about 10% of OLYM (UNEP 2008; Henderson et al. 1989). These forests have a much broader elevation range on the drier, east-side of the Peninsula where they can reach up to about 4,000 feet while in wetter areas they typically only reach up to about 2,000 feet and thus have a much narrower range (Henderson et al. 1989). On the western and wetter side of the Olympic Mountains, the North Pacific Maritime Douglas-fir-Western Hemlock Forest Group differs from other areas in western Washington by the predominance of western redcedar and western hemlock, widely scattered silver fir, and relatively low abundance of Douglas-fir. The North Pacific Mesic Western Hemlock-Silver Fir Forest Group is the major forest type, approximately 50% of the park and occurs between 2,000 and 4,000 feet. A few very old Douglas-fir trees (700+ years) are found within these forests in the wetter portion of the park and indicate an earlier and drier climate (McNulty 2003). The North Pacific Mesic Western Hemlock-Silver Fir Forest Group is absent from dry, south-facing slopes in the northeastern portion of the park, generally between 1,805 to 3,609 feet, and instead are dominated by forests similar to the Vancouverian Dry Douglas-fir-(Madrone) Forest and Woodland Group (Henderson et al. 1989; UNEP 2008). These forests are dominated by Douglas-fir that can contain small amounts of grand fir, lodgepole pine, seaside juniper (*Juniperus maritima*), or Pacific madrone (Henderson et al. 1989).

Except for the northeastern portion of OLYM, the subalpine, areas between 4,000 to about 6,000 feet, is dominated by the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Forest Group. This forest Group occupies 20% of the park and includes the subalpine parklands (Henderson et al. 1989; UNEP 2008). As in the other two parks, the North Pacific Alpine-Subalpine Dwarf-shrubland and Heath, Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow, and Temperate Pacific Subalpine-Montane Wet Meadow Groups intermingle with the North Pacific Mountain Hemlock-Silver Fir Forest and Tree Island Group to form characteristic subalpine parklands and meadows. A notable spruce-fir forest type occupies the northeastern portion of the subalpine that is dominated by subalpine fir and/or lodgepole pine along with occasional whitebark pine and mountain hemlock (Henderson et al. 1989).

The North American Alpine Ice Field, North Pacific Alpine and Subalpine Bedrock and Scree, and North Pacific Alpine-Subalpine Dwarf-shrubland and Heath, and North Pacific Alpine Herbaceous Meadow Groups dominate the alpine zone which occupies approximately 10% of the park and is generally found above 6,000 feet. The vegetated portion of alpine is generally found below 7,382 feet where steep topography and permanent ice limit vegetation growth. Alpine vegetation is characterized by heath dwarf-shrublands, mat-forming, low shrubs dominated by spreading phlox, and turfs dominated by showy and black sedges.

Previous Vegetation Studies

Mount Rainier National Park

Botanical exploration over the past two centuries in MORA provide many citations from the late 1800's and early 1900's (NPS 2008a). Although Archibald Menzies, John Scouler, and David Douglas had conducted floristic surveys of western Washington the in late 18th and early 19th centuries, it was not until 1833 that William Tolmie collected plants within MORA boundaries (Biek 2000). Charles Pickering and W.D. Brackenridge, botanists associated with the Wilkes Expedition, botanized extensively up the White River to Naches Pass providing the first compilation of plants for the region near MORA (Biek 2000). Charles Piper extensively studied the flora in the region of Mount Rainier in the late 1880's. Piper published his findings in a series of articles titled "The Flora of Mount Rainier" in *The Mazama* in 1902 in which he documented 295 species (Biek 2000). In 1929, the National Park Service initiated a systematic effort to build an herbarium for the park. George Jones published the first comprehensive flora of the park, *The Flowering Plants and Ferns of Mount Rainier*, in 1938 which included 729 species. In 1983, Peter Dunwiddie listed 804 species as occurring in the park in his dissertation entitled "Holocene Forest Dynamics on Mount Rainier, Washington" (Biek 2000). The latest compilation occurs in *Flora of Mount Rainier National Park*, by David Biek (2000).

In response to concerns of human impacts to subalpine meadows, Frank Brockman conducted an ecological study of the meadows in 1959-1960 to determine the effects of foot traffic on the subalpine vegetation communities (NPS 2008a). Additional research by Hamman (1972), Henderson (1974), Edwards (1980), and NPS Science Advisor, Regina Rochefort (Rochefort and Peterson 1996) has contributed much knowledge about the ecology of subalpine and alpine meadows.

In 1975 through 1980, Franklin et al. (1988) classified and mapped Mount Rainier's forests. This research defined fourteen types of mature forests and five early seral forest types. This work has had a significant influence on management decisions within the park, especially those associated with fire management and development planning (NPS 2008a). Some other ecological studies include Hemstrom and Franklin's (1982) study of fire and disturbance ecology of the park's forests, Frehner's (1957) work on soil development and vegetation succession on the Kautz Creek mudflow, Dunwiddie's (1983) research on Holocene forest dynamics, and Cushman's (1981) study on the influence of recurrent avalanches on vegetation patterns (Biek 2000). Vegetation classification research on lands adjacent to MORA also provide insight into vegetation patterns in the park (del Moral and Long 1977; Henderson et al. 1992). The citations above only provide a brief overview of the research which has been and continues to be conducted at MORA.

North Cascades National Park Service Complex

In 1892, E.R. Lake and W.R. Hull collected plants in the upper end of Lake Chelan and at Cascades Pass (Alverson and Arnett 1986). Kirk Whited made collections near Stehekin in 1901 and David Griffith and J.R. Cotton collected around Stehekin in 1908. Harold St. John botanized and collected in the Lake Chelan area in 1924. George Ward made extensive collections in the early 1940 for his *Flora of Chelan County* (Alverson and Arnett 1986). Dorothy and Ralph Naas have made extensive collections throughout the North Cascades. Alverson and Arnett (1986) documented 665 species in the Lake Chelan-Sawtooth Ridge area. In 2002, NOCA contracted with the University of Washington Herbarium to organize a series of plant collecting trips to generate vouchers of the park's flora. From 2002-2005, 465 taxa were collected at NOCA and nearly 23% of these taxa represent new voucher records for the NOCA herbarium (NPS 2008b).

Vegetation studies in the region begin in 1962 when the U.S. Forest Service established permanent monitoring plots in the Lake Chelan-Sawtooth Ridge area to determine grazing effects on subalpine vegetation (Alverson and Arnett 1986). Franklin and Trappe (1963) provided a general description of vegetation patterns in the North Cascade range. Douglas (1969) conducted a vegetation survey of NOCA and provided a preliminary vegetation classification of the park. In the early 1970's, Douglas continued extensive ecological study of NOCA vegetation communities, including a survey of potential natural areas (Douglas 1971) and classification and ecological investigations of subalpine-alpine communities (Douglas 1972; Douglas and Bliss 1977). High elevation vegetation communities of the North Cascades range were also studied by del Moral and colleagues, who conducted work in the Alpine Lake region (del Moral et al. 1976) and Enchantment Lake Basin (del Moral 1979). Ron Taylor and George Douglas studied the natural history and vegetation ecology of Chowder Ridge near Mount Baker (Taylor and Douglas 1977) and Alverson and Arnett (1986) described vegetation types in the Lake Chelan-Sawtooth Ridge area. Agee and Kertis (1987) published a summary of the vegetation studies which accompanied the development of a cover type map for the park, in which they identify 18 cover types. Two U.S. Forest Service plant association field guides include portions of the North Cascade region have contributed much knowledge about the vegetation types within and near NOCA. These include the plant association field guide for the Mount Baker-Snoqualmie National Forest (Henderson et al. 1992) and the guide for the Wenatchee National Forest (Lillybridge et al. 1995). Grizzly Bear Habitat analysis work involved vegetation analysis and classification plant communities (Almack et al. 1993). A recent ecological study of montane

wetlands in the North Cascades has also advanced vegetation ecology in the region (Risyold and Fonda 2001).

Olympic National Park

Archibald Menzies was the first botanist to explore the Olympic Peninsula in 1792. David Douglas apparently botanized in the eastern portion of the peninsula near the Hood Canal in the early 1800's and John Scouler collected from the "Straits of Juan de Fuca" in the 1820's and thus likely was in the northern part of the peninsula (Henderson et al. 1989). Charles Pickering and W.D. Brackenridge, botanists associated with the Wilkes expedition of 1841, collected in the northeastern portion of the peninsula. Louis Henderson, a botanist associated with the O'Neil expedition, was the first botanist to explore the interior of the Olympic Mountains. J.B. Flett botanized the Olympic Mountains in 1895 and L.H. Lamb collected in the southwest portion of the Olympic Peninsula in 1897 (Henderson et al. 1989). C.V. Piper surveyed the Olympic Mountains in 1890 and 1895 and included his and others collections in his 1906 "Flora of Washington." George Neville Jones extensively explored the Olympic Peninsula from 1923-1935 and based on that work as well as the work of earlier botanists described the flora for the Olympic Peninsula (Henderson et al. 1989). Buckingham et al. (1995) have provided the most recent checklist of vascular plants occurring on the Olympic Peninsula.

The first ecological description of vegetation in the Olympic Peninsula was published in George Jones' 1936 manuscript where he used the Merriam Life Zone concept to describe vegetation patterns in the region. Fonda and Bliss (1969) developed the first plant association classification for forests of the Olympic Mountains and Kuramoto and Bliss (1970) did the same for subalpine meadows. Fonda (1974) described forest succession on river terraces in OLYM. Kratz (1975) conducted a classified vegetation types within the Sitka Spruce Zone of OLYM. Belsky and del Moral (1982) studied the ecology of subalpine-alpine meadows. Henderson et al. (1989) published a classification of the forested plant associations of the Olympic National Forest. More recently, Bigley and Hull (1995) developed a forested plant association classification and Chappell (1999) initiated a classification of low-elevation riparian vegetation for the Olympic Experimental State Forest.

Methods

The methods used in this project were designed to build upon existing vegetation classification efforts in the Pacific Northwest. The project incorporates and re-evaluates 1) legacy data from previous vegetation studies and 2) new data collected by National Park Service mapping crews. Collection of new data in the parks was designed to fill known gaps in the existing classification, to document the occurrence of known associations, and to identify previously unrecognized associations. This iterative process first required that a preliminary classification and key for use by the field crews be synthesized from previous classification efforts. The subsequent collection of new data was used to update and refine the next version of the classification. An initial classification was compiled in 2005, intermediate classifications in 2006 and 2007, followed by the final classification in 2008.

Preliminary Classification

The 2005 preliminary classification was developed using three major sources of plant associations; 1) the 2005 coastal forests correlation project (CFCP Meidinger et al. 2005), 2) the 2005 version of the NVC/IVC International Vegetation Classification (FDGC 2008, NatureServe 2005) and 3) the WNHP state vegetation classification.

The 2005 preliminary classification included all plant associations recognized by NatureServe (2005), as well as new associations and future revisions to NatureServe (2005) from the coastal forests correlation project (CFCP) (Meidinger et al. 2005). The CFCP quantitatively compared plant associations from southeastern Alaska south to southwestern Oregon. Data sets of previously defined plant associations were collected into a single database and then compared with similarity indices and constancy/cover tables. A group of ecologists with regional expertise in vegetation classification reviewed the analyses and made proposals for combining and naming plant associations on this rangewide scale. C. Chappell, one of the primary authors of the CFCP, wrote short summary descriptions tailored to the three parks for associations which did not already have a summary written by NatureServe. He used CFCP vegetation tables and associated regional publications for environmental information. He edited existing NatureServe global summary descriptions of IVC/NVC plant associations to better reflect how they occur in the three parks.

The WNHP state vegetation classification includes citations of all plant associations described in Washington. The list of plant associations described in the state by all authors for associations was reviewed for potential associations likely to occur in one or more of the three parks and not already on the list of IVC/NVC and CFCP Correlation associations. Those associations recognized within the state, but not globally by NatureServe were included in the preliminary classification for the three parks. In addition, some NatureServe shrubland and herbaceous vegetation types were revised based on a recent correlation of all associations described in publications and reports for the subalpine and alpine zones in Washington.

Using the approach described above, preliminary summary descriptions were written for 192 upland types (including all physiognomic classes) and forested wetland types. Additionally, a list

of the names of 50 shrub and herbaceous wetland associations likely in the parks was compiled. A preliminary key to upland associations was prepared to support field sampling.

Field Methods

Field Sampling Approach

With only two field seasons allocated to classification sampling, a targeted approach to sampling was developed that directed NPS field crews to sample in areas or vegetation types known to be gaps in the legacy data and previous vegetation classification work in the region. In 2005, Chris Chappell with the WNHP provided the following prioritization scheme to direct the field sampling. High priority areas included; shrublands, particularly avalanche chutes; Douglas-fir forests west of the Cascade Crest with no or little western hemlock or western redcedar (less than 10% cover); forests and woodlands in the Ross Lake area of NOCA dominated or co-dominated by Douglas-fir, ponderosa pine, and/or lodgepole pine; subalpine parkland tree islands/stringers west of the Cascade Crest; western redcedar-dominated upland stands with little to no western hemlock; herbaceous or dwarf-shrub "balds" west of the Cascade Crest, and dry grasslands below the subalpine zone. Medium priority areas included riparian forests (riverine floodplain or terraces), non-forested wetlands, especially middle elevations, ponderosa pine- dominated stands and bigleaf maple stands. The descriptions included in the preliminary classification also indicated when a provisional or temporary association needed more data for clarification.

Plot Data Collection

The plot data collection methods combined guidance from the NPS Vegetation Mapping Program Field Methods for Vegetation Mapping (TNC and ESRI 1994a), WNHP data collection protocols, and methods used by the USFS (Henderson and Lesher, 2003).

The basic plot survey method instructed crews to establish a fixed radius plot, the size of which scaled depending on vegetation structure. Forest plots had an area of 400 m2, shrub plots were 100 m2 and dwarf shrub, herbaceous and sparse plots were 50 m2. Within the plot, the crews recorded a suite of environmental variables including aspect, slope, elevation, landform, microposition, macroposition and topographic moisture, which is a moisture availability index that relates slope configuration (e.g. convex or concave) at the plot scale to relative slope position at the mountain scale (Henderson and Lesher 2003). When appropriate, the crews noted wetland type and hydrologic regime. A shallow hole was dug for soil characterization and texture and color was recorded by horizon.

Vegetation characterization included selecting physiognomic class, leaf type and phenology and recording the cover of dominant species by vertical layers (strata). The crews recorded an association name when possible. For undescribed types the field crew assigned a preliminary name. They also recorded feedback on the adequacy of field key and descriptions. The core of the classification plot data is the ocular species list. The crews recorded crown cover (in classes) by species for all species seen in the plot. Cover of a bryophyte species was recorded when cover was greater than 1%. Bryophytes growing on logs were excluded from cover estimates. Additional details on sampling methodology can be found in the Guide for Field Sampling (Appendix G). Examples of the field forms used in sampling are included in Appendix G.

Legacy Data

NPS staff initially acquired legacy plot data and summarized their metadata. The WNHP staff evaluated the summarized metadata to determine if the plot data were appropriate for vegetation classification. The criteria used for inclusion in classification plot data included the following: 1) a near complete vascular species list, 2) plot size scaled to vegetation type (e.g. larger for forests), and 3) cover values for all vascular species. These criteria reflect the minimal standard as discussed in Jennings et al (2002). Nine of twenty nine available legacy data sets evaluated met the criteria for classification (Appendix E). Five data sets are in OLYM and four in MORA or immediately adjacent to and east of MORA and NOCA.

The initial (2006) classification analysis included 2083 plots: 1956 legacy plots and 127 map validation plots from NPS crews. The final classification evaluated 3396 plots: 2479 legacy plots and 917 classification plots from NPS crews.

Observation Points

Legacy plots were used as observation plots when enough information was available to establish a plot into an association but insufficient data was available to describe the vegetation. One MORA data set (Franklin, et al. 1988) lacking tree cover data were classified by estimating relative cover of tree species from tree density by diameter classes. Within this MORA dataset plots in which diagnostic tree species was not clearly exceeding a threshold value or dominance criteria were not used. NPS crews collected new observation points to document the presence and range of previously described associations.

Classification Data Analysis

Plot data is managed in VPRO, developed and managed by the Ministry of Forests, Research Branch (MacKenzie and Klassen 1999). VPRO was designed for British Columbia research ecologists for managing and classifying large bodies of ecological data using standard classification techniques. This Microsoft ACCESS© program allows for tracking plots with species and environmental data, creates stand and synthesis tables, and exports data into the analytical program PC-ORD.

The 2005 classification served as the basis for developing the 2006, 2007 and final classification. It provided structure for initial plot data classification and a basis for comparison of new associations derived from the data. The regionwide CPFC was the basis for classification of forest types as identified and described by Meidinger et al. (2005). Plots were sorted into clusters that fell within the variation of the coastal correlation units using floristic indicators and environmental characteristics described in supporting literature and preliminary keys. Synthesis tables for plots assigned to these pre-existing associations were generated from VPRO and were then subjectively compared to coastal correlation tables and to published tables from supporting literature. Plots not clearly identifiable to pre-existing literature types were analyzed following the general procedure below:

1. subset data into physiognomic groupings of tree-dominated (>25% tree cover), shrub-dominated, dwarf shrub-dominated, herbaceous-dominated, and sparsely vegetated (<25% total vascular plant cover) with VPRO;
2. subdivide lifeform clusters by PCA or other clustering technique,
3. evaluate subdivisions with TWINSPAN and/or stand table manipulation;
4. compare clusters to preliminary and pre-existing classification of NPS units, NatureServe or other types in existing literature;
5. reiterate process assigning plot individually to plant association; and
6. summarize plots per determined type.

New or edited summary descriptions were written for all upland types and forested wetland types. Shrub and herbaceous wetlands and riparian communities are compiled in a list of names of associations organized with by wetland type with little other descriptive information. Descriptions of selected, widespread intermittently flooded and wet meadow associations in alpine and subalpine environments are described.

Following each field season feedback from field crews on the efficacy of preliminary classification and field keys was incorporated into the next iteration of classification. WNHP met with NPS staff to discuss experiences of the field crews and to keep mutually-agreeable progress moving forward. Each year a list of sampling priorities for vegetation classification plots needs were provided for field collection planning to verify type occurrence and increase sampling its range of variation and to sample poorly classified vegetation types, for example, upland shrublands. Field crews were directed to a prioritized sampling scheme, with first priority going towards sampling ecological types that were not well-represented in the current classification (such as dry Douglas-fir forests or avalanche chutes) and associations considered "new" or "ill-defined." Second priority areas were selected to confirm presence and expand range for types that have been described elsewhere but are not known to occur in the parks or have low sample size from the parks, and third priority was to document the occurrence and geographic range of associations that had been described for the region from these parks. In this process, crews were testing the existing key and descriptions.

The 2006 and 2007 field seasons focused on verifying and developing each year's preliminary vegetation classification for MORA, NOCA and OLYM. Each year's preliminary classification incorporated both legacy data from previous vegetation studies on the parks and newly acquired field data collected by NPS crews in the previous year. The plant association classification was complied in a format that could be used by crews to identify plant associations in the field and test the classification.

Alliance is the mapping standard for NPS projects. Alliances are vegetation classification units containing one or more associations and are defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation. NatureServe, in a separate project, will provide the classification and definition of alliances for MORA, NOCA and OLYM. That NatureServe project clusters associations defined in this report into all the revised hierarchical levels in the 2008 FGDC NVC standard. Appendix A arranges associations according to the revised hierarchy. This is the first application of the 2008 NVC hierarchy

(FGDC 2008) to a NPS classification and consequently, the hierarchical organization of the associations in this report is expected to change. The arrangement listed below reflects the hierarchical status developed by NatureServe and partners as of March 31, 2009. Future changes in the classification hierarchy will be available from NatureServe as they are modified (http://www.natureserve.org/explorer/index.htm). The forested portions of the hierarchy was better developed at that date and will likely change less than the non-forest types.

Assessment of State Rarity

A global and state ranking system developed by NatureServe and the Natural Heritage programs is used to estimate conservation priorities. The ranking system facilitates a quick assessment of an entity's rarity. An association is assigned both a global (G) and state (S) rank on a scale of 1 to 5. Global ranks are assigned through a collaborative process involving both NatureServe and individual Natural Heritage Program scientists. State ranks are assigned by scientists within the Natural Heritage Program with the proviso that state rank cannot be rarer than indicated by the global rank.

A rank of G1 indicates critical imperilment on a global basis; the species is at great risk of extinction. S1 indicates critical imperilment within a particular state, regardless of its status elsewhere. A number of factors, such as the total range, the number of occurrences, severity of threats, and resilience contribute to the assignment of global and state ranks. The information supporting these ranks is developed and maintained by the Natural Heritage Program and NatureServe. Only state ranks are present in the association descriptions. Global rank is available on NatureServe explorer for the associations which have been assigned a NatureServe Code.

Uncertainty in conservation rank is expressed as a Range Rank. For example, S2S3 indicates a range of uncertainty such that there is a roughly equal chance of S2 or S3 and other ranks are less likely. A rank of SU expresses that a rank is unable to be assigned to an association due to lack of information or due to conflicting information about status or trends. When the taxonomic distinctiveness of an association is questionable, it is assigned a rank of SQ in combination with a standard numerical S rank, for example S3Q

Ranking for this project considered any previous ranking effort for the association or synonym listed by NatureServe, WNHP or adjacent heritage programs. In estimating the primary rank factor, the number of plots number was used as surrogate for abundance of an association within parks and throughout the state. Observational experience of land-use patterns influencing or threatening the abundance or ecological integrity of associations on and off NPS land was a secondary factor used in estimating ranks.

State Rank definitions:

S1 critically imperiled
S2 imperiled
S3 vulnerable to extirpation or extinction
S4 apparently secure
S5 demonstrably widespread, abundant, and secure

Taxonomic Treatments

The primary source of species identification regionally is Hitchcock and Cronquist (1973) although NPS crews used more recent treatments for some species. The standard for the NatureServe IVC/NVC plant association names is Kartesz, J.T. (1999). The 2008 FGDC states: "Nomenclature for vascular plant taxa used in scientific type names should follow the accepted name in USDA PLANTS or ITIS..." with reference to version. For this report, species are synonomized according to Kartesz (2004) and are used in the tables and type descriptions. When the Kartesz (2004) name differs from Hitchcock and Cronquist (1973) in association descriptions, the latter appears in parenthesis preceded with an "=", for example, *Maianthemum (=Smilacina) stellatum* and *Agrostis pallens (=diegoensis).*

Certain species groups warrant special discussion either from identification difficulties or non-subspecific identification needed to synonomize entities to the current nomenclatural standard. Following NatureServe nomenclatural protocol, when taxa are considered equivalent indicators and/or their field identification easily confused, the entities are included in parenthesis. For example, *Achlys triphylla* and *Achlys californica* are combined and listed as *Achlys* (*californica, triphylla).*

Agrostis diegoensis - A. pallens

Kartesz (2004) and ITIS (Aug. 2008) synonomize *Agrostis diegoensis* Vasey under *A. pallens* Trin. Hitchcock and Cronquist (1973), Buckingham and others (1995) and Beik (2000) recognize the former as a dry site species found from sea level to upper treeline and the latter as a coastal sand dune species. This report lists this species as *Agrostis pallens.*

Achlys triphylla - A. californica

Kartesz (2004) and ITIS (Aug. 2008) recognize *Achlys triphylla* (Sm.) DC and *Achlys californica* I. Fukuda & H.G. Baker in Washington while Hitchcock and Cronquist (1973) recognize only the former. Buckingham and others (1995) state that *A. californica* is the common species in forests of the Olympic Peninsula and that *A. triphylla* is only mid-montane to subalpine and mostly in more open habitats. Chappell concludes from field experience that *A. californica* is the exclusive taxon in western Washington. All legacy data (399 plots) lists only *A. triphylla.* Recent NPS plot data lists *A. californic*a primarily in OLYM (42 plots) with two plots in MORA. Recent plot data lists 109 MORA plots and 32 OLYM plots as *A. triphylla.* Because legacy data does not distingush *Achlys triphylla* and *Achlys californica,* they are combined and listed as *Achlys* (*californica, triphylla).*

Caltha biflora – Caltha leptosepala

Caltha leptosepala is listed in 44 plots (38 legacy), *C. biflora* in 28 legacy plots and *C. leptosepala* ssp. *howellii* 6 plots. Hitchcock and Cronquist (1973) recognize two species of *Caltha*: *C. bifolia* DC. (var. *rotundifolia* (Huth) Hitchc.) and *C. leptosepala* DC. (var. sulfurea Hitchc.). Kartesz (2004) and ITIS (Aug. 2008) list *C. biflora* under *C. leptosepala* ssp. *howellii* and *C. biflora* var. *rotundifolia* under *C. leptosepala* var. *leptosepala.* Buckingham and others (1995) in the Olympics and Biek (2000) at Mount Rainier list both subspecies of *C. leptosepala*. The Flora of North America recognizes only *C. leptosepala* and no subspecies. For this project, the subspecies are combined and appear as *Caltha leptosepala* (=*biflora, leptosepala*).

Festuca ovina

Festuca ovina is listed in 125 legacy plots (27 MORA, 96 OLYM, 2 other), *Festuca saximontana* appears in 1 OLYM plot, and *F. brachyphylla* in 1 NOCA and 5 MORA plots. *Festuca ovina L.* is not native to the Pacific Northwest, Hitchcock and Cronquist (1973) recognized two native varieties: *Festuca ovina* L. var. *brevifolia* (R. Br.) Wats. and *Festuca ovina* L. var. *rydbergii* St.-Yves. Kartesz (2004) and ITIS (Aug. 2008) list the former under *Festuca brachyphylla* Schult. ex Schult. & Schult. ssp. *brachyphylla* and the latter as *Festuca saximontana* Rydb. var. *saximontana*. Buckingham and others (1995) lists *F. saximontana* in alpine habitats on the Olympic Peninsula. Biek (2000) lists *F. brachyphylla* at Mount Rainier. For this project, *Festuca brachyphylla* and *F. saximontana* are combined in the synthesis tables as *Festuca (brachyphylla, saximontana*) and Olympic data is assumed to be *F. saximontana* and Cascades data to be *F. brachyphylla* and discussed as such in the type descriptions.

Lupinus latifolius – Lupinus arcticus ssp. subalpinus

Lupinus arcticus ssp. *subalpinus* appears in 101 plots, *Lupinus latifolius* ssp. *latifolius* in 51 plots and *Lupinus latifolius* without subspecies in 671 legacy plots. Hitchcock and Cronquist (1973) recognized two varieties of *Lupinus latifolius* Agardh: *subalpinus* (Piper & B.L. Rob.) and *latifolius.* Kartesz (2004) and ITIS (Aug. 2008) lists the former as a synonym of *Lupinus arcticus* S. Watson ssp. *subalpinus* (Piper & B.L. Rob.) D. Dunn and the latter as a synonym of *Lupinus latifolius* Lindl. ex J. Agardh ssp. *latifolius*. Buckingham and others (1995) describe the habitat of *L. latifolius* as "open" and *L. arcticus* as "scree" and both occurring at subalpine elevations. Biek (2000) at Mount Rainier notes that *L. latifolius* is common below 5000 feet in forest openings and that *L. arcticus* is the dominant subalpine meadow lupine species. Plots with a subspecies determination do not clearly segregate by habitat. Additionally, field crews found species identification difficult. As a result, *Lupinus arcticus* ssp. *subalpinus* and *Lupinus latifolius* ssp. *latifolius* are combined and listed as *Lupinus* (*arcticus* ssp. *subalpinus, latifolius).*

Lupinus lepidus – Lupinus sellulus

Lupinus lepidus appears in 63 plots (61 legacy) and *Lupinus sellulus* Kellogg var. *lobbii* in 50 plots (47 legacy). Hitchcock and Cronquist (1973) recognized five varieties of *Lupinus lepidus* Dougl.including var. *lobbii* (Gray) Hitchc. Kartesz (2003) and ITIS (Aug. 2008) synonomize that variety under *Lupinus sellulus* Kellogg ssp. *sellulus* var. *lobbii* (Gray ex S. Wats) Cox. Because all legacy plots are high elevation and *L. lepidus* Dougl. ex Lindel is a lowland western Washington species and the other Hitchcock and Cronquist (1973) varieties are outside of the range of the national parks surveyed, *L. lepidus* in all legacy plots are considered *Lupinus sellulus* Kellogg var. *lobbii.*

Luzula campestris

Luzula campestris (L.) DC is an uncommon introduced weed at low elevations, <u>not</u> typically occurring in naturally vegetated areas (Flora of North America). It is listed in 247 plots (19 NOCA, 10 MORA, 217 OLYM, 1 other), 229 of which are legacy plots all of which are assumed to be in naturally vegetated areas. According to the University of Washington Burke Museum Herbarium: “The name *Luzula campestris* has long been misapplied to several of our species of *Luzula*, including *L. comosa* and *L. multiflora*. Hitchock and Cronquist's treatment of *L. campestris* is incorrect; see Flora of North America Volume 22 for accurate treatments.” Hitchcock and Cronquist (1973) recognized three varieties: *congesta* (Thuill.) Mey., *frigida*

Buch. and *multiflora* (Ehrh.) Celek. ITIS (Aug. 2008) lists all three *L. campestris* varieties as *L. campestris*. Kartesz (2004) and ITIS (Aug. 2008) list *L. campestris* var. *congesta* (Thuill.) Mey. under *L. congesta* (Thuill.) Lej. (4 plots). The Washington Flora Checklist (October 2008 http://biology.burke.washington.edu/waflora/checklist.php) and Beik (2000) consider *L. congesta* and *L. comosa* the same enitity – *L. comosa* E. Mey. This species is native to forest openings up to alpine. Kartesz (2004) and ITIS (Aug. 2008) list *L. campestris* var. *multiflora* (Ehrh.) Celak under *L. multiflora* var. *multiflora* (13 plots) which is an introduced species that grows in grasslands at low elevations. Kartesz (2004) and ITIS (Aug. 2008) synonomize *L. campestris* ssp. *frigida* Buch. under *L. multiflora* (ssp. *frigida* (Buch.) Krecz. which according to the Washington Flora Checklist (October 2008 http://biology.burke.washington.edu/waflora/checklist.php), is the introduced species *L. multiflora*. For this project, *Luzula campestris* is assumed to be *Luzula multiflora* or *L. comosa* because of its assumed native habitat and is listed as *Luzula (comosa, multiflora)* in tables and descriptions of low elevation associations. Higher elevation associations are assumed to be native vegetation and are listed as *Luzula comosa* (=*campestris, congesta*) in the association descriptions.

Luzula divaricata

Luzula divaricata is listed in 4 MORA plots. Kartesz (2004) does not recognize *L. divaricata* S. Wats.in Washington although ITIS (Aug. 2008) accepts that entity. According to the Washington Flora Checklist (October 2008 http://biology.burke.washington.edu/waflora/checklist.php) *Luzula divaricata*, is misapplied in Hitchcock and Cronquist (1973) and is *L. parviflora* (Ehrh.) Desv. For this project, *Luzula divaricata* is considered *L. parviflora*.

Oxalis oregana – O. trilliifolia

Kartesz (2004), ITIS (Aug. 2008), and Hitchcock and Cronquist (1973) recognize *Oxalis oregana* Nutt. and *O. trilliifolia* Hook. in Washington. Buckingham and others (1995) lists only *O. oregana* as the common species in forests of the Olympic Peninsula. Beik (2000) lists *Oxalis oregana* as common below 762 m (2500 ft) and *O. trilliifolia* less commonly and appearing to higher elevations at Mount Rainier. Plot data (159 plots) lists only *O. oregana*. NatureServe lists a plant association in Oregon and Washington (that occurs in MORA and OLYM) as *Oxalis (oregana, trilliifolia)*. That association name is retained.

Solidago spathulata

Kartesz (2004) synonomizes *Solidago spathulata* DC. (22 MORA legacy plots) under *S. simplex* Kunth and *Solidago spathulata* DC var. *nana* (Gray) Cronq.under *S. simplex* Kunth ssp. *simplex* var. *nana* (Gray) Ringus (7 MORA legacy plots). Beik (2000) only recognizes *S. simplex* Kunth ssp. *simplex* var. *nana* (Gray) Ringus at Mount Rainier. For this project, all *Solidago spathulata* is considered to be *S. simplex* var. *nana*.

Vaccinium alaskaense (V. alaskaensis)

Kartesz (1999) synonomized *Vaccinium alaskaense* and *V. ovalifolium* under *V. alaskaensis* and NatureServe retains this treatment. Kartesz (2004) recognized *V. alaskaensis* and *V. ovalifolium* as a separate species. USDA PLANTS and ITIS (Aug. 2008) list *V. alaskaense* as in Hitchcock and Cronquest (1973)**.** This report uses *Vaccinium alaskaense* and *V. ovalifolium.*

Results

Plant Association Descriptions

Final descriptions represent how plant associations appear, on average, at MORA, NOCA and OLYM (Appendix A). The descriptions are based on summarized plot data and existing literature. A total of 311 upland and forested wetland types are described. Over half (188) of the described associations are tree-dominated, 53 are shrub-dominated, 43 are herbaceous-dominated and 27 are sparse or lithomorphic vegetation types. Of those associations, 49 may occur in the parks based on description from literature in adjacent areas but are not represented by current plot data from within park boundaries.

Most of the described associations (153) are represented by data collected in five or more plots from MORA, NOCA and/or OLYM. Table 2 summarizes the number of plots which support plant associations, organized by life form categories. Fourteen variants of associations (20 plots) are discussed within the context of one of the described associations but appear separately in the synthesis tables (Appendix C). Global (rangewide) descriptions are not included in this report. A limited set of global association descriptions are available on NatureServe explorer.

Table 2. Numbers of plant associations within plot number and life-form categories at MORA, NOCA and OLYM.

Life form Category	Number of Plots				Total Associations
	0	1	2 - 4	5 +	
Tree	39	27	37	85	**188**
Shrub	5	10	12	26	**53**
Herbaceous	4	5	9	25	**43**
Sparse	1	3	8	15	**27**
Total Associations	**49**	**44**	**66**	**153**	**311**

Each description includes scientific name, common name, a NatureServe Code when present, acronym (that cross-references to synthesis tables), national vegetation hierarchy levels including alliance, classification confidence, range in Washington, environmental features, USFWS wetland classification, vegetation description, state conservation rank, rank justification, comments, and plant association synonyms in previous classifications.

A field key to plant association identification preceeds the association descriptions, in Appendix A. Supporting synthesis tables of these associations are organized in Appendix C. The synthesis table lists a subset of species found in each association, with constancy and average cover values. Appendix D presents a summary of a selected set of environmental characteristics sampled for each association at MORA, NOCA, and OLYM.

Appendix B provides 50 additional shrub and herbaceous wetland associations compiled from NatureServe, WNHP classification, literature and field experience that occur or can possibly occur in the parks. Over half (38) of those associations are supported in the current plot data. Appendix B provides the list of those wetland associations in preliminary field key format. Each wetland association includes scientific name, common name, NatureServe Code, acronym (that cross-references to synthesis tables), range in Washington, and environmental features. Larger-scale tree and shrub-dominated wetlands (7 tree-dominated and 2 shrub-dominated associations) and riparian vegetation (18 tree-dominated and 9 shrub-dominated associations) are described and represent by plot data in Appendix E. An additional four wetland and eight riparian tree-dominated associations are described from literature without plot representation but likely to occur in the parks. Fifty herbaceous wetland associations that probably occur in the parks are provided, twenty-two of which have at least one representative plot.

The 2005 preliminary classification, based on literature and existing knowledge, identified 195 probable associations: 142 tree-dominated, 25 shrub-dominated, 23 herbaceous-dominated, and 5 sparse vegetation types. Forty-four of those preliminary associations were then not supported by plot data from the parks, 141 were represented by plot data from the parks, and ten were considered variants of associations and were merged or split into other types.

The final classification step added an additional 126 associations. 54 tree-dominated, 28 shrub-dominated, 22 herbaceous-dominated, and 22 sparse vegetation types. Five of those additional associations are not currently supported by plot data but are described in literature as on or near MORA, NOCA, or OLYM. Fourteen of the added associations are recognized in the current NVC or are included in the coastal correlation (Meidinger 2005). Twenty are related to current NVC associations and, if not accepted as new associations, would expand the geographic range or floristic variation of the current NVC association. Eighteen are new association concepts with support in the classification literature and 40 represent entirely new association concepts generated by sampling in the parks. The remaining additional associations are provisionally recognized and most are represented by a single plot. They fall within the following general categories: avalanche tracks, lahar or debris surfaces or riparian flood terraces (22) or are map assessment plots (7) that could either represent more widespread types or prove to be outliers during subsequent mapping efforts.

An evaluation of the number of plots per park may be used to assess the relative coverage of the classification sampling effort. OLYM has the most plots-1661, followed by MORA- 931 plots and NOCA- 272. The latter two parks are augmented by 270 plots from within approximately10 miles of their eastern boundaries. Forests are the dominant physiognomic class on all parks and the plot distribution reflects that characteristic. OLYM has the widest representation of physiognomic categories among the parks (Table 3). Sparse vegetation sampling is least represented at NOCA. That vegetation type is classified primarily from plots on OLYM and is probably the least represented category in this classification.

Table 3. The distribution of final plots expressed as percent by physiognomic category among MORA, NOCA, and OLYM.

Lifeform Category	Percentage of Plots				
	MORA	**NOCA**	**OLYM**	**Other**	**All Parks**
Tree	72.4%	64.7%	37.4%	41.5%	**50.7%**
Shrub	14.7%	23.5%	18.6%	20.7%	**18.1%**
Herbaceous	10.4%	11.4%	26.1%	33.7%	**20.9%**
Sparse	2.5%	0.4%	17.9%	4.1%	**10.7%**
Total Plots	**931**	**272**	**1661**	**270**	**3134**

Legacy plots represent over half of the plots used in classification, with most of those from OLYM. NOCA has no legacy plots (Table 4). In addition, OLYM has the greatest number and NOCA the least of the NPS crew plots. In spite of the lowest overall sampling, NOCA has the highest percentage of NPS herbaceous plots.

Table 4. The distribution of legacy and NPS plots expressed as percent by physiognomic category among MORA, NOCA, and OLYM.

Lifeform Category	Percentage of Legacy Plots			
	MORA	**OLYM**	**Other**	**All Parks**
Tree	76.0%	27.4%	41.5%	**42.7%**
Shrub	8.5%	19.2%	20.7%	**16.4%**
Herbaceous	12.7%	31.1%	33.7%	**26.3%**
Sparse	2.7%	22.3%	4.1%	**14.6%**
Total Plots	**622**	**1338**	**270**	**2230**
Lifeform Category	Percentage of NPS Plots			
	MORA	**NOCA**	**OLYM**	**All Parks**
Tree	65.0%	64.7%	78.6%	**69.8%**
Shrub	27.2%	23.5%	16.1%	**22.1%**
Herbaceous	5.8%	11.4%	5.3%	**7.3%**
Sparse	1.9%	0.4%	0.0%	**0.8%**
Total Plots	**309**	**272**	**323**	**904**

Association Results

The most sampled plant associations by physiognomic group give an indication (sampling is not random) of their relative abundance within the parks. The most sampled forest associations are subalpine types: *Tsuga mertensiana-Abies amabilis/Rhododendron albiflorum* Forest (66 plots),

Abies lasiocarpa-(Abies amabilis)/Vaccinium membranaceum/Valeriana sitchensis Forest (52 plots), and upper montane types *Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Rubus pedatus* Forest (45 plots), *Abies amabilis/Vaccinium membranaceum /Rubus lasiococcus* Forest (44 plots), and *Tsuga heterophylla-Abies amabilis-(Pseudotsuga menziesii)/Vaccinium alaskaense* Forest (41 plots).

The most sampled shrub associations are alpine and subalpine dwarf-shrub types: *Phyllodoce empetriformis-Vaccinium deliciosum-(Cassiope mertensiana)* Subalpine Dwarf-shrubland (102 plots), *Cassiope mertensiana-Phyllodoce empetriformis* Alpine Dwarf-shrubland (65 plots), and *Vaccinium deliciosum* Dwarf-shrubland (52 plots), *Juniperus communis-(Phlox diffusa)* Dwarf-shrubland (40 plots), and the avalanche/riparian-associated tall shrubland *Alnus viridis ssp. sinuata-Rubus spectabilis/Athyrium filix-femina* Shrubland (27 plots).

The most sampled herbaceous associations are high elevation mesic grassland and forb meadows: *Luetkea pectinata* Herbaceous Vegetation (71 plots), *Carex spectabilis-(Lupinus (arcticus, latifolius)-Polygonum bistortoides* Herbaceous Vegetation (64 plots), *Phlox diffusa-(Lomatium martindalei-Carex phaeocephala)* Herbaceous Vegetation (55 plots), and *Lupinus (arcticus ssp. subalpinus, latifolius)* Herbaceous Vegetation (47 plots) and alpine/subalpine grassland *Festuca roemeri-(Phlox diffusa-Arenaria capillaris)* Herbaceous Vegetation (52 plots). These summaries are mostly legacy plots.

The most sampled sparse association are *Astragalus cottonii* Lithomorphic Vegetation (48 plots), *Phlox diffusa* Lithomorphic Vegetation (34 plots), *Juniperus communis* Lithomorphic Vegetation (25 plots), *Phacelia hastata* Lithomorphic Vegetation (24 plots), and *Delphinium glareosum* Lithomorphic Vegetation (23 plots). These are mostly OLYM legacy plots.

Preliminary associations represent new associations to the NVC. Over half of the preliminary forest associations are supported by descriptions in the literature. Those forest associations without supporting literature appear in two general categories: 1) new classification units representing existing vegetation that were only implicitly recognized in previous Pacific Northwest forest association classifications that emphasized late seral vegetation. An example is the *Pseudotsuga menziesii/Achlys triphylla* Forest, and 2) associations with affinities to complex classification units found east of the Cascade crest in Washington and British Columbia, for example *Abies lasiocarpa-Pseudotsuga menziesii/Mahonia nervosa* Forest. Most preliminary sparse vegetation types represent new vegetation classification units that were underrepresented or not sampled in previous classification work in the region.

Imperiled Associations

The classification includes seven associations ranked S1 (indicating critical imperilment within the state of Washington), eighteen ranked S2 (imperiled) and eight associations have a range rank of S1S2 (critically imperiled or imperiled). Ranks of S1 to S2 are an estimate of rarity based on restricted or unique habitat and/or threatened habitats. Six of the S1 associations occur in restricted habitats although three coastal forest associations (*Picea sitchensis/Maianthemum dilatatum, Picea sitchensis/Vaccinium ovatum,* and *Tsuga heterophylla-Abies amabilis-(Thuja plicata)/Vaccinium alaskaense/Blechnum spicant* Forests) have been reduced in overall ecological quality by past timber harvesting on and off national park land. Three S1 grassland

associations (*Calamagrostis nutkaensis-Vicia nigra ssp. gigantea-(Equisetum telmateia), Festuca roemeri-Cerastium arvense-Koeleria macrantha and Festuca roemeri-Plectritis congesta* Herbaceous associations) are restricted environmentally to forest openings and are threatened by exotic species invasion with site disturbance and tree invasion, particularly the *Festuca roemeri* associations. The *Pinus ponderosa/Pseudoroegneria spicata* Woodland association which is possible at NOCA, previously had a wider range in Washington but its extent has been greatly reduced due to removal of larger trees, fire suppression and invasive species.

Three S1S2 associations are occur along OLYM's narrow wilderness coast. The *Thuja plicata-Tsuga heterophylla/Lysichiton americanus/Sphagnum spp.* Woodland is found only in coastal bogs and fens. *Thuja plicata-Tsuga heterophylla/Vaccinium ovatum* Forest, a very late-seral stage forest and *Tsuga heterophylla-Thuja plicata-(Abies amabilis)/Gaultheria shallon/Blechnum spicant* Forest occur only along the coast as regionally endemic associations. Non- protected lands supporting the latter two associations along the coast have largely been converted or modified by logging. Two S1S2 whitebark pine communities are fairly widely distributed but restricted to small patches in the high elevations of the eastern Cascades in northern Washington and OLYM. The ecological condition of occurrences is declining due to *Pinus albicaulis* mortality from fire exclusion and white pine blister rust (*Cronartium ribicola*). As result, the *Pinus albicaulis/Festuca viridula* Woodland and *Pinus albicaulis-(Tsuga mertensiana)/Luzula glabrata var. hitchcockii* Woodland associations are increasingly rare, and are likely to continue to decline. The non-forest S1S2 associations are *Vaccinium deliciosum-Tauschia stricklandii* Dwarf-shrubland,endemic to MORA,occurs in small patches in subalpine settings where recreational impacts of trampling and trail proliferation pose a possible threat, and *Koeleria macrantha-(Agrostis pallens)* Herbaceous Vegetation found only on balds in the Cascades is subject to tree and exotic species invasions.

Fifteen of the eighteen S2 associations are restricted environmentally, four are wetland or riparian forest types, five are subalpine woodlands, three are subalpine or alpine herbaceous types, two are forest associations with east Cascade affinities and one is a grassland bald. Three S2 associations are less restricted environmentally but have reduced occurrences due to vegetation alteration from timber harvesting and land conversion (*Pseudotsuga menziesii/Gaultheria shallon-Holodiscus discolor* and *Pinus contorta var. contorta-Pseudotsuga menziesii/Gaultheria shallon* Forest associations. nly the former has been confirmed on OLYM) One S2 association possible at NOCA (*Purshia tridentata/Pseudoroegneria spicata* Shrubland) is subject to both land conversion and exotic species invasion.

Discussion

Contributions of This Work

Prior to this project, vegetation sampling and classification concentrated on the abundant forest landscape on and off park lands and on special environments at high elevation, primarily alpine and subalpine dwarf-shrubland and herbaceous vegetation. The targeted sampling effort has allowed some physiognomic or ecologic niches such as avalanche tracks or montane shrublands to be better understood in the region. As directed, the NPS crews accumulated 109 shrub plots that contributed to defining forty of fifty-two shrubland associations in this document. Specifically, variation within thirteen NVC (NatureServe) shrubland associations was described and verified as being on NPS land. Eleven associations that were tentatively recognized from literature and field experience were newly described and verified as occurring within the parks. Provisionally, eight new associations are described pending more survey beyond NPS land to verify the range of variation of types or their relationship to associations recognized elsewhere. These associations provide a foundation from which to more fully describe shrublands and their relationships to natural processes in the Pacific Northwest.

This project provided the opportunity to test the classification of new associations and revisions to the existing NatureServe (2005) from the coastal forests correlation project (CFCP) (Meidinger et al. 2005), since the results of that multi-jurisdictional project served as the basis for forest classification. This project confirmed eighty-seven NatureServe and forty-four CFCP associations as recognizable units and as being on NPS land. Twenty-seven new forest associations were described not previous recognized by NatureServe or the CFCP. Nine of those types represent new associations not currently recognized elsewhere. Provisionally, thirty-four new forest associations are pending more survey or analysis beyond NPS land to verify the range of variation of types or their relationship to associations recognized elsewhere.

Because most of the non-forest alpine and subalpine vegetation in the coastal Pacific Northwest occurs on MORA, NOCA and OLYM, this project provided the opportunity to evaluate its classification through comparison of both legacy data and new NPS data. This project clarified the classification and distribution of twenty-one previously recognized NVC high-elevation non-forest associations and more formally recognized nine new associations cited from literature. An additional eleven new non-forest associations were described to better characterize this high-elevation landscape. Eight provisonal associations were proposed pending more survey or analysis beyond NPS land to verify the range of variation of types or their relationship to associations recognized elsewhere.

Not only has this project filled in gaps and clarified previous classification efforts, this work greatly contributes to the regional and even national organization of vegetation information. Through cooperative project with NatureServe, the association level classification developed for these parks is being used to develop the 2008 NVC hierarchy for the region. Associations provide the reference for evaluating relationships among the various upper levels of the NVC. NatureServe collaborated with WNHP to develop the alliance-level concepts for these classifications by providing a review of the analytical results, review of the plant associations determined by WNHP and wrote descriptions for the alliances and alliance groups with input

from WNHP. This work included determination of all plant associations and their relationship to alliance, group level and other higher levels of the Pacific Northwest portion of the new NVC hierarchy.

This project helps clarify the important role MORA, NOCA and OLYM play in the protection of state and globally rare vegetation. Through sampling and developing the classification, eighteen state critically imperiled or imperiled associations are recognized and confirmed on national parks. These state rare associations are **not** confined to national parks and are located in appropriate environments elsewhere in the state. The parks though support important protection of some of the least altered representatives of these types in Washington, particularly low elevation forests along the coast strip and foothills of OLYM. High elevation forest, woodlands and grasslands are well represented in all the parks and offer the most natural setting for representation of those associations in the state.

Gaps in the Classification

In contrast to using a systematic stratified, or gradient-transect sampling approach to sampling the landscape, the NPS field crews were directed to sample plots that would 1) augment the description and distribution of known associations and 2) sample vegetation not represented in the current classification, for example shrub-dominated vegetation. This approach allowed the NPS to take maximum advantage of previous regional classification work, and seemed the best viable option for 12 people to sample nearly 2 million acres during only 2 field seasons.

From a whole-park perspective, the classification for OLYM is likely the most complete based on total plots and range of physiognomic categories classified. MORA is well represented in forest classification and appears to also be well represented in shrub and herbaceous classification. In contrast, NOCA is the least sampled and contains a complex of vegetation for which the classification is most likely to need further modifications and updates during mapping.

This project's objective was to provide a vegetation classification that would support planned vegetation mapping, consequently, minimal effort went to sampling small-scale associations such as those occurring within wetland patches. Additionally, wetland vegetation is under sampled because it requires a different sampling protocol and additional training of field personnel. Although larger forested and shrub wetlands are fairly described, more the half of the wetland herb types that are likely to occur in the parks are not sampled.

Sparsely vegetated areas or lithomorphic vegetation was largely unsampled during this project and are represented mostly by legacy plots from OLYM. Sparse areas pose unique challenges for both sampling and classification analysis because of their low species diversity, importance of non-vascular species, small patch size and high landscape heterogeneity. Developing a better classification for these small-scale associations would require a higher sampling intensity than was supported. Furthermore, these associations are found in some of the most difficult terrain to access in the parks.

In addition to addressing these known gaps, further sampling may help reduce confusion between certain types. Associations identified in this project as CFCP types (Meidinger et al. 2005) that are represented by only a few plots and have distributions primarily north in BC or

south in Oregon would benefit from further clarification. For example, the *Populus balsamifera ssp. trichocarpa-Alnus rubra/Carex obnupta* association as recognized in this report is the CFCP *Populus balsamifera* spp. *trichocarpa*/ *Cornus sericea*/*Carex obnupta* (PNWCOAST_113). Inclusion of these western Olympic plots with this type expanded the Puget Trough/Georgia Strait concept to include riverine associated wetlands, a much wetter climate, and differing associated species. The *Pseudotsuga menziesii-(Abies grandis)/Acer circinatum/Polystichum munitum* association is a newly recognized association in this report as a result of the coastal correlation from northwest Oregon and new in Washington. Although not represented in the current data for national parks in Washington further sampling is needed to better characterize this association in Washington.

Provisional types in this report also indicate gaps or need for addition classification attention. Many provisional units are placeholders for groups of plots that can be classified to alliance or higher hierarchical levels, such as *Ceanothus velutinus* Shrubland, *Spiraea splendens* Shrubland and *Vaccinium scoparium* Shrubland. Other provisional types defined from park plots appear to be variants of vegetation described elsewhere, for example *Cupressus nootkatensis /Vaccinium deliciosum* Provisional Forest appears to be a variant of *Tsuga mertensiana/Phyllodoce empetriformis-Vaccinium deliciosum.* The *Pseudotsuga menziesii-(Pinus ponderosa / Symphoricarpos albus* Provisional Forest is either a variant of or is the same as *Pseudotsuga menziesii/Symphoricarpos albus* Forest found in the east Cascades and Northern Rockies.

Future Directions

This report summarizes current available data and literature, and therefore represents the latest approximation of the plant associations on MORA, NOCA and OLYM. Continuation of this project into a vegetation mapping phase undoubtedly will reveal associations not covered in the current classification or will add to the variation described by it. The WNHP coordinates with NatureServe to maintain and update the NVC and will continue in that role during the mapping phases of the project. A final approximation of the plant associations of MORA, NOCA and OLYM will incorporate new sampling and any updates to this classification will be incorporated into the NVC.

Conclusions

The project met its goal of developing a single vegetation classification of plant associations for MORA, NOCA and OLYM. The plant associations described in Appendix A reflect the most current and comprehensive vegetation classification not only for the parks, but for the region. This work also represents a philosophical shift in this region from describing and mapping vegetation based on potential vegetation relative to bioclimatic zones to one that is based on existing vegetation. The field keys and descriptions which comprise this report will provide NPS staff, natural resource managers from other agencies, and researchers the tools necessary to sample vegetation in a manner that will closely tie their work to the forthcoming NPS vegetation maps. The combined NCCN classification and mapping work not only provides park managers information for land use decisions, but also informs park visitors, guides research and will serve as a baseline against which to evaluate future vegetation change.

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Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks

Plant Association Descriptions and Identification Keys: Appendices A - G

Natural Resource Technical Report NPS/NCCN/NRTR—2009/211



ON THE COVER
Clockwise from upper left: Photos demonstrate the range of plant communities in these three large parks: 1) An herbaceous meadow at Mount Rainier, 2) imperiled Sitka spruce- False Lily of the Valley Forest association found only on the coastal strip at Olympic National Park, 3) White Mountain Heather-Pink Mountain-heather Dwarf-shrubland at North Cascades National Park, a subalpine heather association also found commonly in all three parks, and 4) Subalpine Fir-(Pacific Silver Fir)/Big Huckleberry/ Sitka Valerian Forest one of the most sampled forest associations in all three parks.
Photograph by: National Park Service 2005-2007 field crew

Vegetation Classification of Mount Rainier, North Cascades, and Olympic National Parks

Plant Association Descriptions and Identification Keys: Appendices

Appendix A. Key to and descriptions of the plant associations of the Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix B. Preliminary key to wetland and riparian plant associations of the Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix C. Synthesis Tables of plant associations sampled at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic.

Appendix D. Environmental variables of plant associations sampled at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix E. Legacy plot data evaluated at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix F. Literature cited in descriptions of plant associations of the Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix G. Sampling instructions and field forms used at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

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Appendix A. Key to and descriptions of the plant associations of the North Cascades including the Chelan National Recreation Area, Olympic and Mount Rainier National Parks.

Introduction

Appendix A contains the field key and descriptions of plant associations found during this project. These are placed in the same section to facilitate easier movement between key and description.

Plant Association Key

The key is constructed as a field key. The following explains features and application of the key in the field.

1. Select a relatively uniform area of vegetation and topography to key out. A representative plot is a simple way to examine a stand, just be sure the plot represents the stand of interest.
2. "Present" means the species is typically found on a representative plot, i.e. it regularly occurs in the stand. "Prominent" means the species occurs with 3-15% cover
3. If the stand or plot meets the criteria in a line, then read to the right or (if blank) to the next indented line down. If the stand or plot does not meet the criteria, then go to the next line down that is not indented from the current line.
4. Some associations key to multiple different lines. For associations that may be distinguished by any one of a number of different characteristics, the criteria are broken into multiple lines so as to avoid excessive and confusing use of "and" and "or" statements. Go to the next line down if the criteria are not met.
5. Percentage values refer to crown cover, that is, the vertical projection below the entire crown of the plant, do not subtract for spaces between leaves and branches
6. "+" = add the crown cover of each of the species indicated, e.g. 7+22 = 29% cover, overlap between the species gets counted twice. One species may be absent.
7. The park or parks where the association occurs or likely occurs are listed at each selection as MORA (Mount Rainier), NOCA (North Cascade) or OLYM (Olympic).
8. Wetland associations located or possibly located in one or all the parks appear in Appendix B and are referenced in the physiognomic section of the key.
9. The key is not the classification. After you have keyed out a stand, always read the association description of vegetation composition, geographic distribution, and physical environment. If it sounds like it fits in most regards, you have made a correct identification. If there are multiple inconsistencies between the stand and the description, the key probably was incorrect. In this case, you probably need to try the key again and follow slightly different leads or identify the stand by reading the descriptions. There are also many undescribed communities in the area and the key does not deal with non-forested wetlands or riparian communities for the most part, so the vegetation you are looking at may be an undescribed type.

Key to Physiognomic Categories: (page numbers refer to key)

Trees > 25%, or stand is a tree island in subalpine parkland

Deciduous broadleaf trees clearly > canopy cover than conifer trees ..... **Key to Deciduous Forest Types p. 3**

Conifer trees approximately equal in canopy cover or > than deciduous broadleaf trees ..... **Key to Conifer Forest and Woodland Types, p. 4**

Shrubs (taller than 0.5 m) or shrub-form trees (krummholz) > 25%.....

Site occurs in a landform where groundwater discharge and/or overbank flooding heavily influence vegetation composition (e.g. seeps/springs, depressions, riparian areas); soils can be organic (fibrous or woody peat or muck) or mineral; includes shrub swamps and fens. ..... **Key to Shrub Swamp & Fen Types Appendix B**

Site occurs in an upland environment such as steep slopes, rocky and/or well-drained soils, or other areas where surface and/or groundwater do not affect vegetation composition ..... **Key to Upland Shrubland Types, p. 13**

Dwarf-shrubs (shorter than 0.5 m) >25% ..... **Key to Upland Dwarf-shrubland Types p. 15**

Herbaceous Vegetation > 25%

Site occurs in a landform where surface water accumulates or groundwater discharges (e.g. marsh, wet meadow, fen, or aquatic bed); may be near late-lying snowbeds; water table near, at, or above soil surface for significant portion of growing season; soil very moist to saturated, although may be dry in late summer/early fall; organic soils may be present;

Site is aquatic and permanently flooded; standing water can be up to several feet above the soil surface; rooted vegetation may be submerged or emergent; some vegetation may be or appear to be floating; includes ponds, lakes, oxbows, etc.; Characteristic species include Utricularia, Brasenia, Elodea, Nuphar, Potamogeton, Ranunculus (aquatilis), Sparganium, and Lemna..... **Key to Aquatic Bed Vegetation Appendix B**

Site is seasonally to semi-permanently flooded; vegetation typically taller than in wet meadows or fens; topography flat or nearly so; includes marshes found along perimeter of beaver ponds, lakes, and in depressions; Characteristic species include Carex exsiccata, C. obnupta, Hippuris vulgaris, Schoenoplectus (acutus, tabernaemontani, Juncus effusus, Menyanthes trifoliata, Oenanthe sarmentosa **Key to Freshwater Marsh Vegetation Appendix B**

Site has organic soils; standing water, if present, rarely more than a few inches above the soil surface; soils are typically saturated year-round; some sites may have hummocks; Sphagnum or “brown” mosses may be abundant; Graminoids typically dominate but forbs can be abundant; Characteristic species include Carex aquatilis var. dives, C. utriculata, C. livida, C. nigricans, C. limosa, C. lenticularis, C. interior, C. utriculata, C. exsiccata, Dulichium arundinaceum, Eleocharis quinqueflora, E. palustris, Trichophorum caespitosum, Rhynchospora alba, Eriophorum spp., Comarum palustre, Calamagrostis canadensis, Menyanthes trifoliata., and Caltha leptosepala..... **Key to Bog or Fen Vegetation Appendix B**

Site has mineral soils; seasonal standing water may be present early in the growing season; sites typically dry out by late summer/early fall. However, early season flooding or soil saturation result in distinctive wetland vegetation; forbs are typically more abundant than previous, however graminoids can be dominant. ..... **Key to Wet Meadow Vegetation Appendix B**

Site has mineral soils; soils are moist and rarely wet (except potentially early spring); fine-textured soils, snow deposition, or windswept dry conditions limit tree establishment; forbs are often abundant.. ..... **Key to mesic meadows; see Herbaceous Upland Vegetation p. 16**

Site occurs in an upland environment (steep slopes, rocky and/or well-drained soils, other areas where surface and/or groundwater do not affect vegetation); may be near early melting snowbeds; soils are rarely saturated (and if so, only in early spring) but can be moist; organic soils or even organic soil horizons not present; ..... **Key to Herbaceous Upland Vegetation p. 16**

Herbaceous Vegetation < 25%.. **Key to Bryophyte and Lithomorphic Sparse Vegetation Types p. 18**

Key to Deciduous Forest Types (page numbers refer descriptions)

Populus balsamifera or Acer macrophyllum > 25%
Populus balsamifera, Picea sitchensis, and Oxalis oregana each > 5% OLYM ..... **POPBAL-PICSIT-(ACEMAC)/OXAORE, p. 220**

Populus balsamifera dominant
Cornus sericea > 10% NOCA..... **POPBAL/CORSER, p. 218**
Gaultheria shallon >10% Polystichum munitum > 10% MORA..... **POPBAL/GAUSHA/POLMUN, p. 146**
Carex obnupta >10% OLYM ..... **POPBAL-ALNRUB/CAROBN, p. 219**
Lahar or debris flow surface MORA ..... **POPBAL-ALNRUB/RUBURS-EQUARV, p. 147**
Alnus incana > 10% NOCA ..... **POPBAL/ALNINC, p. 217**
Not as above ..... **variation in types above or represents an undescribed type**

Acer macrophyllum dominant
Rubus spectabilis > 10% MORA NOCA OLYM ..... **ACEMAC/RUBSPE, p. 202**
Oxalis oregana each > 3% OLYM ..... **ACEMAC/OXAORE, p. 200**
Riparian Polystichum munitum > 10% Tolmiea menziesii present OLYM ..... **ACEMAC/POLMUN-TOLMEN, p. 201**
Non-riparian Polystichum munitum > 10%, Mahonia nervosa usually present..... MORA NOCA OLYM ..... **ACEMAC-(PSEMEN)/POLMUN, p. 141**
Symphoricarpos albus > 10% NOCA ..... **ACEMAC/SYMALB, p. 143**
Acer macrophyllum dominating tall shrub layer, avalanche NOCA ..... **ACEMAC/PAXMYR shrubland p. 142**

Not as above see possible types represented by 1 plot ..... **ACEMAC/MAISTE p. 199 or variation in types above or represents an undescribed type**

Alnus rubra dominant
Carex obnupta or Lysichiton americanus > 5% wetland
Carex obnupta present and > Athyrium filix-femina OLYM ..... **ALNRUB/RUBSPE/CAROBN-LYSAME, p. 209**
Athyrium filix-femina present and > Carex obnupta MORA NOCA OLYM..... **ALNRUB/ATHFIL-LYSAME, p. 196**

Chrysosplenium glechomifolium > 10% riparian OLYM..... **ALNRUB/RUBSPE/CHRGLE, p. 198**

Understory dominated by grasses and/or Rubus ursinus, and Elymus glaucus or E. hirsutus > 1% riparian MORA NOCA OLYM..... **ALNRUB/ELYGLA, p. 204**

Shrubs > 20% and site is riparian or wetland
- Oplopanax horridus > 10% MORA NOCA OLYM ..... **ALNRUB/OPLHOR-RUBSPE, p. 205**
- Rubus parviflorus the dominant shrub MORA NOCA OLYM ..... **ALNRUB/RUBPAR, p. 207**
- Rubus spectabilis + Ribes bracteosum > 20% MORA NOCA OLYM . **ALNRUB/RUBSPE, p. 208**
- Acer circinatum dominant Oxalis oregana >5% MORA OLYM ..... **ALNRUB/OXAORE, p. 212**
- Acer circinatum dominant, not as above MORA NOCA OLYM **ALNRUB/ACECIR/CLASIB, p. 203**
- Alnus viridis dominant shrub MORA NOCA OLYM ..... **ALNRUB/ALNVIR, p. 144**
- Salix sitchensis dominant shrub, riparian OLYM MORA ..... **SALSIT/EQUARV-PETFRI, p. 2307**

Shrubs < 20% and site is riparian or wetland
- Petasites frigidus > 10% MORA NOCA OLYM ..... **ALNRUB/PETFRI, p. 206**
- Oxalis oregana or trilliifolia the dominant herb ..... **ALNRUB/OXAORE, p. 212**
- Tolmiea menziesii, Stachys chamissonis var. cooleyae and/or Claytonia sibirica dominant MORA NOCA OLYM ..... **ALNRUB/STACHA-TOLMEN, p. 210**
- Glyceria striata (=elata) the dominant herb MORA NOCA OLYM ..... **ALNRUB/GLYSTR, p. 197**

Polystichum munitum >10% and site is not a wetland or riparian floodplain MORA OLYM ..... **ALNRUB/POLMUN, p. 145**

Not as above ..... **variation in types above or represents an undescribed type**

Populus tremuloides dominant NOCA..... **POPTRE/CORNUT p. 66**

Betula papyrifera dominant
- Acer circinatum and Mahonia nervosa > 10% NOCA ... **BETPAP-(THUPLI)/ACECIR/MAHNER p. 104**
- Not as above ..... **variation in types above or represents an undescribed type**

Key to Conifer Forest and Woodland Types

Larix lyallii > 5%
- Vaccinium deliciosum > 5% NOCA ..... **LARLYA/VACDEL, p. 62**
- Phyllodoce empetriformis, Cassiope ssp., or Luetkea pectinata > 5% NOCA..... **LARLYA/CASMER-LUEPEC, p. 61**
- Vaccinium scoparium or Luzula glabrata > 5% NOCA ..... **LARLYA/ LUZGLA, p. 62**
- Not as above ..... **Undescribed type**

Pinus albicaulis > 5% and vegetation is woodland (total tree cover < 60%) or tree island in subalpine parkland
- Vaccinium scoparium or V. myrtillus > 5% MORA NOCA..... **PINALB-(ABILAS)/VACSCO/LUZGLA, p. 56**
- Luzula glabrata > 5%, Tsuga mertensiana usually present MORA NOCA OLYM..... **PINALB-(TSUMER)/LUZGLA, p. 57**
- Juniperus communis > 5% MORA NOCA OLYM ..... **PINALB/JUNCOM, p. 60**
- Calamagrostis rubescens or Carex geyeri > NOCA 5% ..... **PINALB/CALRUB, p. 58**
- Festuca viridula > 5% MORA NOCA..... **PINALB/FESVIR, p. 59**
- Not as above ..... **variation in types above or represents an undescribed type**

Picea sitchensis > 10%
- Tsuga heterophylla <25% Populus balsamifera >5% Oxalis oregana >5% valley bottom OLYM..... **POPBAL-PICSIT-(ACEMAC)/OXAORE, p. 220**
- Carex obnupta or Lysichiton americanus > 5% and Carex obnupta present wetland OLYM..... **PICSIT/RUBSPE/CAROBN-LYSAME, p. 192**
- Oplopanax horridus > 10% riparian OLYM . **PICSIT-TSUHET-(ALNRUB)/OPLHOR/POLMUN, p. 215**
- Calamagrostis nutkaensis >10% OLYM..... **PICSIT/CALNUT, p. 72**

Vaccinium ovatum >10% OLYM ..... **PICSIT/VACOVA, p. 75**
Gaultheria shallon >10% OLYM ..... **PICSIT/GAUSHA, p. 73**
Oxalis oregana > 5% OLYM ..... **PICSIT-TSUHET/POLMUN-OXAORE, p. 77**
Rubus spectabilis >10% and not a riparian floodplain site OLYM ..... **PICSIT-(ALNRUB)/RUBSPE/POLMUN, p. 213**
Polystichum munitum > 5% MORA OLYM ..... **PICSIT-TSUHET/POLMUN, p. 76**
Maianthemum dilatatum >10% OLYM ..... **PICSIT/MAIDIL, p. 74**
Scirpus microcarpus or Glyceria striata (=elata) >10% wetland OLYM ..... **PICSIT/SCIMIC, p. 214**
Not as above ..... **variation in types above or represents an undescribed type**

Tsuga mertensiana > 10%, or stand is a tree island in subalpine parkland with Tsuga mertensiana > 5%

Oplopanax horridus > 5% MORA NOCA OLYM ..... **ABIAMA-TSUMER/OPLHOR, p. 191**

Caltha leptosepala > 10% wet site NOCA OLYM ..... **TSUMER-ABIAMA/CALLEP, p. 298**

Festuca viridula > 10% MORA NOCA ..... **ABILAS-(TSUMER)/FESVIR, p. 184**

Eucephalus ledophyllus > 5% MORA ..... **ABILAS-(TSUMER)/EUCLED-LUPARC, p. 183**

Elliottia pyroliflorus > 5% NOCA ..... **TSUMER-ABIAMA-(CUPNOO)/ELLPYR-VACMEM, p. 182**

Phyllodoce empetriformis or Vaccinium deliciosum > 10% and both usually present
- Abies lasiocarpa > 5% Pinus albicaulis <1% MORA NOCA OLYM ..... **TSUMER-ABILAS/VACDEL-PHYEMP, p. 189**
- Abies lasiocarpa < 5%, Abies amabilis usually present MORA NOCA OLYM ..... **TSUMER/PHYEMP-VACDEL, p. 188**

Rhododendron albiflorum > 5% MORA NOCA OLYM ..... **TSUMER-ABIAMA/RHOALB, p. 176**

Menziesia ferruginea > 5% MORA NOCA ..... **ABIAMA-TSUMER/MENFER, p. 170**

Vaccinium scoparium > 5% MORA NOCA ..... **ABILAS-TSUMER/VACSCO, p. 173**

Luzula glabrata > 5% Carex spectablis if present <5% MORA NOCA ..... **TSUMER-(ABIAMA-ABILAS)/LUZGLA, p. 174**

Vaccinium alaskaense > 5%
- Maianthemum dilatatum > 3% NOCA OLYM ..... **TSUMER-ABIAMA/VACALA/MAIDIL, p. 177**
- Streptopus lanceolatus or Tiarella trifoliata > 3% MORA NOCA OLYM ..... **ABIAMA-TSUMER/STRLAN, p. 171**
- Rubus pedatus or Xerophyllum tenax usually present MORA NOCA OLYM ..... **TSUMER-ABIAMA/VACALA/RUBPED, p. 178**

Xerophyllum tenax > 5% and Vaccinium membranaceum present MORA NOCA OLYM ..... **TSUMER-ABIAMA/VACMEM/XERTEN, p. 180**

Vaccinium membranaceum > 5%
- Streptopus lanceolatus or Tiarella trifoliata > 3% MORA NOCA OLYM ..... **ABIAMA-TSUMER/STRLAN, p. 171**
- Valeriana sitchensis > 3% Heracleum maximum <10% MORA NOCA OLYM ..... **TSUMER-ABIAMA/VACMEM/VALSIT, p. 179**
- Rubus lasiococcus usually present MORA NOCA OLYM ..... **ABIAMA-TSUMER/VACMEM/RUBLAS, p. 172**

Tiarella trifoliata or Streptopus lanceolatus > 4% MORA NOCA OLYM ..... **ABIAMA-TSUMER/STRLAN, p. 171**

Alnus viridis >10% MORA NOCA..... **TSUMER-ABILAS/ALNVIR, p. 181**

Total ground vascular plant cover low MORA NOCA OLYM ..... **TSUMER-ABIAMA/Dep., p. 175**

Not as above ..... **variation in types above or represents an undescribed type**

Abies amabilis or Abies procera > 10%

Lysichiton americanus > 5%

Gaultheria shallon > 10% and Thuja plicata > 20% wetland MORA OLYM..... **TSUHET-THUPLI/GAUSHA/LYSAME, p. 195**

Not as above, Vaccinium alaskaense >5% wetland NOCA OLYM ..... **TSUHET-ABIAMA/VACALA/LYSAME, p. 194**

Oplopanax horridus > 5%

Cupressus nootkatensis >50% of total tree cover and site is an avalanche chute or slope ..... MORA NOCA OLYM ..... **CUPNOO/OPLHOR-(ALNVIR), p. 165**

Site type not an avalanche chute or Chamaecyparis nootkatensis <50% of total tree cover MORA NOCA OLYM ..... **ABIAMA-TSUHET/OPLHOR, p. 234**

Rubus spectabilis > 10% and valley bottom sites riparian OLYM **ABIAMA/RUBSPE-VACALA, p. 233**

Abies lasiocarpa > 15%

Xerophyllum tenax > 5% MORA NOCA ..... **ABILAS-(ABIAMA)/VACMEM/XERTEN, p. 154**

Valeriana sitchensis or Arnica latifolia > 1% or Rubus lasiococcus >5% MORA NOCA OLYM..... **ABILAS-(ABIAMA)/VACMEM/VALSIT, p. 153**

Rhododendron albiflorum > 5% MORA NOCA OLYM ..... **ABIAMA/RHOALB, p. 139**

Menziesia ferruginea > 5%

Abies lasiocarpa >10% NOCA ..... **ABILAS-(ABIAMA)/MENFER, p. 152**

Tsuga heterophylla present MORA NOCA OLYM ..... **ABIAMA/MENFER, p. 138**

Rhododendron macrophyllum > 10% OLYM ..... **ABIAMA-(PSEMEN-TSUHET)/RHOMAC, p. 127**

Oxalis oregana > 5% OLYM..... **TSUHET-ABIAMA/OXAORE-BLESPI, p. 123**

Polystichum munitum > 5% MORA OLYM..... **TSUHET-ABIAMA/BLESPI-TIATRI-POLMUN, p. 122**

Gaultheria shallon > 5%

Blechnum spicant >1%, Pseudotsuga menziesii usually absent .....

Thuja plicata > 15% OLYM..... **TSUHET-THUPLI-(ABIAMA)/GAUSHA/BLESPI, p. 84**

Thuja plicata < 15% MORA OLYM..... **TSUHET-(ABIAMA)/GAUSHA/BLESPI, p. 79**

Blechnum spicant < 1%, Pseudotsuga menziesii usually present MORA NOCA OLYM..... **TSUHET-ABIAMA-PSEMEN/GAUSHA, p. 132**

Vaccinium membranaceum > 5%

Xerophyllum tenax > 5% MORA OLYM ..... **ABIAMA-(PSEMEN-ABIPRO)/VACMEM/XERTEN, p. 135**

Valeriana sitchensis or Arnica latifolia > 2% or Rubus lasiococcus >5% MORA NOCA OLYM..... **ABIAMA/VACMEM/RUBLAS, p. 140**

Tiarella trifoliata + Maianthemum stellatum > 5% MORA NOCA OLYM..... **ABIAMA-(PSEMEN)/ACHTRI-TIATRI, p. 126**

Vaccinium alaskaensis > 5% MORA NOCA OLYM ..... **ABIAMA-(TSUHET)/VACMEM-VACALA, p. 137**
Achlys triphylla > 1% MORA OLYM ..... **ABIAMA-(PSEMEN)/VACMEM/ACHTRI, p. 134**
Clintonia uniflora, Rubus lasiococcus or Orthilia secunda present MORA NOCA OLYM..... **ABIAMA-(TSUHET)/VACMEM, p. 136**

Vaccinium alaskaensis > 5%
Tiarella trifoliata + Streptopus lanceolatus + Maianthemum dilatatum > 3% ..... MORA NOCA OLYM ..... **TSUHET-ABIAMA/VACALA/TIATRI, p. 125**
Blechnum spicant > 5% and Thuja plicata >15% MORA NOCA OLYM ..... **TSUHET-ABIAMA-(THUPLI)/VACALA/BLESPI, p. 121**
Clintonia uniflora + Rubus pedatus + Cornus unalaschkensis + Erythronium montanum >3% MORA OLYM ..... **TSUHET-ABIAMA/VACALA/RUBPED, p. 124**
Not as above MORA NOCA OLYM..... **TSUHET-ABIAMA-(PSEMEN)/VACALA, p. 131**

Xerophyllum tenax > 5% and Vaccinium membranaceum present MORA OLYM ..... **ABIAMA-(PSEMEN-ABIPRO)/VACMEM/XERTEN, p. 135**

Achlys triphylla > 5%, or Acer circinatum > 10% and Achlys triphylla present
Tiarella trifoliata + Maianthemum stellatum > 5% MORA OLYM ..... **ABIAMA-(PSEMEN)/ACHTRI-TIATRI, p. 126**
Not as above MORA OLYM ..... **ABIAMA-PSEMEN/ACHTRI, p. 128**

Mahonia nervosa > 5% MORA NOCA OLYM..... **TSUHET-ABIAMA-PSEMEN/MAHNER, p. 133**

Tiarella trifoliata + Streptopus lanceolatus + Rubus pedatus + Blechnum spicant > 5% RUBSPE<20% MORA NOCA OLYM..... **ABIAMA-TSUHET/RUBPED-TIATRI, p. 130**

Total cover of shrubs and herbs < 15%
Herb-dominated Rubus pedatus, Blechnum spicant, Streptopus lanceolatus, Tiarella trifoliata >1% MORA NOCA OLYM ..... **ABIAMA-TSUHET/RUBPED-TIATRI, p. 130**
Vaccinium alaskaense or Vaccinium ovalifolium > Vaccinium membranaceum..... MORA NOCA OLYM ..... **TSUHET-ABIAMA-(PSEMEN)/VACALA, p. 131**
Vaccinium membranaceum, Orthilia secunda, or Chimaphila menziesii present ..... MORA NOCA OLYM ..... **ABIAMA-(TSUHET)/VACMEM, p. 136**
Not as above MORA NOCA OLYM..... **ABIAMA-TSEHET/Dep., p. 129**

Not as above, see possible types represented by 1 plot ..... **variation in types above or undescribed type**

Tsuga heterophylla or Thuja plicata > 10%
Ledum groenlandicum + Kalmia microphylla > 10% wetland
Pinus contorta the dominant tree MORA NOCA OLYM..... **PINCON/LEDGRO/SPHAGN, p. 294**
Tsuga heterophylla or Thuja plicata the dominant tree wetland MORA NOCA OLYM..... **TSUHET-(THUPLI)/LEDGRO/SPHAGN, p. 296**

Lysichiton americanus > 5% wetland
Gaultheria shallon and Thuja plicata each > 10%
Sphagnum spp. >10%, open woodland with stunted trees OLYM..... **THUPLI-TSUHET/LYSAME/SPHAGN, p. 295**
Not as above MORA OLYM..... **TSUHET-THUPLI/GAUSHA/LYSAME, p. 195**
Rubus spectabilis or Athyrium filix-femina present OLYM ..... **TSUHET-(THUPLI-ALNRUB)/LYSAME-ATHFIL, p. 193**

Oplopanax horridus > 5% riparian MORA NOCA OLYM.....

.....**TSUHET-PSEMEN-(THUPLI)/OPLHOR/POLMUN, p. 120**

Arctostaphlos nevadensis > 10% NOCA.....**PSEMEN-PINCON/ARCNEV, p. 48**

Rhododendron macrophyllum > 10%
Polystichum munitum > 3% OLYM.....**PSEMEN-TSUHET/RHOMAC/POLMUN, p. 98**
Not as above OLYM ..... **PSEMEN-TSUHET/RHOMAC, p. 112**

Rubus spectabilis > 10% and not a riparian floodplain site MORA NOCA OLYM.....
.....**PSEMEN-(ALNRUB-TSUHET)/RUBSPE, p. 114**

Oxalis oregana > 5%
Pseudotsuga menziesii > 10% and Vaccinium alaskaense > 5% MORA OLYM.....
.....**TSUHET-PSEMEN/VACALA/OXAORE, p. 102**
Vaccinium alaskaense > 10% and Pseudotsuga menziesii <10% OLYM .....
.....**TSUHET/VACALA/OXAORE, p. 83**
Gaultheria shallon > 5% OLYM.....**TSUHET/GAUSHA/POLMUN-BLESPI, p. 80**
Blechnum spicant or Vaccinium alaskaense present, Mahonia nervosa absent OLYM.....
.....**TSUHET/POLMUN-OXAORE, p. 82**
Pseudotsuga menziesii absent OLYM .....**TSUHET/POLMUN-OXAORE, p. 82**
Pseudotsuga menziesii present MORA OLYM .. **PSEMEN-TSUHET/POLMUN-OXAORE, p. 117**

Gaultheria shallon > 10%, Blechnum spicant > 1%, and Pseudotsuga menziesii absent or minor
Vaccinium ovatum > 5% OLYM.....**THUPLI-TSUHET/ VACOVA, p. 78**
Polystichum munitum > 5% OLYM.....**TSUHET/GAUSHA/POLMUN-BLESPI, p. 80**
Thuja plicata > 15% OLYM..... **TSUHET-THUPLI-(ABIAMA)/GAUSHA/BLESPI, p. 84**
Thuja plicata < 15% OLYM..... **TSUHET-(ABIAMA)/GAUSHA/BLESPI, p. 79**

Vaccinium alaskaense > 5%
Xerophyllum tenax > 5% Abies lasiocarpa and Cupressus nootkatensis absent .....
.....**PSEMEN-TSUHET/VACALA/XERTEN, p. 113**
Polystichum munitum > 5% .....**TSUHET-(PSEMEN)/VACALA/POLMUN, p. 119**
Mahonia nervosa or Gaultheria shallon > 5% .....
.....**TSUHET-(PSEMEN)/VACALA-MAHNER-(GAUSHA), p. 100**
Not as above..... **TSUHET-(PSEMEN)/VACALA/CORUNA, p. 99**

Polystichum munitum > 10%
Blechnum spicant > 5%, Tiarella trifoliata < 1%, and Pseudotsuga menziesii < 15% .....
..... **TSUHET/POLMUN-BLESPI, p. 81**
Tiarella trifoliata + Athyrium filix-femina > 1% and > Mahonia nervosa + Gaultheria shallon ..... **TSUHET-(PSEMEN-THUPLI)/POLMUN-ATHFIL, p. 216**
Gaultheria shallon > 5% ..... **PSEMEN-TSUHET/GAUSHA/POLMUN, p. 94**
Mahonia nervosa > 5%.....**PSEMEN-TSUHET/MAHNER-POLMUN, p. 116**
Rubus spectabilis > 2% ..... **TSUHET-(PSEMEN-THUPLI)/POLMUN-ATHFIL, p. 216**
Tiarella trifoliata + Blechnum spicant + Athyrium filix-femina + Dryopteris expansa > 3% .....
..... **TSUHET-(PSEMEN-THUPLI)/POLMUN-ATHFIL, p. p. 216**
Not as above, Pseudotsuga menziesii present ..**PSEMEN-TSUHET/(ACECIR)/POLMUN, p. 115**

Gaultheria shallon > 10%
Polystichum munitum > 3% ..... **PSEMEN-TSUHET/GAUSHA/POLMUN, p. 94**
Rhododendron macrophyllum > 5% ..... **PSEMEN-TSUHET/RHOMAC, p. 112**
Holodiscus discolor > 2% ..... **PSEMEN-TSUHET/GAUSHA-HOLDIS, p. 110**
Xerophyllum tenax > 2% ..... **PSEMEN-TSUHET/GAUSHA/XERTEN, p. 109**
Mahonia nervosa > 5%.....**PSEMEN-TSUHET/GAUSHA-MAHNER, p. 111**
Not as above, Vaccinium parvifolium usually present.....

.....**PSEMEN-TSUHET/GAUSHA-VACPAR, p. 95**

Polystichum munitum and Blechnum spicant each > 5%, and usually Pseudotsuga menziesii < 15% ..... **TSUHET/POLMUN-BLESPI, p. 81**

Achlys triphylla > 5% Tiarella trifoliata <5% Gymnocarpium dryopteris<1% .... **PSEMEN-TSUHET/ACHTRI, p. 93**

Xerophyllum tenax > 5%
Abies lasiocarpa >10% MORA NOCA..... **ABILAS-(ABIAMA)/VACMEM/XERTEN, p. 154**
Not as above MORA OLYM .....**PSEMEN-TSUHET/VACALA/XERTEN, p. 113**

Tiarella trifoliata + Gymnocarpium dryopteris >5% MORA NOCA OLYM..... .....**TSUHET-(PSEMEN)/TIATRI-GYMDRY, p. 118**

Mahonia nervosa > 5%
Polystichum munitum > 3% MORA NOCA OLYM ....**PSEMEN-TSUHET/MAHNER-POLMUN, p. 116**
Gaultheria shallon > 5% MORA NOCA OLYM...**PSEMEN-TSUHET/GAUSHA-MAHNER, p. 111**
Not as above MORA NOCA OLYM.....**PSEMEN-TSUHET/MAHNER, p. 96**

Tiarella trifoliata and/or Gymnocarpium dryopteris present MORA NOCA OLYM..... .....**TSUHET-(PSEMEN)/TIATRI-GYMDRY, p. 118**

Acer circinatum > 5% and Mahonia nervosa >3% Vaccinium membranaceum <5% MORA NOCA OLYM .....**PSEMEN-TSUHET/MAHNER, p. 96**

Acer circinatum > 5%, Cornus unalaschkensis absent and Paxistima myrsinites > 1% NOCA ....**PSEMEN-(TSUHET)/ACECIR-PAXMYR, p. 39**

Paxistima myrsinites > 5% NOCA..... **PSEMEN-TSUHET/PAXMYR/LINBOR, p. 97**

Vaccinium membranaceum > 5% MORA NOCA ..... **PSEMEN-(THUPLI-ABIGRA)/VACMEM p. 87**

Total cover of shrubs and herbs < 10%, Mahonia nervosa present Chimaphila menziesii, Chimaphila umbellata, or Corallorhiza sp. present, moist site indicators absent MORA NOCA OLYM ..... **TSUHET-PSEMEN/MAHNER-CHIMEN, p. 101**

Total vascular plant cover low.....**PSEMEN-(TSUHET)/Dep. p. 108**

Not as above .....**TSUHET-THUPLI/TAXBRE, p. 103 or** ..... **variation in types above or represents an undescribed type**

Abies lasiocarpa > 10%, or stand is a tree island in subalpine parkland with Abies lasiocarpa > 5%, or Picea engelmannii > 10% and > Abies grandis

Rubus spectabilis > 10% riparian OLYM..... **ABILAS/RUBSPE, p. 235**

Mahonia nervosa or Achlys triphylla >5% Pseudotsuga menziesii present..... .....**ABILAS-PSEMEN/MAHNER, p. 162**
Cupressus nootkatensis co-dominant, avalanche OLYM .... **ABILAS-CUPNOO/MAHNER/VALSIT, p. 161**

Veratum viride >10% MORA NOCA OLYM .....**ABILAS/VERVIR, p. 160**

Vaccinium deliciosum > 5%
Erythronium montanum >1% Tsuga mertensiana>5% MORA NOCA OLYM ..... **TSUMER-ABILAS/VACDEL-PHYEMP, p. 189**
Not as above MORA NOCA OLYM ..... **ABILAS/VACDEL, p. 186**

Phyllodoce empetriformis and Vaccinium scoparium each > 5% NOCA ..... **ABILAS-PICENG/PHYEMP, p. 150**

Equisetum arvense > 10% NOCA ..... **PICENG/EQUARV, p. 190**

Rhododendron albiflorum > 5%
Picea engelmannii, Vaccinium scoparium, or V. myrtillus >1% NOCA ... **ABILAS/RHOALB, p. 70**
Rubus lasiococcus or Lupinus arcticus ssp. subalpinus usually present MORA NOCA OLYM ..... **ABILAS/RHOALB/RUBLAS, p. 156**

Menziesia ferruginea > 5% NOCA ..... **ABILAS-(ABIAMA)/MENFER, p. 152**

Vaccinium scoparium > 5% and Valeriana sitchensis or Luzula glabrata var. hitchcockii > 1% MORA ..... **ABILAS/VACSCO/VALSIT, p. 149**

Festuca viridula > 10% shrub and dwarf-shrubs <5% MORA NOCA ..... **ABILAS-(TSUMER)/FESVIR, p. 184**

Eucephalus ledophyllus > 5% shrubs minor MORA .. **ABILAS-(TSUMER)/EUCLED-LUPARC, p. 183**

Valeriana sitchensis or Arnica latifolia >5%
Veratum viride >5% MORA NOCA OLYM ..... **ABILAS/VERVIR, p. 160**
Vaccinium membranaceum > 5% MORA NOCA OLYM ..... **ABILAS-(ABIAMA)/VACMEM/VALSIT, p. 153**
Not as above MORA NOCA OLYM ..... **ABILAS/VALSIT, p. 159**

Erythronium montanum >10% OLYM ..... **ABILAS/ERYMON, p. 155**

Rubus lasiococcus > 5% MORA NOCA OLYM ..... **ABILAS/VALSIT, p. 159**

Vaccinium membranaceum > 5%
Xerophyllum tenax > 5% MORA NOCA OLYM .. **ABILAS-(ABIAMA)/VACMEM/XERTEN, p. 154**
Abies amabilis > 1% and Valeriana sitchensis or Veratrum viride present MORA NOCA OLYM ..... **ABILAS-(ABIAMA)/VACMEM/VALSIT, p. 153**
Calamagrostis rubescens or Carex geyeri >1% NOCA ..... **ABILAS-(PSEMEN)/VACMEM/CALRUB, p. 67**
Lupinus arcticus ssp. subalpinus > 1% MORA OLYM ..... **ABILAS/VACMEM/LUPARC, p. 157**

Juniperus communis > 5% and > Lupinus arcticus subalpinus, Lomatium martindalei usually present OLYM ..... **ABILAS-(PINCON)/JUNCOM-LOMMAR, p. 151**

Lupinus arcticus ssp. subalpinus > 3%, Valeriana sitchensis, Luzula glabrata, Carex spectabilis <3% OLYM ..... **ABILAS-(PINCON)/LUPARC, p. 148**

Linnaea borealis > 5% NOCA ..... **PICENG-(ABILAS)/LINBOR, p. 71**

Vaccinium scoparium + Vaccinium myrtillus > 10% Picea engelmannii present NOCA ..... **ABILAS-PICENG/VACSCO, p. 68**

Polemonium pulcherrimum or Pedicularis racemosa >1%, Polygonum bistortoides, or Luzula glabrata var. hitchcockii present MORA NOCA OLYM ..... **ABILAS/POLPUL-PEDRAC, p. 185**

Arnica latifolia or Valeriana sitchensis > 1% MORA NOCA OLYM..... **ABILAS/VALSIT, p. 159**

Calamagrostis rubescens > 5% NOCA.....**ABILAS-PSEMEN/CALRUB, p. 69**

Pedicularis racemosa or Polygonum bistortoides > 1% MORA NOCA OLYM .... **ABILAS/POLPUL-PEDRAC, p. 185**

Not as above ..... **variation in types above or represents an undescribed type**

Cupressus (Chamaecyparis) nootkatensis >10%

Oplopanax horridus > 5% and site is an avalanche chute or slope MORA NOCA OLYM .... **CUPNOO/OPLHOR-(ALNVIR), p. 165**
Valeriana sitchensis > 5% MORA NOCA OLYM ..... **CUPNOO/VALSIT, p. 168**
Tiarella trifoliata + Streptopus lanceolatus + Rubus pedatus > 2% often avalanche MORA NOCA OLYM.....**CUPNOO/STRLAN, p. 167**
Not as above, see possible types represented by 1 plot ..... **CUPNOO/RIBLAC, p. 166; CUPNOO/VACDEL, p. 187; CUPNOO-PSEMEN/ACECIR, p. 169**

Abies grandis > 10%

Oplopanax horridus > 5% MORA NOCA OLYM ....**TSUHET-PSEMEN-(THUPLI)/OPLHOR/POLMUN, p. 120**

Polystichum munitum > 5%

Gaultheria shallon or Mahonia nervosa > 5% OLYM .... **PSEMEN-ABIGRA/MAHNER-GAUSHA/POLMUN, p. 92**
Acer circinatum >10% OLYM ..... **PSEMEN-ABIGRA/ACECIR/POLMUN, p. 86**
Bromus vulgaris > 5% OLYM ..... **ABIGRA/BROVUL-POLMUN, p. 211**

Vaccinium membranaceum > 5% MORA NOCA ..... **PSEMEN-(THUPLI-ABIGRA)/VACMEM p. 87**

Acer circinatum >5% Paxistima myrsinites present NOCA..... ..... **PSEMEN-(ABIGRA)/ACECIR/PAXMYR, p. 38**

Pteridium aquilinum and Spiraea betulifolia each > 1% NOCA ..... **PSEMEN-ABIGRA/SPIBET, p. 42**

Calamagrostis rubescens > 5% NOCA.....**PSEMEN-ABIGRA/CALRUB, p. 41**

Not as above ..... **variation in types above or represents an undescribed type**

Pseudotsuga menziesii > 10%

Pinus contorta > 25% .....**PINCON key p. 13**

Polystichum munitum > 10%

Gaultheria shallon or Mahonia nervosa > 5% MORA NOCA OLYM..... ..... **PSEMEN/GAUSHA-MAHNER/POLMUN, p. 107**
Acer circinatum >10% MORA NOCA OLYM.....**PSEMEN-TSUHET/(ACECIR)/POLMUN, p. 115**

Arctostaphylos nevadensis > 10% Pinus contorta > Pinus ponderosa NOCA ....**PSEMEN-PINCON/ARCNEV, p. 48**
Arctostaphylos nevadensis > 10% Pinus ponderosa > Pinus contorta NOCA .....

..... **PSEMEN-PINPON/ARCNEV, p. 53**

Vaccinium myrtillus > 5% NOCA..... **PSEMEN-(PINCON)/VACMYR, p. 45**

Arctostaphylos uva-ursi > 10% and Racomitrium spp. (a moss) or Cladonia spp. (a lichen) > 1% (west of Cascade Crest) MORA NOCA OLYM ...**PSEMEN-(PINCON)/ARCUVA/RACCAN, p. 106**

Gaultheria shallon > 5% Holodiscus discolor >2% OLYM ..... **PSEMEN/GAUSHA-HOLDIS, p. 36**

Gaultheria shallon > 5% Vaccinium parvifolium present MORA NOCA OLYM .....
..... **PSEMEN/GAUSHA-VACPAR, p. 90**

Mahonia nervosa > 5%
- Acer circinatum>10% MORA NOCA ..... **PSEMEN/ACECIR/MAHNER p. 88**
- Holodiscus discolor + Rosa gymnocarpa > 5% Polystichum munitum Festuca occidentalis >1%, Calamagrostis rubescens absent, west Cascades MORA NOCA OLYM.....
..... **PSEMEN/HOLDIS-ROSGYM/FESOCC, p. 37**
- Achlys triphylla>1% MORA OLYM ..... **PSEMEN/MAHNER/ACHTRI p. 91**
- Calamagrostis rubescens or Carex geyeri present Spiraea betulifolia>1% NOCA .....
..... **PSEMEN/ MAHNER/CALRUB p. 40**

Achlys triphylla>1% MORA OLYM ..... **PSEMEN/ACHTRI p. 89**

Vaccinium caespitosum >5% NOCA..... **PSEMEN/VACCAE p. 46**

Vaccinium membranaceum > 5%
- Vaccinium parvifolium >1% MORA NOCA..... **PSEMEN-(THUPLI-ABIGRA)/VACMEM p. 87**
- Calamagrostis rubescens or Carex geyeri >1% NOCA ..... **PSEMEN/VACMEM p. 47**

Acer circinatum >5%
- Holodiscus discolor + Rosa gymnocarpa > 5% Polystichum munitum or Festuca occidentalis present MORA NOCA OLYM ..... **PSEMEN/HOLDIS-ROSGYM/FESOCC, p. 37**
- Paxistima myrsinites present NOCA ..... **PSEMEN-(ABIGRA)/ACECIR/PAXMYR, p. 38**

Symphoricarpos albus > 5% Spiraea betulifolia >2% NOCA.....**PSEMEN-(PINPON)/SYMALB, p. 49**

Symphoricarpos albus > 5% Acer circinatum >2% riparian NOCA.....
..... **PSEMEN-PINPON-POPBAL/ACECIR, p. 221**

Holodiscus discolor + Rosa gymnocarpa > 5%
- Spiraea betulifolia Calamagrostis rubescens Arnica cordifolia present NOCA .....**PSEMEN/HOLDIS/CALRUB, p. 50**
- Polystichum munitum Lathyrus nevadensis, Symphoricarpos hesperius, Bromus vulgaris Adenocaulon bicolor or Festuca occidentalis present MORA NOCA OLYM .....
..... **PSEMEN/HOLDIS-ROSGYM/FESOCC, p. 37**

Purshia tridentata and Pinus ponderosa each > 5% NOCA ..... **PINPON-PSEMEN/PURTRI, p. 51**

Paxistima myrsinites > 5% NOCA.....**PSEMEN/PAXMYR-SPIBET p. 52**

Calamagrostis rubescens > 5% NOCA..... **PSEMEN-PINPON/CALRUB, p. 54**

Not as above .....**variation in types above or represents undescribed type**

Pinus ponderosa > 10%

Purshia tridentata > 5% and Pseudotsuga menziesii present NOCA **PINPON-PSEMEN/PURTRI, p. 51**

Arctostaphylos nevadensis > 10% NOCA ..... **PSEMEN-PINPON/ARCNEV, p. 53**

Pseudoroegneria spicata > 5% NOCA ..... **PINPON/PSESPI, p. 55**

Not as above ..... **variation in types above or represents an undescribed type**

Pinus contorta > 10%

Ledum groenlandicum + Kalmia microphylla > 10% wetland MORA NOCA OLYM ..... **PINCON/LEDGRO/SPHAGN, p. 294**

Arctostaphylos uva-ursi > 10% and Racomitrium spp. (a moss) or Cladonia spp. (lichen) > 1% (west of Cascade Crest) MORA NOCA OLYM ..... **PSEMEN-(PINCON)/ARCUVA/RACCAN, p. 106**

Gaultheria shallon > 5% MORA NOCA OLYM ..... **PINCON-PSEMEN/GAUSHA, p. 105**

Vaccinium membranaceum > 5% NOCA ..... **PINCON/VACMEM p. 44**

Arctostaphylos nevadensis > 10% NOCA ..... **PSEMEN-PINCON/ARCNEV, p. 48**

Juniperus communis > 5% and > Lupinus arcticus ssp. subalpinus, and Abies lasiocarpa present OLYM ..... **ABILAS-(PINCON)/JUNCOM-LOMMAR, p. 151**

Lupinus arcticus ssp. subalpinus > 3% and Abies lasiocarpa present OLYM ..... **ABILAS-(PINCON)/LUPARC, p. 148**

Paxistima myrsinites > 5% NOCA ..... **PINCON/PAXMYR/CALRUB p. 43**

Not as above ..... **variation in types above or represents an undescribed type**

Key to Upland Shrubland Types

Tsuga mertensiana dominant, krummholz (near treeline shrubland) MORA NOCA OLYM ..... **KRUMM TSUMER, p. 164**

Abies lasiocarpa dominant or co-dominant with Cupressus nootkatensis, krummholz (near treeline shrubland) MORA NOCA OLYM ..... **KRUMM ABILAS, p. 163**

Pinus albicaulis dominant, krummholz (near treeline shrubland) MORA NOCA OLYM ..... **KRUMM PINALB, p. 64**

Populus tremuloides dominating tall shrub layer, steep slope NOCA..... **POPTRE shrubland p. 65**

Acer macrophyllum dominating tall shrub layer, steep slope NOCA..... **ACEMAC/PAXMYR shrubland p. 142**

Taxus brevifolia dominating tall shrub layer, steep slope NOCA ..... **TAXBRE/PAXMYR, p. 85**

Cupressus nootkatensis shrub-form (not krummholz) >15% and Oplopanax horridus > 5% and site is an avalanche chute or slope MORA NOCA OLYM..... **CUPNOO/OPLHOR-(ALNVIR), p. 165**

Alnus viridis > 10%
Oplopanax horridus > 5%, often avalanche MORA NOCA OLYM .....**ALNVIR-OPLHOR, p. 226**
Rubus spectabilis, Ribes bracteosum, or Athyrium filix-femina present, often avalanche MORA NOCA OLYM ..... **ALNVIR-RUBSPE/ATHFIL, p. 227**
Acer circinatum > 10%, often avalanche MORA NOCA OLYM ..... **ALNVIR-ACECIR, p. 225**
Not as above MORA NOCA OLYM..... **ALNVIR p. 224**

Gaultheria shallon > 25% OLYM ..... **GAUSHA, p. 290**

Acer circinatum the dominant shrub
Rubus spectabilis, Oplopanax horridus, Athyrium filix-femina, Tolmiea menziesii, Maianthemum stellatum or Stachys chamissonis present riparian MORA NOCA OLYM ....**ACECIR/ATHFIL-TOLMEN, p. 223**
Not as above and not a riparian floodplain or wetland site MORA NOCA OLYM.....**ACECIR, p. 222**

Salix sitchensis the dominant shrub, riparian OLYM MORA ..... **SALSIT/EQUARV-PETFRI, p. 231**

Rubus parviflorus the dominant shrub and Chamerion angustifolium or Pteridium aquilinum > 1% MORA NOCA OLYM ..... **RUBPAR/CHAANG, p. 267**

Rubus parviflorus the dominant shrub and Rubus spectabilis present MORA NOCA OLYM..... .....**RUBPAR-RUBSPE, p. 268**

Oplopanax horridus > 10% MORA NOCA OLYM ..... **OPLHOR, p. 229**

Rubus spectabilis and/or Ribes bracteosum dominant MORA NOCA OLYM... **RUBSPE-RIBBRA, p. 230**

Vaccinium membranaceum and Vaccinium deliciosum each > 15% MORA NOCA OLYM ....**VACMEM/VACDEL, p. 315**
Vaccinium membranaceum and Phyllodoce empetriformis each > 15% MORA NOCA OLYM .... **VACMEM/PHYEMP, p. 311**

Vaccinium membranaceum >15%
Calamagrostis rubescens >5% NOCA ..... **VACMEM/CALRUB, p. 278**
Phlox diffusa >5% MORA NOCA OLYM .....**VACMEM/PHLDIF, p. 276**
Xerophyllum tenax > 15% MORA NOCA OLYM..... **VACMEM/XERTEN, p. 279**
Not as above MORA NOCA OLYM.....**VACMEM, p. 277**

Vaccinium caespitosum > 15% MORA NOCA OLYM .... **VACCAE/FESVIR p. 272 or VACCAE/XERTEN p. 279**

Vaccinium scoparium > 15% MORA NOCA..... **VACSCO, p. 275**

Spiraea splendens dominant shrub MORA NOCA OLYM .....**SPISPL, p. 269**

Arctostaphylos columbiana dominant shrub OLYM ..... **ARCCOL, p. 291**

Ceanothus velutinus > 15% MORA NOCA ..... **CEAVEL, p. 292**

Amelanchier alnifolia >15% and Calamagrostis rubescens >5% NOCA ..... **AMEALN/CALRUB, p. 264**

Paxistima myrsinites > 10% Phlox diffusa >5% MORA NOCA OLYM..... **PAXMYR-PHLDIF, p. 266**
Sorbus sitchensis > 10% Phyllodoce empetriformis or Vaccinium deliciosum >5% , often avalanche MORA NOCA OLYM..... **SORSIT/PHYEMP-VACDEL, p. 310**

Purshia tridentata > 10%

Pseudoroegneria spicata > 5% and Festuca idahoensis and F. campestris each < 5% NOCA ..... **PURTRI/PSESPI, p. 303**
Not as above ..... **Undescribed**

Symphoricarpos albus > 10% avalanche track OLYM ..... **SYMALB-MALFUS, p. 232**

Not as above, see possible types represented by 1 plot ..... **SYMHES, p. 271 or variation in types above or undescribed types**

Key to Dwarf-Shrubland Types

Kalmia microphylla > 10% wetland **SHRUB and DWARF-SHRUB SWAMP AND FEN key in Appendix B**

Empetrum nigrum the dominant dwarf-shrub, alpine site MORA NOCA OLYM **EMPNIG-LUPSEL, p. 305**

Arctostaphylos uva-ursi or Arctostaphylos nevadensis the dominant dwarf-shrub and
High elevation sites Festuca brachyphylla, Dasiphora floribunda, and other more alpine species MORA NOCA ..... **ARCUVA-(DASFLO), p. 304**
Mid-elevations Arctostaphylos nevadensis present MORA NOCA OLYM ..... **ARC(NEV,UVA)-JUNCOM, p. 280**
Mid-elevations with Paxistima myrsinites Calamagrostis rubescens NOCA ..... **ARC(NEV,UVA)-PAXMYR, p. 281**
Low to mid elevations Fragaria virginiana or Festuca roemeri present OLYM ..... **ARCUVA-FRAVIR-(FESROE), p. 282**

Salix cascadensis the dominant dwarf-shrub NOCA ..... **SALCAS-FESBRA, p. 312**

Phyllodoce glanduliflora > 10% MORA NOCA OLYM ..... **PHYGLA-(CASMER), p. 309**

Phyllodoce empetriformis >10%
Lupinus arcticus > Vaccinium deliciosum + Cassiope mertensiana at or above treeline MORA OLYM ..... **PHYEMP-(VACDEL)/LUPARC, p. 307**
Vaccinium deliciosum > Cassiope mertensiana tree species often present and >5% subalpine parkland MORA NOCA OLYM ..... **PHYEMP-VACDEL-(CASMER), p. 308**
Vaccinium deliciosum < Cassiope mertensiana tree species usually absent <5% more alpine settings MORA NOCA OLYM ..... **CASMER-PHYEMP, p. 306**

Cassiope mertensiana >10%
Vaccinium deliciosum > Cassiope mertensiana tree species often present and >5% subalpine parklands MORA NOCA OLYM ..... **PHYEMP-VACDEL-(CASMER), p. 308308**
Vaccinium deliciosum < Cassiope mertensiana tree species usually absent <5% more alpine settings MORA NOCA OLYM ..... **CASMER-PHYEMP, p. 306**

Vaccinium deliciosum the dominant dwarf-shrub
Tauschia stricklandii > 5% MORA ..... **VACDEL-TAUSTR, p. 314**
Festuca viridula >5% MORA NOCA ..... **VACDEL-FESVIR, p. 274**
otherwise MORA NOCA OLYM ..... **VACDEL, p. 313**

Vaccinium scoparium dominant MORA NOCA ..... **VACSCO, p. 275**

Juniperus communis the dominant dwarf-shrub
Arctostaphylos uva-ursi > 10% MORA NOCA OLYM ..... **ARC(NEV,UVA)-JUNCOM, p. 280**

Juniperus communis > 10% MORA NOCA OLYM ..... **JUNCOM-(PHLDIF), p. 265**

Dasiphora floribunda > 10% MORA NOCA OLYM ..... **DASFLO-(PHLDIF), p. 336**

Spiraea splendens >10% dominant MORA NOCA OLYM ..... **SPISPL, p. 269**

Not as above ..... **variation in types above or represents an described type**

Key to Upland Herbaceous Vegetation Types (dominant generally means >49% of total cover OR >9%& most abundant)

Carex breweri dominant
Carex phaeocephala co-dominant MORA ..... **CARBRE -CARPHA p. 331**
Not as above MORA NOCA ..... **CARBRE, p. 316**

Carex phaeocephala dominant MORA NOCA OLYM ..... **CARPHA, p. 317**
Bromus sitchensis co-dominant, avalanche OLYM..... **BROSIT-CARPHA p. 236**

Festuca brachyphylla MORA NOCA or Festuca saximontana OLYM dominant .. **FES(BRA, SAX), p. 318**

Carex scirpoidea ssp. pseudoscirpoidea dominant MORA NOCA ..... **CARPSE, p. 250**

Carex nardina dominant NOCA..... **CARNAR, p. 249**

Juncus parryi dominant MORA NOCA OLYM..... **JUNPAR-(POLBIS), p. 243**

Luetkea pectinata dominant MORA NOCA OLYM..... **LUEPEC, p. 253**

Antennaria lanata dominant MORA NOCA OLYM ..... **ANTLAN, p. 242**
Antennaria lanata and Juncus parryii co-dominant MORA NOCA OLYM .. **JUNPAR-(POLBIS), p. 243**

Calamagrostis nutkaensis dominant OLYM ..... **CALNUT-VICNIG-(EQUTEL) p. 289**

Festuca roemeri > 10%
Phlox diffusa > 1% or Arenaria capillaris, Delphinium glareosum alpine/subalpine sites
MORA NOCA OLYM ..... **FESROE-(PHLDIF-ARECAP) p. 319**
Plectritis congesta >5% OLYM..... **FESROE-PLECON p. 285**
Cerastium arvense or Koeleria macrantha usually present OLYM .....
..... **FESROE-(CERARV-KOEMAC) p. 284**
Not as above ..... **variation in types above or represents an undescribed type**

Selaginella wallacei dominant with Festuca brachyphylla, F. saximontana or F. roemeri present
MORA OLYM..... **SELWAL-(FESROE,FESBRA), p. 321**

Kalmia microphylla > 5%, and Carex nigricans or Oreostemma alpigenum > 5% MORA.....
..... **KALMIC-CARNIG, p. 297**

Festuca viridula > 10%
Valeriana sitchensis > 10% MORA NOCA OLYM ..... **VALSIT-LIGGRA, p. 261**
Eucephalus ledophyllus > 5% MORA NOCA..... **FESVIR-EUCLED, p. 251**
Lupinus arcticus > 5% MORA NOCA..... **FESVIR-LUPARC, p. 252**

Carex nigricans dominant (>49%total cover), Caltha leptosepala < 1% MORA NOCA OLYM .....

.....**CARNIG, p. 301**
Carex nigricans co-dominant, Caltha leptosepala > 10% wetland MORA NOCA OLYM .....
..... **CAR (AQU, NIG)-CALLEP, Appendix B**

Carex nigricans >10% & >all other herb spp. MORA NOCA OLYM .....**CARNIG, p. 301**

Carex mertensia dominant, often avalanche MORA NOCA OLYM .....**CARMER, p. 300**

Saussurea americana > 10% MORA NOCA OLYM.....**SAUAME-(HERMAX), p. 248**

Veratrum viride dominant MORA NOCA OLYM..... **VALSIT-VERVIR, p. 262**

Carex spectabilis > 10%
- Phlox diffusa > 3% Lupinus sellulus or Pedicularis contorta > 2% alpine sites MORA NOCA OLYM ..... **PHLDIF-LUPSEL-(PEDCON), p. 320**
- Phlox diffusa >3%, Lupinus arcticus<5% MORA NOCA OLYM ..... **CARSPE-PHLDIF, p. 254**
- Carex nigricans or Potentilla flabellifolia > 5% MORA OLYM**CARSPE-CARNIG-(POTFLA), p. 302302**
- Lupinus arcticus>5% Polygonum bistortoides subalpine sites MORA NOCA OLYM.....
..... **CARSPE-(LUPARC-POLBIS), p. 244**
- Veratrum viride > 5% MORA NOCA OLYM ..... **VALSIT-VERVIR, p. 262**
- Valeriana sitchensis > 15% MORA NOCA OLYM .....**VALSIT-CARSPE, p. 260**
- Eucephalus ledophyllus > 5% Festuca viridis > Carex spectabilis MORA ....**FESVIR-EUCLED, p. 251**
- Lupinus arcticus OR Polygonum bistortoides >1% MORA NOCA OLYM .....
..... **CARSPE**-(**LUPARC-POLBIS), p. 244**

Xerophyllum tenax > 15%
- Vaccinium membranaceum>10% MORA NOCA OLYM.....**VACMEM/XERTEN, p. 279**
- Not as above MORA NOCA OLYM.....**XERTEN p. 263**

Valeriana sitchensis > 10%
- Festuca viridula, Ligusticum grayi, or Eucephalus ledophyllus >3% MORA NOCA OLYM.....
.....**VALSIT-LIGGRA, p. 261**
- Carex spectabilis > 5% MORA NOCA OLYM .....**VALSIT-CARSPE, p. 260**
- Not as above, see possible 1 plot type or wetland types .....**VALSIT-ATHFIL p. 259**

Luzula glabrata dominant MORA NOCA..... **LUZGLA-(LUPARC), p. 258**

Lupinus arcticus > 15% MORA NOCA OLYM.....**LUPARC, p. 246**

Eucephalus paucicapitatus dominant OLYM.....**EUCPAU, p. 239**

Phlox diffusa > 10%
- Lupinus sellulus or Pedicularis contorta > 2% alpine sites MORA NOCA OLYM.....
..... **PHLDIF-LUPSEL-(PEDCON), p. 320**
- Carex spectabilis > 3%, Lupinus arcticus frequent subalpine sites MORA NOCA OLYM.....
..... **CARSPE-PHLDIF, p. 254**
- Carex phaeocephala > 1%, Arenaria capillaris subalpine and lower elevation MORA NOCA OLYM ..... **PHLDIF-(LOMMAR-CARPHA), p. 255**
- Festuca roemeri > 5% subalpine/alpine sites OLYM .....**FESROE-(PHLDIF-ARECAP), p. 319**
- Luina hypoleuca >1% unstable slopes MORA NOCA OLYM .....**LUIHYP, p. 338**
- Lomatium martindalei present subalpine and lower elevation MORA NOCA OLYM.....
..... **PHLDIF-(LOMMAR-CARPHA), p. 255**

Lupinus sellulus present, Erigeron aureus or Minuartia obtusiloba > 5% MORA OLYM .....
.....**LUPSEL-(ERIAUR-MINOBT), p. 332**

Caltha leptosepala dominant wetland MORA NOCA OLYM ..... **Appendix B**

Heracleum maximum dominant MORA NOCA OLYM ..... **HERMAX, p. 245**

Hydrophyllum fendleri dominant MORA NOCA OLYM ..... **HYDFEN, p. 237**

Delphinium glareosum dominant MORA OLYM ..... **DELGLA, p. 329**

Luina hypoleuca dominant MORA NOCA OLYM ..... **LUIHYP, p. 338**

Phacelia hastata dominant MORA NOCA OLYM ..... **PHAHAS, p. 240**

Artemisia ludoviana dominant MORA NOCA OLYM ..... **ARTLUD-LOMMAR, p. 238**

Polygonum davisae dominant MORA NOCA OLYM ..... **POLDAV, p. 241**

Danthonia intermedia >10% or dominant MORA NOCA ..... **DANINT, p. 256**

Koleria macrantha >10% or dominant MORA NOCA ..... **KOLMAC-(AGRPAL), p. 286**

Pseudoroegneria spicata >10% or dominant NOCA ..... **PSESPI, p. 257**

Athyrium americanum the most abundant vascular plant MORA NOCA OLYM ..... **ATHAME-CRYACR, p. 324**

Pteridium aqulifoliun dominant MORA NOCA OLYM ..... **PTEAQU, p. 247**

Lomatium martindalei dominant MORA NOCA OLYM ..... **LOMMAR Lithomorphic p. 287**

Not as above, see possible types represented by 1 plot ..... **BLESPI, p. 288, BROVUL-FESSUB p. 283, POASTE-CERARV, p. 345 or variation in types above or represents undescribed types**

Key to Bryophyte and Lithomorphic Sparse Vegetation Types (<25% total vascular plant cover)

Carex breweri most abundant vascular plant MORA NOCA ..... **CARBRE, p. 316**

Festuca brachyphylla MORA NOCA or Festuca saximontana OLYM most abundant ..... **FES(BRA, SAX), p. 318**

Carex nardina most abundant vascular plant NOCA ..... **CARNAR, p. 249**

Luetkea pectinata most abundant vascular plant MORA NOCA OLYM ..... **LUEPEC, p. 253**

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Plant Community Descriptions

Plant association descriptions are alphabetized as they appear in the key within physiognomic category and by dominance type in forest associations. Each association description summary includes scientific name, common name, NatureServe code when present, acronym, selected national vegetation hierarchy, classification confidence, range in Washington, environmental features, U.S.F.W.S. wetland classification, vegetation description, state conservation rank, rank justification, comments, and plant association synonyms in previous classifications.

Plant association scientific name uses the naming conventions in the NVC (FDGC 2008). Plant species in the name are dominant (cover the greatest area) and diagnostic or differential (found consistently in some vegetation types but not others). At least one species from the dominant and/or uppermost stratum is included in each name. A hyphen ("-") indicates species occurring in the same stratum. A slash ("/") indicates species occurring in different strata. Species that occur in the uppermost stratum are listed first, followed successively by those in lower strata. Order of species names generally reflects decreasing levels of dominance, constancy, or indicator value.

The following terms are used to describe the distribution and abundance of individual species within each plant association.

Dominant – clearly the most abundant species in a well-developed stratum of vegetation
Co-dominant – one of two to four species that share dominance in a well-developed stratum of vegetation (usually percent cover is in the range of 5 or 10 to 50 percent)
Prominent – species has cover in the range of about 3 to 15 percent
Present – species found on plot with less than about 3 percent cover
Usually – more than 60% of the time or 60% of plots
Sometimes – 40-60% of the time
Occasionally – 10-40% of the time
Well-developed layer – stratum of vegetation typically >10% cover

The NatureServe Code indicates the current classification status of the association in the NatureServe NVC. That field includes the following:

1. Codes starting with CEGL appear on NatureServe (November 2008) explorer (http://www.natureserve.org/explorer/index.htm) and represent associations accepted as global associations.
2. Codes starting with PNW represent new associations and revisions to NatureServe from the coastal forests correlation project (Meidinger et al. 2005). Codes are assigned by NatureServe (2005).
3. "Preliminary" indicates new associations developed for this project. These associations are usually represented by five or more plots and may appear in regional or state plant community classification literature. Some preliminary associations have less than five plots but are supported in the literature.
4. "Provisional" indicates a potential association that usually has fewer than five plots and no literature support. They represent known or likely cover and dominance types or low confidence plant associations. Provisional types are included in this report to provide a placeholder that is categorized in higher NVC hierarchy levels for mapping purposes.

Acronyms are plant association scientific names listed by the first three letters of the genus and the species. For example, LARLYA/VACDEL is the ***Lar****ix* ***lya****llii/****Vac****cinium* ***del****iciosum* association. Acronyms cross-reference to the dichotomous key and to synthesis tables in Appendix C.

The national vegetation hierarchy levels in the description include Macrogroup, Group and Alliance. This is the first application of the 2008 NVC hierarchy (FGDC 2008) to a NPS classification and

consequently, the hierarchical organization of the associations in this report is expected to change. The arrangement listed below reflects the hierarchical status developed by NatureServe and partners as of March 31, 2009. Future changes in the classification hierarchy will be available from NatureServe (http://www.natureserve.org/explorer/index.htm) as modified.

Classification confidence indicates the level of confidence in the classification of the association or based on the quality and type of data used in the analysis, as well as the extent to which the entire (or potential) range type was considered. Values include: 1 = Strong, 2 = Moderate, and 3 = Weak.

Synonym lists plant associations or plant community types with more, less, or equivalent concept. Full citations are in the Reference cited.

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Pseudotsuga menziesii/Gaultheria shallon-Holodiscus discolor Forest

Douglas-fir/Salal-Oceanspray Forest

Acronym: PSEMEN/GAUSHA-HOLDIS

NatureServe Code: PNWCOAST_121

Macrogroup: Californian-Vacouverian Foothill and Valley Forest & Woodland

Group: Vancouverian Dry Douglas-fir-(Madrone) Forest and Woodland

Alliance: *Pseudotsuga menziesii*-(*Arbutus menziesii*) Forest and Woodland

Classification Confidence Level:



Range: This association occurs in the eastern and northeastern Olympic Mountains and the adjacent Puget Lowlands.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs at low to middle elevations in dry climatic areas within the Olympic Mountains' rainshadow. Aspects are more commonly south to west. The association occurs most frequently on soils that are relatively shallow such as on glacial outwash, glacial till, other parent materials with high gravel or stone content, and/or on bedrock.

Vegetation Description: Stands are dominated by *Pseudotsuga menziesii* with little to no *Tsuga heterophylla* or *Thuja plicata*. *Arbutus menziesii* can be prominent. The understory is dominated by *Gaultheria shallon. Holodiscus discolor* can be abundant and is diagnostic in the Olympic Mountains. *Polystichum munitum* may be present, but always with under 5% cover. Other frequently occurring species are *Festuca occidentalis*, *Rosa gymnocarpa, Rubus ursinus,* and *Mahonia (=Berberis) nervosa*.

USFWS Wetland System: Not applicable.

Comments: In the Olympics, this type is distinguished from the *Pseudotsuga menziesii/Gaultheria shallon-Vaccinium parvifolium* association (PNWCOAST_124) by the prevalence of *Holodiscus discolor*.

Conservation Rank: S2

Rank Justification: Few occurrences of relatively good quality remain. Most examples have been altered by past timber harvest.

Synonyms:

Mixed Coniferous Forest; Rust 1992
Pseudotsuga menziesii/*Gaultheria shallon* Community; Fonda and Bernardi 1976
Pseudotsuga menziesii/*Gaultheria shallon-Holodiscus discolor*; Chappell 2006 Puget
Pseudotsuga menziesii/*Gaultheria shallon-Holodiscus discolor* Association; Chappell 1997
Pseudotsuga menziesii/*Gaultheria shallon-Holodiscus discolor* Forest; Chappell 2001
Pseudotsuga menziesii/*Gaultheria shallon-Holodiscus discolor*-WA; Chappell 2004
Pseudotsuga menziesii/*Gaultheria shallon-Vaccinium ovatum* Association; Chappell 1997

Pseudotsuga menziesii/Holodiscus discolor-Rosa gymnocarpa/Festuca occidentalis Forest

Douglas-fir/Oceanspray-Baldhip Rose/Western Fescue Forest

Acronym: PSEMEN/HOLDIS-ROSGYM/FESOCC

NatureServe Code: CEGL000456

Macrogroup: Californian-Vacouverian Foothill and Valley Forest & Woodland

Group: Vancouverian Dry Douglas-fir-(Madrone) Forest and Woodland

Alliance: *Pseudotsuga menziesii*-(*Arbutus menziesii*) Forest and Woodland

Classification Confidence Level: 1

Range: This association occurs primarily in the northeastern Olympic Mountains but also occurs in the western Cascadesand northern Puget Lowlands.

Plots: 18, MORA (1), NOCA (2), OLYM (15), Other (0)

Environmental Description: This association occurs at low to middle elevations on steep slopes or upper slope positions with southerly aspects. Sites have shallow or very rocky, well-drained soils. Topographic positions are dry.



Vegetation Description: This forest, or occasionally woodland, is dominated by *Pseudotsuga menziesii*. A variable-density tall-shrub layer (2-6 m tall) is usually present and is dominated by *Holodiscus discolor*. Occasionally *Acer circinatum* or *A. glabrum* is prominent. *Taxus brevifolia* can be abundant and character species may be sparsely represented in some examples of this association. Shorter shrubs are also variable in their cover and always include *Rosa gymnocarpa*. *Mahonia (=Berberis) nervosa* and *M. aquifolium* are usually present, the former sometimes co-dominant. *Symphoricarpos hesperius* (=*mollis*) is frequent and sometimes prominent in the Olympics. The herb layer is typically dominated by short grasses, especially *Festuca occidentalis*, *Festuca subuliflora*, and *Melica subulata*. Other frequent herbs include *Achlys (californica, triphylla)*, *Bromus vulgaris*, *Osmorhiza berteroi*, *Pteridium aquilinum*, *Rubus ursinus*, *Adenocaulon bicolor*, *Fragaria vesca*, *Linnaea borealis,* and *Trientalis borealis* ssp. *latifolia*. *Polystichum munitum* is frequently present but never prominent.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the preliminary *Pseudotsuga menziesii*/*Holodiscus discolor*/*Calamagrostis rubescens* association that contains species more common to the Rocky Mountain flora such as *Pinus ponderosa*, *Calamagrostis rubescens* and *Spiraea betulifolia*.

Rank Justification: This association has a restricted geographic range and relatively specific environmental range. Few occurrences not significantly altered by past timber harvest are known in the lowlands. Lower foothill occurrences are less disturbed and more abundant.

Synonyms:
Forested Rock Outcrop; Rust 1992
Pseudotsuga menziesii/*Holodiscus discolor*/*Melica subulata* Association; Chappell 1997
Pseudotsuga menziesii/*Holodiscus discolor-Rosa gymnocarpa* Association; Henderson et al. 1989
Pseudotsuga menziesii/*Holodiscus discolor-Rosa gymnocarpa*/*Festuca occidentalis* Forest; Chappell 2005 NPK
Pseudotsuga menziesii/*Holodiscus discolor-Rosa gymnocarpa*-NWW; Henderson et al. 1989
Pseudotsuga menziesii/*Holodiscus discolor-Rosa gymnocarpa*-WA; Chappell 2004
Pseudotsuga menziesii/*Rosa gymnocarpa*/*Festuca occidentalis* Association; Chappell 1997
Pseudotsuga menziesii/*Rosa gymnocarpa-Holodiscus discolor*; Chappell 2006 Puget

Pseudotsuga menziesii-(Abies grandis)/Acer circinatum/Paxistima myrsinites Forest

Douglas-fir-(Grand Fir)/Vine Maple-Oregon boxwood Forest



Acronym: PSEMEN-(ABIGRA)/ACECIR-PAXMYR

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

Alliance: *Abies grandis-Pseudotsuga menziesii* Forest

Classification Confidence Level: 3

Range: This association is found at middle elevations in the east Cascades, mostly in and south of the Lake Chelan National Recreation Area.

Plots: 4, MORA (0), NOCA (2), OLYM (0), Other (2)

Environmental Description: This association is found at middle elevations. Sites are generally flat to moderately steep slopes on southerly aspects. Soils are wel-drained, often derived from glacial, alluvial or debris flow parent material.

Vegetation Description: *Pseudotsuga menziesii* typically dominates the canopy or co-dominates with *Abies grandis*. The abundance of *Abies grandis* is generally a function of stand age with abundance being higher in older forests. *Abies grandis* often occupies over 10% total cover and usually dominates tree regeneration. *Pinus ponderosa* or *Acer macrophyllum* are often present. A tall to medium-sized shrub layer is dominated by *Acer circinatum* with several other shrub species, usually *Paxistima (=Pachistima) myrsinites*, abundant with *Rosa gymnocarpa*, *Spiraea betulifolia*, *Chimaphila umbellata*, *Mahonia (=Berberis) nervosa* and *Vaccinium membranaceum* frequently present. On moist sites, the herb layer is well developed and frequently includes *Clintonia uniflora*, *Trillium ovatum*, and *Maianthemum (=Smilacina) stellatum.* In dense stands, the herb layer is sparse or absent, however, *Pteridium aquilinum* or *Goodyera oblongifolia* are usually present.

USFWS Wetland System: Not applicable.

Comments: This is a provisional association that is similar to both the *Abies grandis*/*Acer circinatum* association as described on the Wenatchee National Forest and to the provisional *Pseudotsuga menziesii*-(*Tsuga heterphylla*)/*Acer circinatum*/ *Paxistima myrsinites* association in this report. A broad regional analysis is needed to clarify relationships between these types.

Conservation Rank: S3Q

Rank Justification: This provisional association appears to have a narrow range in the east Cascades.

Synonyms:

Pseudotsuga menziesii-(Tsuga heterophylla)/Acer circinatum-Paxistima myrsinites Forest

Douglas-fir-(Western Hemlock)/Vine Maple-Oregon boxwood Forest

Acronym: PSEMEN-(TSUHET)/ACECIR-PAXMYR

NatureServe Code: Provisional

Macrogroup Northern Rocky Mountain Lower Montane and Foothill Forest

Group: East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

Alliance: *Abies grandis-Pseudotsuga menziesii* Forest

Classification Confidence Level: 3

Range: This association occurs in the east Cascades, mostly in the Lake Chelan National Recreation Area and south to the Upper Wenatchee drainage.

Plots: 3, MORA (0), NOCA (2), OLYM (0), Other (1)

Environmental Description: This association is found at middle elevations less than 1220 m (4000 ft). Sites are relatively warm toe slopes and benches,are located on all aspects and have well-watered but well-drained soil.



Vegetation Description: The canopy is typically co-dominated by *Pseudotsuga menziesii* with *Tsuga heterophylla*, *Thuja plicata* and/or *Abies grandis* in the main canopy. The abundance of the latter three species is generally a function of stand age. *Pinus monticola* is often present. *Tsuga heterophylla* or *Thuja plicata* always occupy over 10% total cover and usually dominate tree regeneration. A tall-shrub layer is dominated by *Acer circinatum.* Several other shorter shrub species may be present such as *Paxistima (=Pachistima) myrsinites*, which is predominate, and *Mahonia (=Berberis) nervosa*, *Rosa gymnocarpa*, *Chimaphila umbellata*, *Linnaea borealis* and *Rubus parviflorus*, which occur less prominently. On moist sites the herb layer is well developed. *Clintonia uniflora*, *Asarum caudatum*, *Maianthemum (=Smilacina) stellatum* or *Goodyera oblongifolia* are usually present.

USFWS Wetland System: Not applicable.

Comments: This association is similar to four stands in the North Cascades that have *Abies grandis* in the main canopy without *Tsuga heterophylla* or *Thuja plicata.* These stands are described as the provisional *Pseudotsuga menziesii*-(*Abies grandis*)/*Acer circinatum*/*Paxistima myrsinites* Forest. A similar association on the Wenatchee National Forest, *Tsuga heterophylla* /*Acer circinatum*/*Clintonia uniflora* association has less prominence of *Paxistima myrsinites*.

Conservation Rank: S3S4

Rank Justification: This association occurs in the east Cascades within a relatively narrow range.

Synonyms:
Tsuga heterophylla /*Acer circinatum*/*Clintonia uniflora* association; Lillybridge et al. 1995

Pseudotsuga menziesii/Mahonia nervosa/Calamagrostis rubescens Forest

Douglas-fir/Dwarf Oregongrape/Pinegrass Forest



Acronym: PSEMEN/MAHNER/CALRUB

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

Alliance: *Pseudotsuga menziesii*-(*Tsuga heterophylla*)-*Calamagrostis rubescens* Woodland

Classification Confidence Level: 3

Range: This association occurs in the northeastern Cascades.

Plots: 6, MORA (0), NOCA (5), OLYM (0), Other (1)

Environmental Description: This association occurs at low to middle elevations, typically on moderately steep and southerly slopes. Evidence of past fire is usually present.

Vegetation Description: The open to closed canopy is dominated by *Pseudotsuga menziesii*. When present,*Tsuga heterophylla* or *Thuja plicata* is never prominent. *Mahonia (=Berberis) nervosa* is typically prominent to dominant in the shrub layer. The tall shrub layer is generally sparse although *Acer circinatum*, *Acer glabrum*, *Holodiscus discolor*, *Lonicera ciliosa*, and/or *Corylus cornuta* may be present. *Spiraea betulifolia* (characteristic), *Mahonia aquifolium*, *Lonicera ciliosa*, *Paxistima (=Pachistima) myrsinites* and *Rosa gymnocarpa* are typical in the lower shrub layer. The herb layer is usually poorly developed. *Calamagrostis rubescens* (characteristic), *Elymus glaucus*, *Moehringia (=Arenaria) macrophylla*, *Trientalis borealis* and *Linnaea borealis* are frequently present. *Achlys (californica, triphylla)* is absent.

USFWS Wetland System: Not applicable.

Comments: This association has similarities with the *Abies grandis/Mahonia nervosa*/*Calamagrostis rubescens* association on the Wenatchee National Forest (Lillybridge et al. 1995) although lacking the tree species in the name,. It is also similar to the east Cascades preliminary *Pseudotsuga menziesii*/*Mahonia nervosa*/*Achlys triphylla* Forest association but lacks the differential species *Achlys (californica, triphylla)* and contains *Calamagrostis rubescens*, and *Spiraea betulifolia*.

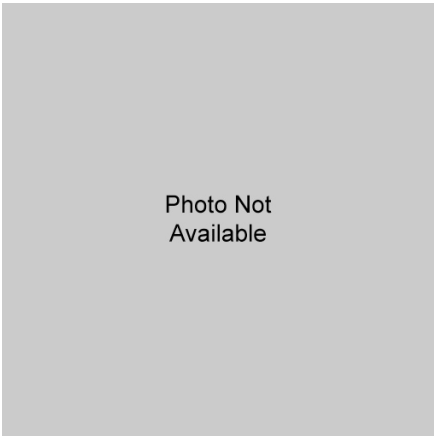
Conservation Rank: S2S4

Rank Justification: As currently recognized, this preliminary association occurs in the northeastern Cascades and may occur in the east Cascades within a narrow geographic range.

Synonyms:

Pseudotsuga menziesii-Abies grandis/Calamagrostis rubescens Woodland

Douglas-fir-Grand Fir/Pinegrass Woodland



Acronym: PSEMEN-ABIGRA/CALRUB

NatureServe Code: CEGL000916

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

Alliance: *Pseudotsuga menziesii*-(*Tsuga heterophylla*)-*Calamagrostis rubescens* Woodland

Classification Confidence Level: 3

Range: This association occurs in the east Cascades, mostly south of the Lake Chelan National Recreation Area.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association is found at middle elevations on all aspects on flat to moderately steep slopes on deep, well-drained colluvial soils.

Vegetation Description: The woodland or forest canopy is typically co-dominated by *Abies grandis* and *Pseudotsuga menziesii* with *Pinus ponderosa* present to prominent. *Abies grandis* always occupies over 10% total cover and usually dominates tree regeneration. A sparse, medium-sized shrub layer may be present and is usually comprised of *Rosa gymnocarpa*, *Spiraea betulifolia*, or *Paxistima (=Pachistima) myrsinites*. The herb layer is well developed and is dominated by *Calamagrostis rubescens* and often *Carex geyeri*. *Arnica cordifolia* or *Moehringia (=Arenaria) macrophylla* may be present.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plot data for national parks in Washington.

Conservation Rank: S4S5

Rank Justification: This association occurs in the east Cascades and the northern Rocky Mountains in a relative narrow ecological range. Fire suppression may have increased its local abundance and most of those stands are threatened by wildfire.

Synonyms:
Abies grandis / *Calamagrostis rubescens*; Lillybridge et al. 1995

Pseudotsuga menziesii-Abies grandis/Spiraea betulifolia Forest

Douglas-fir-Grand Fir/White Spirea Forest

Acronym: PSEMEN-ABIGRA/SPIBET

NatureServe Code: CEGL000281

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

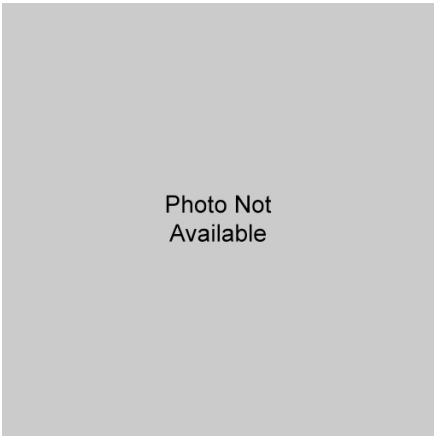
Alliance: *Pseudotsuga menziesii*-(*Tsuga heterophylla*)-*Calamagrostis rubescens* Woodland

Classification Confidence Level: 3

Range: This association occurs in the east Cascades, mostly in the Entiat drainage.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association is found over a broad elevation range on southerly, moderately steep slopes with deep, well-drained pumice-derived soils.



Vegetation Description: The canopy is typically dominated by *Pseudotsuga menziesii* and *Abies grandis,* often with *Pinus ponderosa* present to prominent. *Pinus contorta* or *Pinus monticola* are frequently members of the upper canopy. *Abies grandis* always occupies over 10% total cover and usually co-dominates tree regeneration with *Pseudotsuga menziesii*. A scattered tall-shrub layer of *Acer glabrum* may be present. The lower shrub layer is typically comprised of *Spiraea betulifolia* and *Paxistima (=Pachistima) myrsinites* with *Rubus parviflorus* or *Chimaphila umbellata* often present. *Pteridium aquifolium* characterizes the herb layer and can be dominant. Other herbs include *Calamagrostis rubescens* and *Orthilia (=Pyrola) secunda*.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataet of vegetation plots for national parks in Washington.

Conservation Rank: G2S2

Rank Justification: This association occurs in the east Cascades within a relative narrow geographic range. Fire suppression may have increased its local abundance and most stands are threatened by wildfire.

Synonyms:
Abies grandis/*Spiraea betulifolia* Forest; John et al. 1988, Johnson & Clausnitzer 1992
Abies grandis/*Spiraea betulifolia*/*Pteridium aquilinum* Forest; Lillybridge et al. 1995
Pseudotsuga menziesii-Abies grandis/*Spiraea betulifolia* Forest; Chappell 2005 NPK

Pinus contorta/Paxistima myrsinites/Calamagrostis rubescens Forest

Lodgepole Pine/Oregon boxwood/Pinegrass Forest



Acronym: PINCON/PAXMYR/CALRUB

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus contorta* var. *latifolia*) Forest

Classification Confidence Level: 3

Range: This association is described from one plot sampled in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The plot defining this type occurs on a south-facing flat site at 890 m (2965 ft) elevation.

Vegetation Description: *Pinus contorta* var. *latifolia* dominates the forest canopy with only trace amounts of *Pseudotsuga menziesii*. The ground cover is patchy with *Paxistima (=Pachistima) myrsinites* prominent to dominant. Other shrubs such as *Shepherdia canadensis*, *Mahonia (=Berberis) nervosa*, and *Vaccinium membranaceum* are often present. *Calamagrostis rubescens* (indicator for this type)*, Chimaphila umbellata*, *Trientalis borealis* ssp. *latifolia* and other herbaceous species occur in low abundance.

USFWS Wetland System: Not applicable.

Comments: This provisional type is similar to the Northern Rocky Mountain *Pinus contorta*/*Calamagrostis rubescens* association (CEGL000139) but with Cascadian species (*Acer circinatum*, *Mahonia nervosa*). We assume that all *Pinus contorta* at high elevation (over 1970ft, 600 m) is variety *latifolia.*

Conservation Rank: SU

Rank Justification: There is insufficient information to rank this provisional association.

Synonyms:

Pinus contorta/Vaccinium membranaceum Woodland

Lodgepole Pine/Big Huckleberry Woodland



Acronym: PINCON/VACMEM

NatureServe Code: CEGL000169

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus contorta* var. *latifolia*) Forest

Classification Confidence Level: 3

Range: This association occurs in the North Cascades and likely occurs north into British Columbia and east into the Northern Rockies.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: The association occurs on dry, rocky, and relatively flat sites. Current samples are from 870-950 m (2858-3123 ft) elevation.

Vegetation Description: These are open forests dominated by *Pinus contorta* var. *latifolia. Abies lasiocarpa* occurs in some locations although it is is never prominent and usually occurs below the main canopy. *Vaccinium membranaceum* and *Arctostaphylos nevadensis* dominate the patchy shrub layer. The abundance of *Arctostaphylos nevadensis* is inversely related to canopy density. *A. nevadensis* is replaced by *Vaccinium membranaceum* in more closed canopies. *Paxistima (=Pachistima) myrsinites* and *Amelanchier alnifolia* are frequently present. Although the herb layer is generally sparse, *Calamagrostis rubescens* can be abundant in some sites.

USFWS Wetland System: Not applicable.

Comments: This association, as sampled in North Cascades, is apparently a seral stage of the *Abies lasiocarpa*/*Vaccinium membranaceum* association (CEGL000342). This expands the same concept as *Pinus contorta*/*Vaccinium membranaceum* Rocky Mountain Forest rather than the *Pinus contorta*/*Vaccinium membranaceum* Forest (CEGL000170) which occurs at lower elevation or is more associated with or seral to *Abies grandis* or *Pseudotsuga menziesii* forests in the east Cascades. We assume that all *Pinus contorta* at high elevation (over 1970ft, 600 m) is variety *latifolia.*

Conservation Rank: S4Q

Rank Justification: This association is relatively common in the east Cascades and Rocky Mountains. It is fire dependent.

Synonyms:
Pinus contorta (*Abies lasiocarpa*)/*Vaccinium membranaceum* Community; Johnson & Clausnitzer 1992
Pinus contorta (*Abies lasiocarpa*)/*Vaccinium membranaceum*/*Calamagrostis rubescens* Community; Johnson & Clausnitzer 1992

Pseudotsuga menziesii-(Pinus contorta)/Vaccinium myrtillus Woodland

Douglas-fir-(Lodgepole Pine)/ Bilberry Woodland

Acronym: PSEMEN-(PINCON)/VACMYR

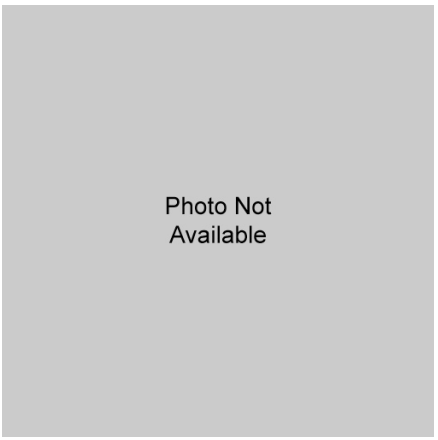
NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus contorta* var. *latifolia*) Forest

Classification Confidence Level:



Range: This association occurs in the northeastern Cascades in Washington and adjacent British Columbia.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This cool, usually steep sloped, montane woodland association occurs in an elevation range from 910 to 1500 m (3000-5000+ ft). Stands occur on cool sites on mid to upper slopes on southerly aspects.

Vegetation Description: The typically open tree canopy is dominated by *Pseudotsuga menziesii* usually with *Pinus contorta* although *Larix occidentalis*, *Pinus monticola* or *Pinus ponderosa* may also be present. A short shrub layer is dominated by *Vaccinium myrtillus* with *Paxistima (=Pachistima) myrsinites*, *Spiraea betulifolia*, *Arctostaphylos uva-ursi* and/or *Vaccinium membranaceum* frequently present. *Calamagrostis rubescens* occurs in most sites and can be dominant on more moderate sites with deeper soil.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington. This association similar to the *Pseudotsuga menziesii*/*Vaccinium caespitosum* in Northern Rockies (CEGL000465). A regionwide evaluation is need to clarify this relationship.

Conservation Rank: S3S4

Rank Justification: This association is relatively widespread in the mountains of eastern Washington but occupies small areas.

Synonyms:
Pseudotsuga menziesii/*Vaccinium myrtillus* association; Lillybridge et al. 1995
Pseudotsuga menziesii/*Vaccinium myrtillus/Calamagrostis rubescens* association; Lillybridge et al. 1995
Pseudotsuga menziesii-(*Pinus contorta*)/*Vaccinium myrtillus* Woodland; Chappell 2005 NPK

Pseudotsuga menziesii/Vaccinium caespitosum Forest

Douglas-fir/Dwarf Huckleberry Forest



Acronym: PSEMEN/VACCAE

NatureServe Code: CEGL000465

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus contorta* var. *latifolia*) Forest

Classification Confidence Level: 2

Range: This association occurs in the eastern North Cascades and the Northern Rocky Mountains.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association appears on gentle slopes and in cold air drainages typically on glacial outwash. It occurs between 700 and 1350 m (2300-4420 ft) elevation in the Northern Rockies. The plot sampled in the parks occurred on a small rocky terrace at 620 m (2037 ft) elevation on a 15% slope.

Vegetation Description: The canopy is dominated by *Pinus contorta var.* latifolia or co-dominated by that species and *Pseudotsuga menziesii*. *Vaccinium caespitosum* occurs present to prominent with *Arctostaphylos uva-ursi*, *Paxistima (=Pachistima) myrsinites*, *Spiraea betulifolia* and *Vaccinium membranaceum*. The herb layer can be sparse to proiminent with *Calamagrostis rubescens* almost always present and often the dominant species. However the ground layer can be well-developed and often dominated by mosses such as *Pleurozium schreber*i and *Hylocomium splendens*.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs in the northeastern Cascades and in the east Cascades within a narrow geographic range.

Synonyms:
Pseudotsuga menziesii/Vaccinium cespitosum Forest; Cooper et al. 1990, Lillybridge 1995, Williams et al. 1995

Pseudotsuga menziesii/Vaccinium membranaceum Forest

Douglas-fir/Big Huckleberry



Acronym: PSEMEN/VACMEM

NatureServe Code: CEGL000466

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus contorta* var. *latifolia*) Forest

Classification Confidence Level: 3

Range: This association occurs in the east Cascade Mountains and the Northern Rocky Mountains.

Plots: 5, MORA (0), NOCA (5), OLYM (0), Other (0)

Environmental Description: This association occurs from 850-975 m (2800-3200 ft) elevation on any aspect and typically located on drier topographic positions. Slopes are moderately steep to steep (12-60%). Soils are well-drained

Vegetation Description: These tall forests are dominated by *Pseudotsuga menziesii*. *Pinus monticola* or *Pinus contorta* are often present in the subcanopy. *Abies amabilis*, *Abies lasiocarpa* or *Tsuga heterophylla* are also often present but never prominent. The understory is relatively open and is dominated by *Vaccinium membranaceum*. *Paxistima (=Pachistima) myrsinites* can be co-dominant. Other shrubs that may be present include *Amelanchier alnifolia*, *Spiraea betulifolia*, *Acer glabrum*, and *Sorbus scopulina*. *Calamagrostis rubescens* is the most common graminoid and most abundant species in the herb layer. Other species include *Arnica cordifolia*, *Lilium columbianum*, *Rubus lasiococcus* and *Goodyera oblongifolia*.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Pseudotsuga menziesii*/*Vaccinium membranaceum* association (CEGL000466) as described in the northern Rockies but with Cascadian species (*Abies amabilis, Mahonia (=Berberis) nervosa,* and *Pseudotsuga menziesii* presumably var. *menziesii*). It is tentatively considered part of that association pending better regionwide analysis.

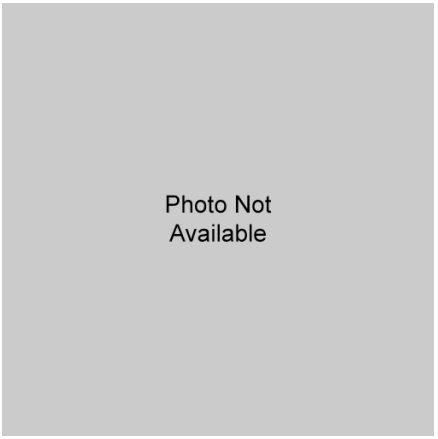
Conservation Rank: S3S5Q

Rank Justification: This association occurs in the northeastern Cascades and northern Rocky Mountains where it is relatively abundant. As defined here, it may occur only in the northeastern Cascades of Washington and adjacent British Columbia.

Synonyms:
Pseudotsuga menziesii/*Vaccinium membranaceum* Forest; Williams et al. 1995

Pseudotsuga menziesii-Pinus contorta/Arctostaphylos nevadensis Woodland

Douglas-fir-Lodgepole Pine/Pinemat Manzanita Woodland



Acronym: PSEMEN-PINCON/ARCNEV

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus contorta* var. *latifolia*) Forest

Classification Confidence Level: 3

Range: This association occurs in the east Cascades, mostly in the Lake Chelan National Recreation Area and southward.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association is found at middle elevations on very rocky sites with a relatively mild climate. They are located on all aspects.

Vegetation Description: The canopy is always open and is composed of slow growing trees. Stands are usually co-dominated by *Pseudotsuga menziesii* and *Pinus contorta* with *Tsuga heterophylla* frequently in the main canopy, its abundance generally a function of stand age. *Pinus monticola* may be present. A low shrub layer is dominated by *Arctostaphylos nevadensis* typically with several other short shrub species, including *Vaccinium membranaceum*, *Paxistima (=Pachistima) myrsinites*, *Chimaphila umbellata*, and *Spiraea betulifolia*. The herb layer is inconspicuous although patches of *Pteridium aquifolium*, *Calamagrostis rubescens* or *Hieracium albiflorum* may be present.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data for national parks in Washington. This type may be a variation of *Tsuga heterophylla*/*Arctostaphylos nevadensis* association (CEGL000913) described by Lillybridge (1995) on the Wenatchee National Forest.

Conservation Rank: S2S3

Rank Justification: This association occurs in the east Cascades within a relatively narrow geographic range.

Synonyms:
Tsuga heterophylla/*Arctostaphylos nevadensis* association; Lillybridge et al. 1995
Pseudotsuga menziesii-Pinus contorta/*Arctostaphylos nevadensis* Woodland; Chappell 2005 NPK

Pseudotsuga menziesii-(Pinus ponderosa)/Symphoricarpos albus Forest

Douglas-fir-(Ponderosa Pine)/Common Snowberry Forest



Acronym: PSEMEN-(PINPON)/SYMALB

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus ponderosa*) Forest

Classification Confidence Level: 2

Range: This association occurs north of Wenatchee in the east Cascades and in the Okanogan Highlands.

Plots: 3, MORA (0), NOCA (2), OLYM (0), Other (1)

Environmental Description: This association is found in the mid to lower elevation range. Sites vary from moderately steep slopes to flat, dry terraces near streams. Aspects vary from north to southeast.

Vegetation Description: The forest or woodland canopy is typically dominated by *Pseudotsuga menziesii* and often by *Pinus ponderosa*. Scattered tall shrubs, such as, *Amelanchier alnifolia, Acer glabrum* or *Holodiscus discolor* may be present. *Symphoricarpos albus* dominates the mid-sized shrub layer, with scattered *Spiraea betulifolia*, *Paxistima (=Pachistima) myrsinites*, *Mahonia (=Berberis) aquilifolium* or *M. repens* also present. The herb layer is sparse but diverse and it often includes low cover of *Arnica cordifolia*, *Osmorhiza berteroi (=chilensis)*, *Elymus glaucus* or *Calamagrostis rubescens*. In sites where shrubs have been reduced because of a dense tree canopy, grazing, or repeated fire, *Calamagrostis rubescens* is dominant to co-dominant with *Symphoricarpos albus*.

USFWS Wetland System: Not applicable.

Comments: This association is similar to or the same as the *Pseudotsuga menziesii* / *Symphoricarpos albus* forest (CEGL000459). It may occur near Lake Chelan. A regionwide evaluation is need to clarify this relationship.

Conservation Rank: S4

Rank Justification: This widespread, montane forest association occurs in the east Cascades and northern Rocky Mountains. Logging has removed many large trees from many stands and has lowered the overall condition of the type.

Synonyms:
Pseudotsuga menziesii/Symphoricarpos albus Association; Williams and Lillybridge 1983, Lillybridge et al. 1995, Johnson & Clausnitzer 1992, Williams et al. 1995
Pseudotsuga menziesii/Symphoricarpos albus/Calamagrostis rubescens Association; Lillybridge et al. 1995
Pseudotsuga menziesii-(*Pinus ponderosa*)/*Symphoricarpos albus* Forest; Chappell 2005 NPK

Pseudotsuga menziesii/Holodiscus discolor/Calamagrostis rubescens Forest

Douglas-fir/Oceanspray/Pinegrass Forest



Acronym: PSEMEN/HOLDIS/CALRUB

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus ponderosa*) Forest

Classification Confidence Level: 3

Range: This association occurs in the northeastern Cascade Mountains.

Plots: 4, MORA (0), NOCA (3), OLYM (0), Other (1)

Environmental Description: This association was sampled between 580 and 795 m (1900 and 2600 ft) elevation on relatively steep slopes. Sites are in dry topographic positions. The ground contains frequent rocky fragments and is typically moss covered.

Vegetation Description: This forest, or often woodland, is dominated by *Pseudotsuga menziesii*. A tall-shrub layer is usually present in canopy openings and can vary in density. It is dominated by *Holodiscus discolor*, *Acer glabrum* and *Amelanchier alnifolia*. Shorter shrubs are also variable in their cover and usually include *Spiraea betulifolia, Paxistima (=Pachistima) myrsinites*, *Mahonia aquifolium* and *Rosa gymnocarpa*. *Arctostaphylos uva-ursi* and *Lonicera ciliosa* can be prominent. The herb layer contains *Calamagrostis rubescens*, *Arnica cordifolia*, *Fragaria virginiana*, *Trientalis borealis* and *Linnaea borealis*. Mosses such as *Hylocomium splendens* and *Rhytidiadelphus triquetrus* can dominate the ground layer.

USFWS Wetland System: Not applicable.

Comments: This preliminary association may be the same as the *Pseudotsuga menziesii*/*Holodiscus discolor*/*Carex geyeri* association (CEGL000437) found further south in the east Cascades. It is also similar to the *Pseudotsuga menziesii*/*Holodiscus discolor-Rosa gymnocarpa*/*Festuca occidentalis* Forest (CEGL000456) but with east Cascades/ Rocky Mountain floristic elements. Further regional analysis is needed clarify relationships among these associations.

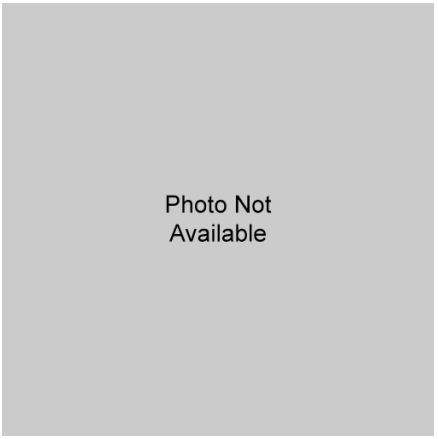
Conservation Rank: S3S4Q

Rank Justification: As currently recognized, this preliminary association occurs within a narrow geographic range.

Synonyms:

Pinus ponderosa-Pseudotsuga menziesii/Purshia tridentata Woodland

Ponderosa Pine-Douglas-fir/Bitterbrush Woodland



Acronym: PINPON-PSEMEN/PURTRI

NatureServe Code: CEGL000214

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus ponderosa*) Forest

Classification Confidence Level: 2

Range: This association occurs in the east Cascades of Washington and British Columbia, and south into Oregon. This type may occur on south aspects near Lake Chelan.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This low to mid-elevation woodland occurs within an elevational range of 760 to 1220 m (2500-4000 ft). Stands occur on hot, dry slopes of varying steepness and on southerly aspects. Surface rocks are usually high to moderate in abundance.

Vegetation Description: The typically open tree canopy is co-dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*. Other tree species rarely appear in these stands. An open to dense shrub layer of consisting nearly exclusively of *Purshia tridentata* forms the understory. Other deciduous shrub speces can occur in low abundance. *Amelanchier alnifolia* is the most frequent of these deciduous shrubs. A moderately dense (10-60% cover) to sparse perennial graminoid layer is typically dominated by *Pseudoroegneria (=Agropyron) spicata*. *Festuca idahoensis* or *Calamagrostis rubescens* may also occur. Forb diversity is low. Common forb species include *Achillea millefolium*, *Balsamorhiza sagittata*, and *Lupinus sericeus*.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plot data for national parks in Washington. It could occur above Lake Chelan.

Conservation Rank: S3

Rank Justification: This association is widespread in the foothills of the east Cascades. Logging of large trees and exotic plant invasion are major threats.

Synonyms:
Pinus ponderosa-Pseudotsuga menziesii/*Purshia tridentata* Woodland; Chappell 2005 NPK
Pseudotsuga menziesii/*Purshia tridentata* Association; Lillybridge et al. 1995
Pseudotsuga menziesii/*Purshia tridentata*/*Agropyron spicatum* Association; Lillybridge et al. 1995
Pseudotsuga menziesii/*Purshia tridentata*/*Calamagrostis rubescens* Association; Lillybridge et al. 1995
Pseudotsuga menziesii-Pinus ponderosa/*Purshia tridentata* Community; Williams and Smith 1990

Pseudotsuga menziesii/Paxistima myrsinites-Spiraea betulifolia Woodland

Douglas-fir/Oregon boxwood-White Spirea Woodland



Acronym: PSEMEN/PAXMYR-SPIBET

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus ponderosa*) Forest

Classification Confidence Level: 3

Range: This association occurs in the northeastern Cascades in Washington and adjacent British Columbia.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This montane woodland occurs at elevations ranging from 1200 to 1600 m (4000-5200 ft). Stands occur on cool, dry sites on mid to upper slopes with southerly aspects. Evidence of past fires is usually present.

Vegetation Description: The typically open tree canopy is dominated by *Pseudotsuga menziesii* although *Pinus ponderosa* or *Pinus contorta* may be abundant in the canopy. *Paxistima (=Pachistima) myrsinites* is the most dominant shrub commonly occuring with scattered individuals of other species such as *Acer glabrum*, *Amelanchier alnifolia*, *Mahonia aquifolium*, *Lonicera ciliosa, Rosa gymnocarpa* or *Spiraea betulifolia*. *Calamagrostis rubescens* occurs in most sites but is rarely more than prominent.

USFWS Wetland System: Not applicable.

Comments: This type is the *Pseudotsuga menziesii*/*Paxistima myrsinites* association on the Wenatchee National Forest. One plot in the North Cascades appears in the tables as PINPON-PSEMEN/PAXMYR-ARCUVA and is interpreted to be a variant of this association.

Conservation Rank: S3S4

Rank Justification: This association is relatively common within a narrow geographic range. Current ecological condition and threats to existing occurrences are unknown.

Synonyms:
Pseudotsuga menziesii/*Paxistima myrsinites* association; Williams and Lillybridge 1983, Lillybridge et al. 1995
Pseudotsuga menziesii/*Paxistima myrsinites*/*Calamagrostis rubescens* Woodland; Chappell 2005 NPK

Pseudotsuga menziesii-Pinus ponderosa/Arctostaphylos nevadensis Woodland

Douglas-fir-Ponderosa Pine/Pinemat Manzanita Woodland



Acronym: PSEMEN-PINPON/ARCNEV

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus ponderosa*) Forest

Classification Confidence Level: 3

Range: This association occurs in the east Cascades.

Plots: 4, MORA (0), NOCA (4), OLYM (0), Other (0)

Environmental Description: This association is found on steep slopes, ridgelines, and rocky sites. It can be associated with glacial outwash or till in cold-air drainages often with rocks exposed

Vegetation Description: The canopy is always open and is typically co-dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*. *Abies grandis* or *Pinus contorta* var. *latifolia* can be present to prominent in some stands. The understory is open. A low shrub layer is dominated by *Arctostaphylos nevadensis* typically with several other short growing shrub species such as *Paxistima (=Pachistima) myrsinites* and *Spiraea betulifolia* present. The moderate to dense herb layer features patches of *Calamagrostis rubescens, Carex geyeri* and *Festuca occidentalis*. *Arnica cordifolia*, *Hieracium scouleri, Heuchera cylindrica, and Cryptogramma acrostichoides (=crispa)* may be present.

USFWS Wetland System: Not applicable.

Comments: Ecologists in southwestern Oregon and adjacent California recognize the *Pinus ponderosa - Pseudotsuga menziesii* / *Arctostaphylos nevadensis* Woodland (CEGL000208). That association appears to be part of the variation described in *Abies grandis*/*Arctostaphylos nevadensis* on the Wenatchee National Forest and on the Yakama Reservation. All of those are equivalent to *Pseudotsuga menziesii*-(*Abies grandis*)/*Arctostaphylos nevadensis* (CEGL000915). The relationship among these associations and the one described here has yet to be resolved regionally.

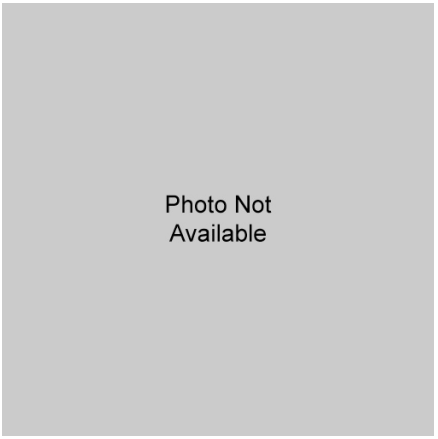
Conservation Rank: S2

Rank Justification: This community is restricted to the east Cascades of Washington. This is a mid- to late-seral woodland that depends upon a relatively specific topography or parent material. Individual sites are small, and there are few representative stands throughout the community's range.

Synonyms:
Abies grandis/*Arctostaphylos nevadensis*; Lillybridge et al. 1995, John et al. 1988

Pseudotsuga menziesii-Pinus ponderosa/Calamagrostis rubescens Forest

Douglas-fir-Ponderosa Pine/Pinegrass Forest



Acronym: PSEMEN-PINPON/CALRUB

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Douglas-fir-Pine Forest

Alliance: *Pseudotsuga menziesii*-(*Pinus ponderosa*) Forest

Classification Confidence Level: 2

Range: This association occurs in the east Cascades and in the Okanogan Highlands.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at low to mid-montane elevations (825 to 2400 m (2700-7900 ft)). Stands occur on cool, dry sites on mid to upper slopes and benches on all aspects. At the lowest elevations, stands are restricted to north aspects, and at upper elevations stands are found on warm and dry southerly exposures. Substrates are variable (sandy to clayey), but are generally well-drained, coarser-textured, gravelly soils and derived from a variety of non-calcareous, acidic, parent materials. Surface rock usually is low to moderate, and litter cover is usually high.

Vegetation Description: The typically open tree canopy is dominated by *Pseudotsuga menziesii* or co-dominated by that species and *Pinus ponderosa. Larix occidentalis* or *Pinus contorta* trees may be present in the upper tree canopy. *Pseudotsuga menziesii* comprises the subcanopy. The scattered dwarf-shrubs *Arctostaphylos uva-ursi, Paxistima myrsinites* or *Spiraea betulifolia* may be present but less abundant than graminoids. The dense to moderately dense (20-60% cover) perennial graminoid layer characteristically dominates the understory. *Calamagrostis rubescens* typically is the dominant. Forbs are often diverse, but typically all have low cover. The most common forb species are *Achillea millefolium, Antennaria* spp., and *Arnica cordifolia.*

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Pseudotsuga menziesii* / *Calamagrostis rubescens* forest (CEGL000429) that may occur near Lake Chelan. A regional assessment is needed to clarify this relationship. This type is not currently represented in the dataset of vegetation plots from the national parks.

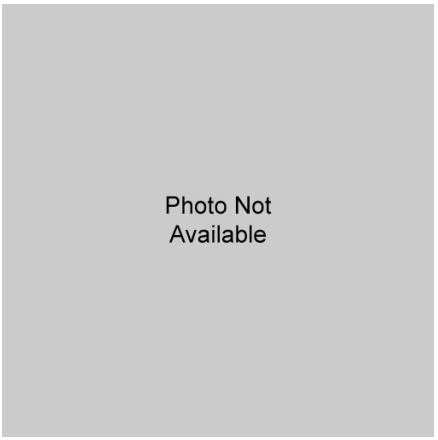
Conservation Rank: S5

Rank Justification: This widespread, montane forest association occurs in the east Cascades and northern Rocky Mountains. Large trees have been removed from many stands and have lowered the overall condition of the type.

Synonyms:
Pseudotsuga menziesii/Calamagrostis rubescens Association; Daubenmire & Daubenmire 1968, Williams and Lillybridge 1983, Lillybridge et al. 1995, Johnson & Clausnitzer 1992, Williams et al. 1995; John et al. 1988
Pseudotsuga menziesii-Pinus ponderosa/ *Calamagrostis rubescens* Forest; Chappell 2005 NPK
Pseudotsuga menziesii/Calamagrostis rubescens Association *Calamagrostis rubescens* Phase; Cooper et al 1987

Pinus ponderosa/Pseudoroegneria spicata Woodland

Ponderosa Pine/Bluebunch Wheatgrass Woodland



Acronym: PINPON/PSESPI

NatureServe Code: CEGL000865

Macrogroup: Northern Rocky Mountain Lower Montane and Foothill Forest

Group: Northern Rocky Mountain Ponderosa Pine Woodland and Savanna

Alliance: *Pinus ponderosa*-(*Pseudotsuga menziesii*) Woodland and Savanna

Classification Confidence Level: 1

Range: This association may occur in the east Cascades but is more common near lower treeline in the Northern Rockies.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This low to mid-elevation woodland association occurs at 760 to 1220 m (2500-4000 ft). Stands occur on hot, dry sites on south-facing aspects. Surface rocks are highly abundant.

Vegetation Description: The typically open tree canopy is dominated by *Pinus ponderosa.* Sites are generally too severe for *Pseudotsuga menziesii*. Shrubs are nearly absent. A moderately dense to sparse (20-60% cover) perennial graminoid layer dominated by *Pseudoroegneria (=Agropyron) spicata* forms the understory. *Festuca idahoensis*, *Koeleria macrantha* (=*cristata*), or *Poa secunda* (=*sandbergii*) may occur. The annual exotic grass *Bromus tectorum* is often present to abundant. Diversity of forbs is moderate. Common forb species include *Achillea millefolium*, *Balsamorhiza sagittata*, and *Lupinus* spp.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetatin plot data for national parks in Washington. It could occur above Lake Chelan.

Conservation Rank: S1

Rank Justification: The association is widespread in eastern Washington but greatly reduced from it original distribution by the effects of fire suppression, timber harvesting of large trees and exotic plant invasion.

Synonyms:
*Pinus ponderosa/Agropyron spicatu*m Association; Clausnitzer & Zamora 1987, Johnson & Clausnitzer 1992, Lillybridge et al. 1995
Pinus ponderosa/*Pseudoroegneria spicata* Woodland; Chappell 2005 NPK

Pinus albicaulis-(Abies lasiocarpa)/Vaccinium scoparium-Luzula glabrata var. hitchcockii Woodland

White-bark Pine-(Subalpine Fir)/Red Huckleberry/Hitchcock's Smooth Woodrush Woodland



Acronym: PINALB-(ABILAS)/VACSCO/LUZGLA

NatureServe Code: CEGL005839

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Abies lasiocarpa-Pinus albicaulis* Woodland

Classification Confidence Level: 2

Range: This association occurs in the Cascade Mountains.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: This association occurs near upper treeline. Sites are generally on moderate to steep slopes with north to southeast aspects.

Vegetation Description: The vegetation consists of tree islands in subalpine parklands. *Pinus albicaulis* typically dominates the three canopy or co-dominates with *Abies lasiocarpa*. The latter is usually present and has short-statured trees under the main canopy that can contribute greater overall cover than *Pinus albicaulis*. The understory vegetation is low in diversity with a short shrub layer of *Vaccinium scoparium* and/or *V. myrtillus*. A well-developed herb layer dominated by *Luzula glabrata* var. *hitchcockii* occurs in sites where snow accumulates and lingers into the growing season. Other sites or parts of sites lack *Luzula glabrata* var. *hitchcockii* and have only the short shrub layer, reflecting drier conditions.

USFWS Wetland System: Not applicable.

Comments: *Abies lasiocarpa* is more abundant in plots from the North Cascades and falls within the concept of this association as it occurs in the Rocky Mountains. One plot contains high cover of *Ledum glandulosum* which is floristically similar to the riparian *Abies lasiocarpa* / *Ledum glandulosum* association (CEGL000314).

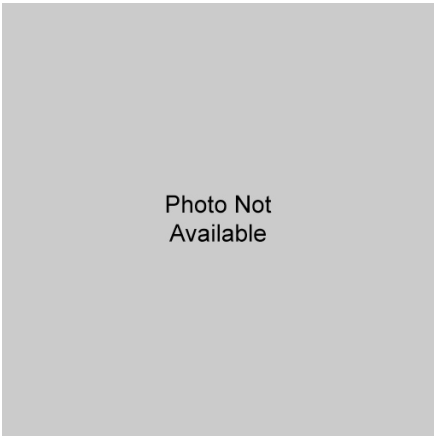
Conservation Rank: S2

Rank Justification: This somewhat widespread but unevenly distributed association occurs as isolated stands within the east Cascades and Okanogan Highlands. The ecological condition of occurrences is declining due to *Pinus albicaulis* mortality from fire exclusion and white pine blister rust (*Cronartium ribicola*).

Synonyms:
Pinus albicaulis/Vaccinium scoparium)/Luzula hitchcockii; Lillybridge et al. 1995

Pinus albicaulis-(Tsuga mertensiana)/Luzula glabrata var. hitchcockii Woodland

White-bark Pine-(Mountain Hemlock)/Hitchcock's Smooth Woodrush Woodland



Acronym: PINALB-(TSUMER)/LUZGLA

NatureServe Code: PNWCOAST_292

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Abies lasiocarpa-Pinus albicaulis* Woodland

Classification Confidence Level: 2

Range: This association may occur at Mount Rainier National Park, in the North Cascades or in the northeast Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at high elevations. Sites are generally on northerly aspects near upper treeline.

Vegetation Description: The vegetation consists of tree islands or ribbons within subalpine parkland. The tree canopy is dominated by *Tsuga mertensiana*, *Abies amabilis*, and/or *Pinus albicaulis*. The latter is always present and typically at least prominent. A shrub layer is largely absent. The well-developed herb layer usually has *Luzula glabrata* var. *hitchcockii*, *Arnica latifolia*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, and *Polemonium pulcherrimum*. *Luzula glabrata* var. *hitchcockii* is prominent to dominant. A number of other species can co-dominate in some locations.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington.

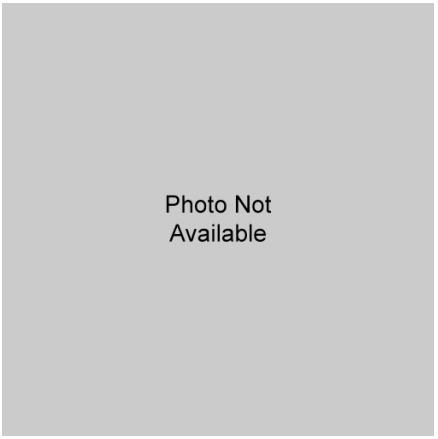
Conservation Rank: S1S2

Rank Justification: This somewhat widespread but unevenly distributed association occurs as isolated stands within the east Cascades. The ecological condition of occurrences is declining due to *Pinus albicaulis* mortality from fire exclusion and white pine blister rust (*Cronartium ribicola*).

Synonyms:
Pinus albicaulis-(*Tsuga mertensiana*)/*Luzula glabrata* var. *hitchcockii* Woodland; Chappell 2005
Tsuga mertensiana- Pinus albicaulis /*Luzula glabrata* var. *hitchcockii*-PNW; McCain and Diaz 2002b, Diaz et al. 1997
Tsuga mertensiana-Pinus albicaulis/*Luzula hitchcockii* Association; Diaz et al. 1997

Pinus albicaulis/Calamagrostis rubescens Woodland

White-bark Pine/Pinegrass Woodland



Acronym: PINALB/CALRUB

NatureServe Code: CEGL000753

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Abies lasiocarpa-Pinus albicaulis* Woodland

Classification Confidence Level: 1

Range: This association occurs in the eastern North Cascades at high elevations.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: Sites are south-facing slopes with relatively well-developed soils at subalpine elevations 1730-1980 m (5700-6500 ft). Sites characteristically have little snow accumulation due to high winds and sublimation.

Vegetation Description: The vegetation is either open woodlands or tree islands in subalpine parkland. The tree canopy is dominated by *Pinus albicaulis*. *Abies lasiocarpa* is often present particularly in stands with taller trees. *Pseudotsuga menziesii* or *Pinus contorta* are occasionally present. A sparse, low-growing shrub layer may be present usually with *Paxistima (=Pachistima) myrsinites*, *Vaccinium scoparium* or *V. myrtillus*. The herb layer is moderate to well-developed in cover and is dominated or co-dominated by *Calamagrostis rubescens* or *Carex geyeri*. *Achillea millefolium* is usually present; other species are inconsistent.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S2

Rank Justification: This community is widely distributed but restricted to the high elevations of the eastern Cascades in northern Washington. It occupies a relatively small acreage. The ecological condition of occurrences is declining due to *Pinus albicaulis* mortality from fire exclusion and white pine blister rust (*Cronartium ribicola*). As a result, this type is becoming increasingly rare.

Synonyms:
Pinus albicaulis/*Calamagrostis rubescens* Association; Lillybridge et al. 1995, Williams and Lillybridge 1983, p60, Williams et al. 1990
Pinus albicaulis/*Calamagrostis rubescens* Woodland; Chappell 2005 NPK

Pinus albicaulis/Festuca viridula Woodland

White-bark Pine/Green Fescue Woodland



Acronym: PINALB/FESVIR

NatureServe Code: CEGL001635

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Abies lasiocarpa-Pinus albicaulis* Woodland

Classification Confidence Level: 2

Range: This association may occur on northeastern slopes of Mount Rainier and possibly in the eastern North Cascades.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs in the high elevation subalpine parkland above continuous forest. Sites are usually on gentle to moderate windblown slopes with south to west aspects.

Vegetation Description: This association consists of tree islands scattered over grassland vegetation. The tree canopy is dominated by *Pinus albicaulis*. *Abies lasiocarpa* is often present in smaller amounts. There is usually no shrub layer; however, *Artemisia tridentata* ssp. *vaseyana* occasionally forms a considerable shrub layer. The herb layer is dominated or co-dominated by *Festuca viridula*. *Achillea millefolium* is usually present. *Lupinus (arcticus ssp. subalpinus, latifolius)* is prominent in about half of the sampled stands. Many other forb species may occur.

USFWS Wetland System: Not applicable.

Comments: This type is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S1S2

Rank Justification: This community is widely distributed but restricted to the high elevations of the eastern Cascades in northern Washington. It occupies a relatively small acreage. The ecological condition of occurrences is declining due to *Pinus albicaulis* mortality from fire exclusion and white pine blister rust (*Cronartium ribicola*). As result this type is increasingly rare.

Synonyms:

Pinus albicaulis /*Festuca viridula*-PNW; Lillybridge et al. 1995
Pinus albicaulis/*Festuca viridula* Association; Lillybridge et al. 1995
Pinus albicaulis/*Festuca viridula* Woodland; Chappell 2005 NPK

Pinus albicaulis/Juniperus communis Woodland

White-bark Pine/Common Juniper Woodland



Acronym: PINALB/JUNCOM

NatureServe Code: PNWCOAST_091

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Abies lasiocarpa-Pinus albicaulis* Woodland

Classification Confidence Level: 2

Range: This association occurs in the east Cascades and possibly on the northeast side of Mount Rainier or in the northeastern Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (0), Other (1)

Environmental Description: This association occurs at high elevations on generally steep, south-facing slopes with shallow or very rocky soils.

Vegetation Description: The vegetation occurs as either open woodlands or tree islands in subalpine parkland. The tree canopy is dominated or co-dominated by *Pinus albicaulis*. *Abies lasiocarpa* is often prominent to co-dominant and *Tsuga mertensiana* is occasionally prominent to co-dominant. The low-growing shrub layer is typically well-developed and always dominated by *Juniperus communis*. *Paxistima (=Pachistima) myrsinites* is occasionally prominent to co-dominant. The herb layer is sparse to at most moderate in cover. *Achillea millefolium* is usually present; other species are inconsistent.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington. This community, as it occurs in the Cascades, is likely the same as the *Abies lasiocarpa* var. *lasiocarpa - Pinus albicaulis* / *Juniperus communis* association (CEGL002326) recognized in British Columbia.

Conservation Rank: S2?

Rank Justification: This community is widely distributed but restricted to the high elevations of the eastern Cascades in northern Washington. It occupies a relatively small acreage. The ecological condition of occurrences is declining due to *Pinus albicaulis* mortality from fire exclusion and white pine blister rust (*Cronartium ribicola*). As result this type is increasingly rare.

Synonyms:
Pinus albicaulis /*Juniperus communis*-PNW; Lillybridge et al. 1995
Pinus albicaulis/*Juniperus communis* Woodland; Chappell 2005 NPK, Lillybridge et al. 1995
Pinus albicaulis/*Juniperus communis*/*Penstemon davidsonii* Community; del Moral 1979
Pinus albicaulis-Abies lasiocarpa/*Juncus parryi-Lupinus sulphureus* Woodland; Annable & Peterson 1988
Tsuga mertensiana-Abies lasiocarpa/*Juniperus communis* Association; Diaz et al. 1997
Tsuga mertensiana-Abies lasiocarpa/*Juniperus communis*-PNW; McCain and Diaz 2002b, Diaz et al. 1997

Larix lyallii/Cassiope mertensiana-Luetkea pectinata Woodland

Subalpine Larch/White Mountain Heather-Partridgefoot Woodland



Acronym: LARLYA/CASMER-LUEPEC

NatureServe Code: Preliminary

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Larix lyallii*-(*Abies lasiocarpa*, *Picea engelmannii*) Woodland

Classification Confidence Level: 2

Range: This association occurs primarily in the east Cascades from Mount Stuart north to near the British Columbia border.

Plots: 3, MORA (0), NOCA (2), OLYM (0), Other (1)

Environmental Description: This subalpine woodland association occurs above continuous forest and below upper treeline. Its typical form is scattered to clustered patches of trees across slopes to ridges. Sites are harsh, wind-swept, and with deep, lingering snowpacks.

Vegetation Description: The open tree canopy is usually dominated or co-dominated by *Larix lyallii* with *Abies lasiocarpa* and/or *Picea engelmannii* often present. *Pinus albicaulis* is absent or low in cover. The most prominent component of the understory is a layer of dwarf-shrubs,including *Luetkea pectinata*, *Cassiope mertensiana* and *Phyllodoce empetriformis*. Herbaceous plants are present but not prominent, typically represented by *Luzula glabrata* var. *hitchcockii*, *Carex nigricans* and *Valeriana sitchensis*.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S3

Rank Justification: This preliminary association occurs within a narrow environmental range although with few threats. Climate change will likely affect this vegetation.

Synonyms:
Larix lyallii/Cassiope mertensiana-Luetkea pectinata Association; Lillybridge et al. 1995, Kovalchik 2001
*Larix lyallii/Phyllodoce empetriformis/Luzula hitchcocki*i Community; del Moral 1979
Larix lyallii/ Cassiope mertensiana Community; del Moral 1979
Larix lyallii-Abies lasiocarpa/Luzula hitchcockii Community; del Moral 1979
Larix lyallii-Abies lasiocarpa/Cassiope mertensiana-Ledum glandulosum Community; del Moral 1979

Larix lyallii/Vaccinium deliciosum Woodland

Subalpine Larch/Blueleaf Huckleberry Woodland



Acronym: LARLYA/VACDEL

NatureServe Code: CEGL000952

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Larix lyallii*-(*Abies lasiocarpa*, *Picea engelmannii*) Woodland

Classification Confidence Level: 2

Range: This association occurs primarily in the east Cascades from Mount Stuart to near the British Columbia border.

Plots: 3, MORA (0), NOCA (3), OLYM (0), Other (0)

Environmental Description: This subalpine woodland association occurs above continuous forest and below upper treeline. It tends to occur at a higher elevation (over 2285 m (7500 ft)) and with deeper snowpacks than *Larix lyallii* / *Cassiope mertensiana-Luetkea pectinata* (Preliminary) sites.

Vegetation Description: This association forms scattered to clustered patches of trees across slopes to ridges. The open tree canopy is usually dominated by *Larix lyallii* with *Abies lasiocarpa* often present to co-dominant. *Pinus albicaulis* is absent or low in cover. The well-developed dwarf-shrub layer is co-dominated by *Vaccinium deliciosum Cassiope mertensiana*, *Luetkea pectinata* and/or *Phyllodoce empetriformis*. *Vaccinium scoparium* is often present. Herbaceous plants *Luzula glabrata* var. *hitchcockii*, *Carex nigricans* and *Valeriana sitchensis* are common and can be prominent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association is restricted narrowly along the Cascades. Climate change will likely affect this vegetation.

Synonyms:
Larix lyallii/*Vaccinium deliciosum* Woodland; Chappell 2005 NPK
Larix lyallii/*Vaccinium deliciosum-Cassiope mertensiana* Association; Lillybridge et al. 1995

Larix lyallii/Vaccinium scoparium/Luzula glabrata var. hitchcockii Woodland

Subalpine Larch/Hitchcock's Smooth Woodrush Woodland



Acronym: LARLYA/LUZGLA

NatureServe Code: CEGL000951

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Larix lyallii*-(*Abies lasiocarpa*, *Picea engelmannii*) Woodland

Classification Confidence Level: 2

Range: This association occurs primarily in the east Cascades from Mount Stuart north to near the British Columbia border and in the Northern Rockies.

Plots: 5, MORA (0), NOCA (4), OLYM (0), Other (1)

Environmental Description: This subalpine woodland association occurs above continuous forest and below upper treeline. Its typical form is scattered to clustered patches of trees across moderate to steep slopes at high elevation (2010-2290 m (6600-7500 ft)).

Vegetation Description: The open tree canopy is usually dominated by *Larix lyallii* with *Picea engelmannii* and/or *Abies lasiocarpa* usually present. *Pinus albicaulis* is absent or low in cover. The well-developed dwarf-shrub layer is co-dominated by the diagnostic shrubs, *Vaccinium scoparium, Vaccinium caespitosum or Vaccinium myrtillis*. *Phyllodoce empetriformis* is often present. *Luzula glabrata* var. *hitchcockii* is the most prominent herb. Other common herbs are *Valeriana sitchensis, Erigeron peregrinus*, *Lupinus* species, *Juncus parryii, Arenaria capillaris, Arnica latifolia*, and *Carex rossii*.

USFWS Wetland System: Not applicable.

Comments: This association appears to be a transition between similar *Abies lasiocarpa* and *Tsuga mertensiana* associations. *Vaccinium caespitosum* is included in this association and expands the current concept.

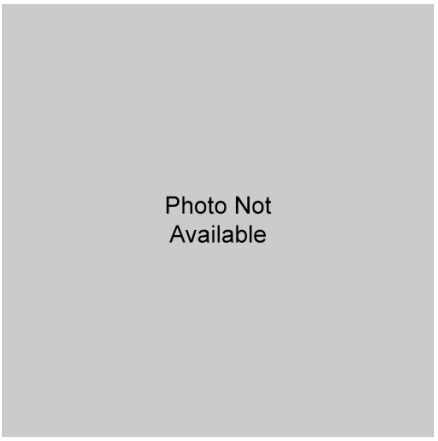
Conservation Rank: S2

Rank Justification: This community appears to be widely distributed but occurs in isolated patches. It is located in the high elevations of the eastern Cascades in northern Washington into British Columbia. Its habitat is restricted by a limited area above closed forests. It occupies a relatively small acreage across this wide distribution. Climate change will likely affect this vegetation.

Synonyms:
Larix lyallii (Okan); Williams and Lillybridge 1983
Larix lyallii/*Vaccinium scoparium*/*Luzula hitchcockii* Association; Lillybridge et al. 1995

Pinus albicaulis Krummholz Shrubland

White-bark Pine Krummholz



Acronym: PINALB

NatureServe Code: Provisional

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Northern Rocky Mountain Whitebark-Limber Pine Woodland

Alliance: *Pinus albicaulis* Krummholz

Classification Confidence Level:

Range: This association occurs in the Cascades (mainly in rainshadow areas) and possibly in the northeastern Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at high elevations. Sites are located at the upper edge of the subalpine parkland and the lower part of the alpine zone. Soils are well-drained.

Vegetation Description: The vegetation is dominated by shrub-form *Pinus albicaulis*. Upright trees are absent or limited to occasional flags. Associated understory species are variable. Usually this vegetation occurs as well-defined patches near upper treeline.

USFWS Wetland System: Not applicable.

Comments: This type is not represented in the current data for national parks in Washington.

Conservation Rank: S2S3

Rank Justification: This association is geographically restricted but widely distributed in the eastern Cascades. White pine blister rust (*Cronartium ribicola*), an exotic fungus, has caused extensive mortality in *Pinus albicaulis* within the range of this association and its impact in these harsh habitats are drastic. Climate change will very likely affect this vegetation.

Synonyms:
Pinus albicaulis Krummholz Shrubland; Chappell 2005 NPK
Pinus albicaulis Krummholz-Central; Douglas and Bliss 1977
Pinus albicaulis Krummholz-East; Douglas and Bliss 1977
Pinus albicaulis/Juncus parryi-Penstemon davidsonii Community; del Moral 1979
Pinus albicaulis/Phlox diffusa Community; del Moral 1979

Populus tremuloides Shrubland

Quaking Aspen Shrubland

Acronym: POPTRE shrub

NatureServe Code: Provisional

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Group

Alliance: *Populus tremuloides/(Acer circinatum-Cornus nuttallii)* Forest

Classification Confidence Level: 3

Range: This type was sampled in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association is represented by a single plot at 1045 m (3430 ft) elevation on a moderately steep, west-facing, debris avalanche slope. Evidence of past fire disturbance is suggested by charcoal on downed logs.



Vegetation Description: A well-developed tall shrub layer is dominated by shrub form *Populus tremuloides*. Other tall shrub species are *Acer circinatum* and *Amelanchier alnifolia* with the shorter shrub *Paxistima (=Pachistima) myrsinites* abundant. The herbaceous layer is rather sparse with *Pteridium aquilinum* the most abundant species.

USFWS Wetland System: Not applicable.

Comments: More plots are needed to better describe this provisional type and to distinguish it from related *Populus tremuloides* types

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this tentative association.

Synonyms:

Populus tremuloides/Cornus nuttallii Forest

Quaking Aspen/Pacific Dogwood Forest



Acronym: POPTRE/CORNUT

NatureServe Code: Provisional

Macrogroup Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Group

Alliance: *Populus tremuloides/(Acer circinatum-Cornus nuttallii)* Forest

Classification Confidence Level: 3

Range: This association is described from one plot in the North Cascades Park and may be located elsewhere in the Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The plot defining this vegetation type occurs at 340 m (1120 ft) elevation on a nearly flat, northeast slope.

Vegetation Description: This closed broadleaf forest is dominated by *Populus tremuloides* with *Acer macrophyllum*, *Populus balsamifera* ssp. *trichocarpa*, and a conifer - *Abies grandis* - each contributing under 20% cover. The short tree, *Cornus nuttallii* dominates the subcanopy. A sparse shrub layer includes *Rubus parviflorus*, *Symphoricarpos albus* and *Acer circinatum*. The sparse herb layer includes moist site species such as, *Athyrium filix-femina*, *Polystichum munitum*, and *Viola glabella*.

USFWS Wetland System: Not applicable.

Comments: This association may be a broadleaf variant of the *Abies grandis* / *Cornus nuttallii - Acer glabrum* Forest association (CEGL001104) described from the southeast Cascades in Washington.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Abies lasiocarpa-(Pseudotsuga menziesii)/Vaccinium membranaceum/Calamagrostis rubescens Forest

Subalpine Fir-(Douglas-fir)/Big Huckleberry/Pinegrass Forest



Acronym: ABILAS-(PSEMEN)/VACMEM/CALRUB

NatureServe Code: CEGL000342

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Alliance: *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest

Classification Confidence Level: 3

Range: This association occurs in the east Cascades.

Plots: 3, MORA (0), NOCA (1), OLYM (0), Other (2)

Environmental Description: This association occurs at middle to high elevations. Sites are relatively cool and on moderate slopes.

Vegetation Description: *Abies lasiocarpa* is dominant in the semi-open to closed tree canopy. *Picea engelmannii* and/or *Pseudotsuga menziesii* are usually present in the canopy. The shrub layer is typically moderately dense and dominated by *Vaccinium membranaceum* with *Paxistima (=Pachistima) myrsinites*. *Vaccinium scoparium* may be present. The herb layer is usually poorly developed with *Calamagrostis rubescens*, *Carex geyeri* and *Orthilia (=Pyrola) secunda* most common.

USFWS Wetland System: Not applicable.

Comments: This may be equivalent to the *Abies lasiocarpa - Picea engelmannii / Vaccinium membranaceum* Rocky Mountain Forest (CEGL000341) described in the Northern Rockies but with occasional Cascadian elements, for example *Vaccinium deliciosum.*

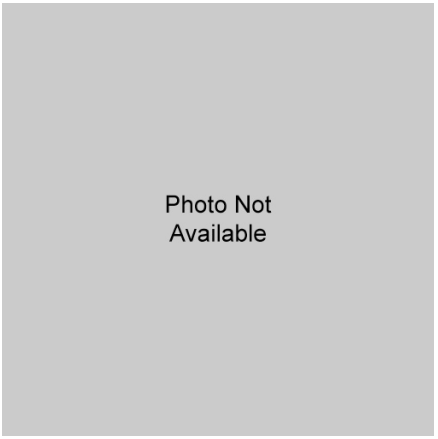
Conservation Rank: S3Q

Rank Justification: This association is represented by locations in the National Park system however, the majority of occurrences are not protected from alterations from threatening land uses.

Synonyms:
Abies lasiocarpa-(*Pseudotsuga menziesii*)/*Vaccinium membranaceum* Forest; Chappell 2005 NPK

Abies lasiocarpa-Picea engelmannii/Vaccinium scoparium Woodland

Subalpine Fir-Engelmann spruce/Grouse Whortleberry Woodland



Acronym: ABILAS-PICENG/VACSCO

NatureServe Code: CEGL000344

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Alliance: *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest

Classification Confidence Level: 3

Range: This association occurs in interior British Columbia, the Rocky Mountains, and perhaps the east Cascades.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This woodland or open forest association may occur at moderately high elevations 1000-2000 m (3300 to 6230 ft). Sites usually have rocky soils that are well-drained and cold. Slopes tend to be gentle and variable in aspect.

Vegetation Description: The woodland or forest canopy is usually dominated by *Abies lasiocarpa. Pinus contorta* is occasionally prominent to co-dominant. *Picea engelmannii* and/or *Pseudotsuga menziesii* may also be present in the canopy. The dwarf-shrub layer is well-developed. *Vaccinium scoparium* and/or *Vaccinium myrtillus* are prominent, dominant and diagnostic. *Paxistima (=Pachistima) myrsinites* is occasionally prominent. The variable herb layer may contain *Carex geyeri* or *Polemonium pulcherrimum*.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data set of vegetation plots in national parks in Washington. Areas at higher elevations or westward sites with deep snowpack where the understory is dominated by *Luzula glabrata* var. *hitchcockii* with *Arnica latifolia* and *Valeriana sitchensis* are part of the preliminary *Abies lasiocarpa*/*Vaccinium scoparium*/*Valeriana sitchensis* association. The *Abies lasiocarpa- Picea engelmannii* /*Vaccinium scoparium* association is a very broadly defined type and further comparison is needed between it and similar associations in the Cascades.

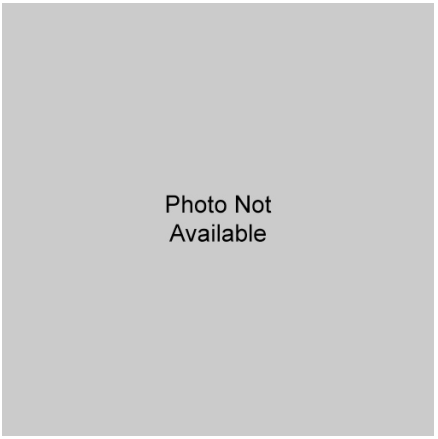
Conservation Rank: S3S4

Rank Justification: This association occurs within a restricted range with few threats. Climate change may effect this vegetation.

Synonyms:
Abies lasiocarpa /Vaccinium scoparium; Chappell 2005 NPK, Williams et al. 1995, Williams and Lillybridge 1983
Abies lasiocarpa /Vaccinium scoparium WEN; Lillybridge et al. 1995, p228
Abies lasiocarpa/Vaccinium myrtillus; John et al. 1988, p43

Abies lasiocarpa-Pseudotsuga menziesii/Calamagrostis rubescens Woodland

Subalpine Fir-Douglas-fir/Pinegrass Woodland



Acronym: ABILAS-PSEMEN/CALRUB

NatureServe Code: CEGL000301

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Alliance: *Abies lasiocarpa - Picea engelmannii / Carex geyeri* Forest

Classification Confidence Level: 2

Range: This association is known from central and eastern Washington and the Rocky Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: Elevations range from 1460 to 1740 m (4800-5700 ft). Stands occur on cold, dry to mesic sites on mid to upper slopes on all aspects. Soils are frequently rocky although moderately so.

Vegetation Description: The typically open tree canopy is co-dominated by *Pseudotsuga menziesii* and *Abies lasiocarpa. Larix occidentalis*, *Pinus contorta* and *Picea engelmannii* are frequently in the canopy as well. The shrub layer is sparse (under 10% cover). *Calamagrostis rubescens* dominates the herb layer. *Arnica cordifolia*, *Chimaphila umbellata* and *Lupinus* spp. are frequent.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data set of vegetation plots for national parks in Washington.

Conservation Rank: S4S5

Rank Justification: This association occurs within a wide range and faces threats from logging, livestock grazing and fire suppression effects.

Synonyms:
Abies lasiocarpa-Pseudotsuga menziesii/*Calamagrostis rubescens* Woodland; Chappell 2005 NPK
Abies lasiocarpa/Calamagrostis rubescens; Lillybridge et al. 1995, Williams and Lillybridge 1983, Williams et al. 1995, John et al. 1988, Clausnitzer & Zamora 1987
Abies lasiocarpa/Vaccinium scoparium-Calamagrostis rubescens; Lillybridge et al. 1995, Williams and Lillybridge 1983

Abies lasiocarpa-(Picea engelmannii)/Rhododendron albiflorum Forest

Subalpine Fir-(Engelmann spruce)/Cascade Azalea Forest

Acronym: ABILAS/RHOALB

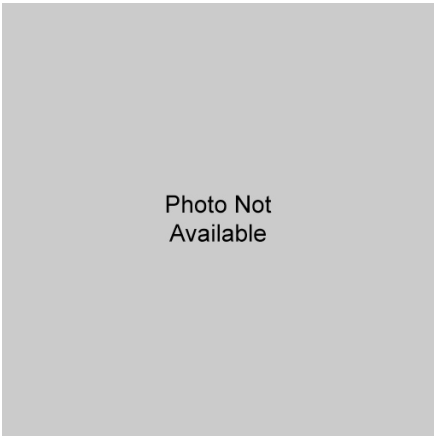
NatureServe Code: CEGL000330

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland

Alliance: *Abies lasiocarpa - Picea engelmannii / Ribes spp.* Forest

Classification Confidence Level: 2



Range: This association occurs in the east Cascade and Northern Rocky Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This forest or woodland association is found at high elevations ranging from 1460 to 2075 m (4600-6800 ft). Sites have deep, slow melting snowpacks and tend to be on mid to upper slopes.

Vegetation Description: The woodland to forest canopy of this association is usually co-dominated by *Abies lasiocarpa* and *Picea engelmannii*. The shrub layer is frequently dense and is dominated by *Rhododendron albiflorum,* typically with *Vaccinium membranaceum*. Low shrubs *Vaccinium scoparium* or *V. myrtillus* are usually present. The herb layer is sparse to moderately dense. A few areas at higher elevations or on west-facing sites with deep snowpack may be dominated by *Luzula glabrata* var. *hitchcockii* with *Valeriana sitchensis*.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current plot data and may it might occur in the mountains near Lake Chelan. The absence or only presence of *Tsuga mertensiana* or *Abies amabilis* or presence of *Calamagrostis rubescens* help distinguish this association from similar forest types found further west in the Cascade Mountains.

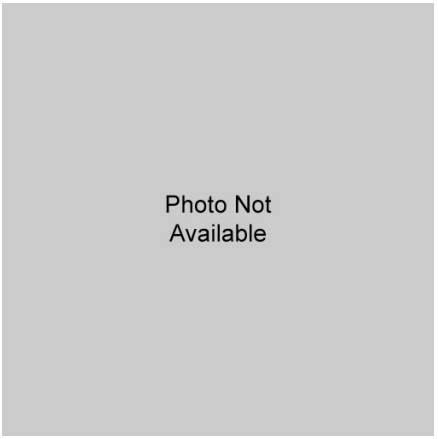
Conservation Rank: S4

Rank Justification: This association is widespread in eastern Washington with few threats. Logging is a threat in part of its range.

Synonyms:
Abies lasiocarpa – (*Picea engelmannii*) / *Rhododendron albiflorum*; Chappell 2005 NPK
Abies lasiocarpa/*Menziesia ferruginea* Association; Daubenmire & Daubenmire 1968
Abies lasiocarpa/*Pachistima myrsinites* Association in part; Daubenmire & Daubenmire 1968
Abies lasiocarpa/*Rhododendron albiflorum* Association; Lillybridge et al. 1995*,* Williams and Lillybridge 1983, Williams et al. 1995
Abies lasiocarpa/*Rhododendron albiflorum-Luzula hitchcockii* Association; Kovalchik 2001*,* Lillybridge et al. 1995
Abies lasiocarpa/*Rhododendron albiflorum-Xerophyllum tenax* Association; Williams et al. 1995
Abies lasiocarpa-Picea engelmannii/*Rhododendron albiflorum-Vaccinium membranaceum* Community; del Moral et al. 1976

Abies lasiocarpa-Picea engelmannii/Linnaea borealis Woodland

Sitka Spruce-(Subalpine Fir)/Twinflower Woodland



Acronym: PICENG-(ABILAS)/LINBOR

NatureServe Code: CEGL000315

Macrogroup: Rocky Mountain Subalpine & High Montane Conifer Forest

Group: Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland

Alliance: *Abies lasiocarpa - Picea engelmannii / Ribes spp.* Forest

Classification Confidence Level: 3

Range: This association occurs in the eastern North Cascades in Washington and in adjacent British Columbia.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This cool, moist ,montane woodland association occurs between 640 to 1800 m (2100-5900 ft). Stands occur on moist sites on mid to upper slopes on all aspects. Soils are deep and can be rocky.

Vegetation Description: The typically open tree canopy is co-dominated by *Picea engelmannii* and a combination or one of the following: *Abies lasiocarpa*, *Pseudotsuga menziesii*, *Pinus contorta* or *Larix occidentalis*. *Abies lasiocarpa* and *Picea engelmannii* are often the most common tree species in the subcanopy. The shrub layer is poorly developed (under 10% cover) with *Paxistima (=Pachistima) myrsinites* or *Vaccinium scoparium* commonly present. *Calamagrostis rubescens* is present, but not dense, on most sites. The ground cover is dominated by *Linnaea borealis*. *Orthilia (=Pyrola) secunda*, *Osmorhiza berteroi (=chilensis)*, *Chimaphila umbellata* and *Thalictrum occidentale* are frequent..

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data set of vegetation plots in national parks in Washington.

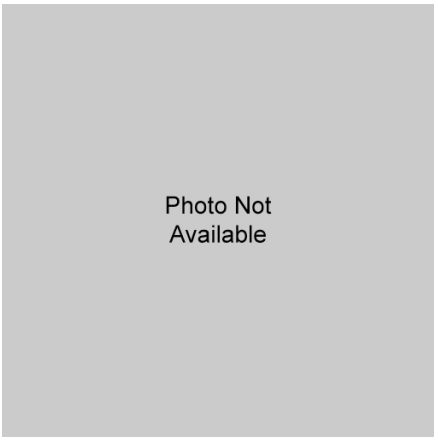
Conservation Rank: S4Q

Rank Justification: This preliminary association appears to be relatively common in the east Cascades

Synonyms:
Abies lasiocarpa/*Linnaea borealis* Association; Williams et al. 1995; Lillybridge et al. 1995; Johnson & Clausnitzer 1992; Williams and Lillybridge 1983

Picea sitchensis/Calamagrostis nutkaensis Woodland

Sitka Spruce/Pacific Reedgrass Woodland



Acronym: PICSIT/CALNUT

NatureServe Code: CEGL003266

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Sitka Spruce Forest

Alliance: *Picea sitchensis - (Tsuga heterophylla)* Forest Alliance

Classification Confidence Level: 2

Range: This association may occur along the Pacific Ocean on the western Olympic Peninsula.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This woodland or open forest association occurs on steep slopes facing the Pacific Ocean.

Vegetation Description: The open canopy is dominated by *Picea sitchensis*. *Tsuga heterophylla* may be present in small amounts. The understory is characterized by high cover of *Calamagrostis nutkaensis*. The shrub layer ranges from sparse to moderately dense. *Gaultheria shallon* is the most typical shrub.

USFWS Wetland System: Not applicable.

Comments: There is no data describing the type from Washington, although unsurveyed stands have been observed in northern Gray Harbor County, south of OLYM.

Conservation Rank: SU

Rank Justification: Until confirmed in Washington, this association is unrankable.

Synonyms:
CWH wh 1 /15; Green and Klinka 1994, BC Ministry of Forests 2003
Picea sitchensis/*Calamagrostis nutkaensis* Woodland; Chappell 2005 NPK

Picea sitchensis/Gaultheria shallon Forest

Sitka Spruce/Salal Forest



Acronym: PICSIT/GAUSHA

NatureServe Code: CEGL000401

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Sitka Spruce Forest

Alliance: *Picea sitchensis*-(*Tsuga heterophylla*) Forest

Classification Confidence Level: 1

Range: This association occurs on the coastal plain of the western Olympic Peninsula.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: This forest or woodland association occurs on well-drained, generally sloping sites, often on or near coastal bluffs.

Vegetation Description: The canopy is dominated by *Picea sitchensis*. *Tsuga heterophylla* or *Thuja plicata* is often present to occasionally co-dominant. The dense shrub layer is dominated or co-dominated by *Gaultheria shallon*. *Rubus spectabilis* is sometimes co-dominant and *Vaccinium ovatum*, if present, is low in cover. The herb layer varies in density. *Blechnum spicant*, *Maianthemum dilatatum*, and *Polystichum munitum* are present in most stands.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S3

Rank Justification: This association occurs within a limited geographic range and sites can be threatened by timber harvesting.

Synonyms:
CWH vh 1 /17; Green and Klinka 1994, BC Ministry of Forests 2003
Picea sitchensis/*Gaultheria shallon* Association; Bigley and Hull 1995
Picea sitchensis/*Gaultheria shallon* Community; Kratz 1975
Picea sitchensis/*Gaultheria shallon* Forest; Chappell 2005 NPK
Picea sitchensis/*Gaultheria shallon*-Olympics; Bigley and Hull 1995
Picea sitchensis/*Gaultheria shallon-Rubus spectabilis* Forest; Hemstrom and Logan 1986
Picea sitchensis/*Gaultheria shallon-Rubus spectabilis*-PNW; Christy et al. 1998

Picea sitchensis/Maianthemum dilatatum Forest

Sitka Spruce/False Lily of the Valley Forest



Acronym: PICSIT/MAIDIL

NatureServe Code: CEGL003266

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Sitka Spruce Forest

Alliance: *Picea sitchensis*-(*Tsuga heterophylla*) Forest

Classification Confidence Level: 1

Range: This association occurs on the western coastal plain of the Olympic Peninsula.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: This forested association occurs on well-drained upland sites on the western coastal plain within the immediate salt spray zone. Sites are relatively flat and adjacent to the top of coastal cliffs. This type also occurs on sand and gravel substrates in the lee of thickets of young trees and driftwood piles adjacent to beaches.

Vegetation Description: *Picea sitchensis* dominates the canopy. *Tsuga heterophylla* and *Thuja plicata* are occasionally present. A shrub layer is typically absent to very sparse. *Maianthemum dilatatum* dominates the well-developed herb layer with *Blechnum spicant* and *Polystichum munitum* often present. Mosses can be a prominent ground cover.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S1?

Rank Justification: This association occurs as small patches within a very limited distribution (within 20 km of the coastline).

Synonyms:
Picea sitchensis/*Maianthemum dilatatum* Community; Kratz 1975
Picea sitchensis/*Maianthemum dilatatum* Forest; Chappell 2005 NPK

Picea sitchensis/Vaccinium ovatum Forest

Sitka Spruce/Evergreen Huckleberry Forest



Acronym: PICSIT/VACOVA

NatureServe Code: PNWCOAST_060

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Sitka Spruce Forest

Alliance: *Picea sitchensis*-(*Tsuga heterophylla*) Forest

Classification Confidence Level: 2

Range: This association may occur in the outer coastal strip of the Olympic Peninsula.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: In Oregon and southern Washington, this association occurs on stabilized dunes or tree islands within unstabilized dunes.

Vegetation Description: The canopy is dominated by *Picea sitchensis*. *Tsuga heterophylla* may also occur. The dense shrub layer is co-dominated by *Gaultheria shallon* and *Vaccinium ovatum*. The herb layer is usually poorly developed.

USFWS Wetland System: Not applicable.

Comments: There is no data describing the type from Washington, though it has been observed on the coastal dunes of Pacific County, Washington.

Conservation Rank: S1?

Rank Justification: This association occurs as small patches within a very limited geographic distribution (within 20 km of the coastline).

Synonyms:
Picea sitchensis/*Gaultheria shallon*-*Vaccinium ovatum* community; Kunze 1982
Picea sitchensis/*Vaccinium ovatum* Forest; Chappell 2005 NPK
Picea sitchensis/*Vaccinium ovatum*-PNW; Christy et al. 1998

Picea sitchensis-Tsuga heterophylla/Polystichum munitum Forest

Sitka Spruce-Western Hemlock/Swordfern Forest



Acronym: PICSIT-TSUHET/POLMUN

NatureServe Code: CEGL003787

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Sitka Spruce Forest

Alliance: *Picea sitchensis*-(*Tsuga heterophylla*) Forest

Classification Confidence Level: 2

Range: This association occurs on the western Olympic Peninsula at low elevations.

Plots: 12, MORA (1), NOCA (0), OLYM (11), Other (0)

Environmental Description: This type occurs on slopes (1-30%) and gently rolling to flat topography and is usually near coastal bluffs without directly facing the Pacific Ocean. All sites have well-drained soils.

Vegetation Description: The canopy is usually dominated or co-dominated by *Picea sitchensis* (minimum of 10% total cover). *Tsuga heterophylla,* usually co-dominant, may only be present in small amounts. *Thuja plicata*, *Alnus rubra*, and *Acer macrophyllum* can be present to prominent. A shrub layer is sparse or absent but when present, it most often contains *Rubus spectabilis*, *Gaultheria shallon* and *Vaccinium parvifolium*. The well-developed herb layer is dominated by *Polystichum munitum*. *Athyrium filix-femina*, and *Dryopteris expansa (=austriaca)*. *Maianthemum dilatatum* and *Blechnum spicant* are usually present. Small amounts of several other herbs may occur, but *Oxalis oregana* is absent or low in cover.

USFWS Wetland System: Not applicable.

Comments: One legacy plot indicates that this association may occur rarely at Mount Rainier.

Conservation Rank: S2S3

Rank Justification: Widespread but uncommon to rare within its range which within Washington is mostly unprotected from forest harvesting which can remove or highly alter it. Recovery is expected within 100 years from time of stand replacement disturbance, if the post-harvest site was not planted with Douglas-fir as many are.

Synonyms:
CWH vh 2 /05; Banner et al. 1993, BC Ministry of Forests 2003
CWH wh 1 /03; Green and Klinka 1994, BC Ministry of Forests 2003
Picea sitchensis/*Polystichum munitum* Community; Kratz 1975
Picea sitchensis/*Polystichum munitum-Trillium ovatum* Association; Bigley and Hull 1995
Picea sitchensis-Tsuga heterophylla/*Blechnum spicant* Community; Kratz 1975
Picea sitchensis-Tsuga heterophylla/*Polystichum munitum* Forest; Chappell 2005 NPK
Tsuga heterophylla-Picea sitchensis/*Oplopanax horridum* Community Type; Mycek 1994
Tsuga heterophylla-Picea sitchensis/*Polystichum munitum* Community; Kratz 1975*,* Mycek 1994

Picea sitchensis-Tsuga heterophylla/Polystichum munitum-Oxalis oregana Forest

Sitka Spruce-Western Hemlock/Swordfern-Oregon Oxalis Forest



Acronym: PICSIT-TSUHET/POLMUN-OXAORE

NatureServe Code: CEGL000058

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Sitka Spruce Forest

Alliance: *Picea sitchensis*-(*Tsuga heterophylla*) Forest

Classification Confidence Level: 1

Range: This association occurs on the western Olympic Peninsula.

Plots: 35, MORA (0), NOCA (0), OLYM (35), Other (0)

Environmental Description: This association occurs at low elevations. Sites are relatively moist but not wet, with well-drained soils. Most often it is located on lower or toe slopes or riparian terraces. It is very extensive on high terraces of major rivers.

Vegetation Description: *Picea sitchensis* usually dominates the canopy or co-dominates with *Tsuga heterophylla*. *Acer macrophyllum* or *Alnus rubra* are sometimes prominent to co-dominant. Tree regeneration is dominated by *Tsuga heterophylla* and/or *Picea sitchensis*. The shrub layer is variable in abundance. When well-developed (mainly in major river valleys), it is dominated by the tall shrub *Acer circinatum*. *Rubus spectabilis*, *Vaccinium alaskaense*, and *Vaccinium parvifolium* are usually present in small amounts, though the former can be prominent. The well-developed herb layer is co-dominated by *Polystichum munitum* and *Oxalis oregana*. *Athyrium filix-femina*, *Blechnum spicant*, and *Tiarella trifoliata* are usually present. *Tiarella trifoliata* or *Achlys (californica, triphylla)* can be abundant.

USFWS Wetland System: Not applicable.

Comments: Most occurrences of this association are found on upland sites within valley bottoms.

Conservation Rank: S3

Rank Justification: This association occurs in a limited range within Washington where much of it has been altered by forest harvesting. Recovery is expected within 100 years from time of stand replacement disturbances, if sites are not planted with Douglas-fir as they often are.

Synonyms:
Picea sitchensis/*Acer circinatum* Association; Chappell 1999
Picea sitchensis/*Acer circinatum*-WArip; Chappell 1999
Picea sitchensis/*Oxalis oregana* Association; Bigley and Hull 1995, Chappell 1999
Picea sitchensis/*Oxalis oregana*-NWW; Henderson et al. 1989
Picea sitchensis/*Oxalis oregana*-Olympics; Bigley and Hull 1995
Picea sitchensis/*Oxalis oregana*-WArip; Chappell 1999
Picea sitchensis/*Polystichum munitum-Oxalis oregana* Association; Henderson et al. 1989
Picea sitchensis-Tsuga heterophylla Community; Fonda 1974
Picea sitchensis-Tsuga heterophylla/*Acer circinatum*/*Polystichum munitum-Oxalis oregana* Community Type; Henderson et al. 1979
Picea sitchensis-Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Community Type; Henderson et al. 1979
Picea sitchensis-Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Forest; Chappell 2005 NPK
Picea sitchensis-Tsuga heterophylla/*Vaccinium alaskaense* Community Type; Henderson et al. 1979
Tsuga heterophylla Community; Fonda 1974

Thuja plicata-Tsuga heterophylla/Vaccinium ovatum Forest

Western Redcedar-Western Hemlock/Evergreen Huckleberry Forest



Acronym: THUPLI-TSUHET/VACOVA

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level: 2

Range: The association appears along the coastal strip of Washington.

Plots: 17, MORA (0), NOCA (0), OLYM (17), Other (0)

Environmental Description: This association occurs at low elevations (typically less than 120 m (400 ft)) on flat to gentle sloping to concave sites on coastal terraces. Windstorms create the major disturbances in these forests.

Vegetation Description: *Thuja plicata* and *Tsuga heterophylla* dominate the canopy with *Picea sitchensis* only occasionally present. The very dense, tall-shrub layer (over 2m (6 ft)) is co-dominated by *Gaultheria shallon* and *Vaccinium ovatum*. *Vaccinium alaskaense*, *V. parvifolium* and *Menziesia ferruginea* are usually present to prominent or occasionally co-dominant. *Blechnum spicant* is always present and often prominent or dominant in the herb layer. The herb layer varies in total cover. *Lysichiton americanus* is frequently present but never abundant (under 5% cover). *Polystichum munitum* is absent or present only in low amounts. A diverse moss layer is typically present.

USFWS Wetland System: Not applicable.

Comments: The set of plots from Olympic is on-average wetter than other sites documented for this type as indicated by the frequency of *Lysichiton americanus*. There is at least one known example of a coastal (Olympic NP) occurrence of *Thuja plicata-Tsuga heterophylla/Gaultheria shallon/Lysichiton americanus* forest association (CEGL003226) that has a high percent cover of *V. ovatum* and would be transitional to this association.

Conservation Rank: S1S2

Rank Justification: This association occurs only along the Pacific coast. Forests can be extremely old and many occurrences have been fragmented by timber harvests.

Synonyms:
Thuja plicata-Tsuga heterophylla/*Vaccinium ovatum-Gaultheria shallon* Association; WANHP files

Tsuga heterophylla-(Abies amabilis)/Gaultheria shallon/Blechnum spicant Forest

Western Hemlock-(Pacific Silver Fir)/Salal/Deer Fern Forest



Acronym: TSUHET-(ABIAMA)/GAUSHA/BLESPI

NatureServe Code: PNWCOAST_221

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level: 2

Range: This association occurs on the western Olympic Peninsula including the western Olympic Mountains and the western slopes of the Willapa Hills.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at low elevations on well-drained soils and a variety of landforms including gentle to steep slopes, ridgetops, and rolling plains.

Vegetation Description: The tree canopy is always dominated or co-dominated by *Tsuga heterophylla*. *Abies amabilis* is sometimes present to co-dominant. Either of these species can dominate tree regeneration. *Thuja plicata* is occasionally present, but never co-dominant. *Gaultheria shallon* dominates the well-developed shrub layer. *Vaccinium alaskaense*, *V. parvifolium* and *Menziesia ferruginea* are usually present to prominent or occasionally co-dominant. The herb layer is variable in total cover. *Blechnum spicant* is always present and often prominent or dominating the herb layer. *Polystichum munitum* is absent or present only in low amounts.

USFWS Wetland System: Not applicable.

Comments: This type is distinguished from *Tsuga heterophylla*-*Thuja plicata*-(*Abies amabilis*)/*Gaultheria shallon*/*Blechnum spicant* by the absence or low percent cover of *Thuja plicata*. This association is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S3

Rank Justification: This association occurs only along the Olympic Peninsula and the western Willapa Hills. Many occurrences have been fragmented by and altered by timber harvests.

Synonyms:
Abies amabilis/*Gaultheria shallon* Association; Bigley and Hull 1995
Abies amabilis/*Gaultheria shallon*/*Pyrola picta*-Olympics; Bigley and Hull 1995
Abies amabilis/*Gaultheria shallon-Blechnum spicant* Association; Henderson et al. 1989
Abies amabilis/*Gaultheria shallon-Blechnum spicant*-NWW; Henderson et al. 1989
Picea sitchensis/*Gaultheria shallon*/*Menziesia ferruginea*-Olympics; Bigley and Hull 1995
Picea sitchensis/*Gaultheria shallon-Menziesia ferruginea* Association; Bigley and Hull 1995
Tsuga heterophylla-(*Abies amabilis*)/*Gaultheria shallon*/*Blechnum spicant* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Gaultheria shallon* Association; Bigley and Hull 1995
Tsuga heterophylla/*Gaultheria shallon*-Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Vaccinium alaskaense-Gaultheria shallon* Association; Henderson et al. 1989
Tsuga heterophylla/*Vaccinium alaskaense-Gaultheria shallon*-NWW; Henderson et al. 1989

Tsuga heterophylla/Gaultheria shallon/Polystichum munitum-Blechnum spicant Forest

Western Hemlock/Salal/Swordfern-Deer Fern Forest



Acronym: TSUHET/GAUSHA/POLMUN-BLESPI

NatureServe Code: CEGL000100

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level: 2

Range: This association occurs on the western Olympic Peninsula and south to the Willapa Hills.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs at low elevations in topographic settings that vary from flats to steep slopes. Soils are deep, well-drained, and relatively moist .

Vegetation Description: The canopy is dominated by *Tsuga heterophylla*. *Thuja plicata* or *Abies amabilis* often occur in small amounts. *Pseudotsuga menziesii* occurs very infrequently. The well-developed shrub layer is dominated by *Gaultheria shallon*. *Vaccinium parvifolium* is always present and sometimes prominent. *Vaccinium alaskaense* and *Menziesia ferruginea* are usually present to prominent. The herb layer is usually well-developed and dominated by *Polystichum munitum*, *Blechnum spicant*, and/or *Oxalis oregana*. The former two species are always present. *Prosartes (=Disporum) smithii* and *Trillium ovatum* are usually present.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished from similar ones by having over 5% cover of either *Polystichum munitum* or *Oxalis oregana*, in combination with over 1% cover of *Blechnum spicant*.

Conservation Rank: S3

Rank Justification: This association occurs only on the Olympic Peninsula and in the Willapa Hills. Many occurrences have been fragmented by timber harvests.

Synonyms:
Tsuga heterophylla/*Gaultheria shallon*/DISM-Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Gaultheria shallon*/*Oxalis oregana* Association; Henderson et al. 1989
Tsuga heterophylla/*Gaultheria shallon*/*Oxalis oregana*-Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Gaultheria shallon*/*Polystichum munitum-Blechnum spicant* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Gaultheria shallon-Disporum smithii* Association; Bigley and Hull 1995
Tsuga heterophylla/*Gaultheria shallon-Oxalis oregana* Association; Bigley and Hull 1995

Tsuga heterophylla/Polystichum munitum-Blechnum spicant Forest

Western Hemlock/Swordfern-Deer Fern Forest



Acronym: TSUHET/POLMUN-BLESPI

NatureServe Code: CEGL000108

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level:

Range: This association occurs on the western Olympic Peninsula and at Mount Rainier.

Plots: 4, MORA (4), NOCA (0), OLYM (0), Other (0)

Environmental Description: The environmental characteristics of this association have not been well described. It has been found at low elevations on moist sites with well-drained, deep soils.

Vegetation Description: The canopy is dominated by *Tsuga heterophylla*. *Pseudotsuga menziesii* is occasionally prominent. The shrub layer ranges from sparse to moderately dense. *Vaccinium alaskaense*, *V. parvifolium*, *Gaultheria shallon*, *Rubus spectabilis* and *Menziesia ferruginea* all occur in most stands. Only the *Vaccinium* spp. are sometimes prominent. The well-developed herb layer is co-dominated by *Polystichum munitum* and *Blechnum spicant*.

USFWS Wetland System: Not applicable.

Comments: All current plots are at Mount Rainier (including three legacy plots) and are at mid-elevations on moderately steep slopes near "slide" areas. In addition to those species described above, these plots have abundant *Mahonia (=Berberis) nervosa*. These plots currently represent an expansion of this association's concept; it may be more appropriate to assign these plots to a new, undescribed type.

Conservation Rank: S2S3

Rank Justification: This association was previously known only along the Olympic Peninsula and Willapa Hills and is now recognized in the southern Cascades. Occurrences have been fragmented by timber harvests.

Synonyms:
Picea sitchensis/*Blechnum spicant*/*Polystichum munitum*-Olympics; Bigley and Hull 1995
Picea sitchensis/*Blechnum spicant-Polystichum munitum* Association; Bigley and Hull 1995
Tsuga heterophylla/*Blechnum spicant-Montia siberica* Association; Bigley and Hull 1995
Tsuga heterophylla/*Menziesia ferruginea-Blechnum spicant* Association; Bigley and Hull 1995
Tsuga heterophylla/*Polystichum munitum* Association; Bigley and Hull 1995
Tsuga heterophylla/*Polystichum munitum-Blechnum spicant* Forest; Chappell 2005 NPK

Tsuga heterophylla/Polystichum munitum-Oxalis oregana Forest

Western Hemlock/Swordfern-Oregon Oxalis Forest



Acronym: TSUHET/POLMUN-OXAORE

NatureServe Code: PNWCOAST_227

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level:

Range: This association occurs on the western Olympic Peninsula.

Plots: 13, MORA (0), NOCA (0), OLYM (13), Other (0)

Environmental Description: This association occurs at low elevations on valley bottoms, lower slopes and, less commonly, mid slopes. Soils are on deep, well-drained, moist.

Vegetation Description: The canopy is usually dominated by *Tsuga heterophylla*. *Pseudotsuga menziesii* is occasionally present to co-dominant. The shrub layer is typically sparse to moderately dense. *Vaccinium alaskaense, V. parvifolium*, and *Rubus spectabilis* are usually present. The latter is sometimes prominent. *Acer circinatum* is occasionally prominent to co-dominant. The well-developed herb layer is co-dominated by *Polystichum munitum* and *Oxalis oregana* (or occasionally just by the latter). *Blechnum spicant* is almost always present and occasionally prominent. *Tiarella trifoliata* is often present.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished from similar ones by the absence of *Pseudotsuga menziesii;* or the presence of *Pseudotsuga menziesii* and *Picea sitchensis* with a combination of presence of *Vaccinium alaskaense* or *Blechnum spicant* and absence of *Mahonia (=Berberis) nervosa*.

Conservation Rank: S3

Rank Justification: This association occurs only on the Olympic Peninsula and the Willapa Hills. Many occurrences have been fragmented by timber harvests.

Synonyms:
Tsuga heterophylla/*Acer circinatum*/*Oxalis oregana*-Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Acer circinatum-Oxalis oregana* Association; Bigley and Hull 1995
Tsuga heterophylla/*Dryopteris austriaca-Oxalis oregana* Association; Bigley and Hull 1995
Tsuga heterophylla/*Oxalis oregana* Association; Henderson et al. 1989
Tsuga heterophylla/*Oxalis oregana*/Draba aureola -Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Oxalis oregana*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Oxalis oregana*-WArip; Chappell 1999
Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Association; Henderson et al. 1989
Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Polystichum munitum-Oxalis oregana*-NWW; Henderson et al. 1989

Tsuga heterophylla/Vaccinium alaskaense/Oxalis oregana Forest

Western Hemlock/Alaska Blueberry/Oregon Oxalis Forest



Acronym: TSUHET/VACALA/OXAORE

NatureServe Code: PNWCOAST_232

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level:

Range: This association occurs on the western and south-central Olympic Peninsula, but probably not on the outer coastal strip.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: Sites are at low elevations on gentle slopes to flats, on lower to toe slopes and benches. Soils are mostly deep and well-drained.

Vegetation Description: The canopy and tree regeneration are dominated by *Tsuga heterophylla*. The well-developed shrub layer is dominated by *Vaccinium alaskaense*. *Vaccinium parvifolium*, *Rubus spectabilis*, *Gaultheria shallon*, and *Menziesia ferruginea* are usually present. The usually well-developed herb layer is dominated by *Oxalis oregana*. *Blechnum spicant* is always present to occasionally prominent. *Polystichum munitum*, *Tiarella trifoliata*, and *Rubus pedatus* are usually present in small amounts.

USFWS Wetland System: Not applicable.

Comments: Very infrequent fire s the major factor in distingushing this association and *Tsuga heterophylla-Pseudotsuga menziesii*/*Vaccinium alaskaense*/*Oxalis oregana* Forest (PNWCOAST_258). The one plot with abundant *Gaultheria shallon* is transitional to *Tsuga heterophylla/Gaultheria shallon/Polystichum munitum-Blechnum spicant* association (CEGL000100).

Conservation Rank: S3

Rank Justification: This association occurs only on the Olympic Peninsula. Although somewhat common in the Olympic Mountains, many occurrences have been fragmented by timber harvests.

Synonyms:
Tsuga heterophylla/*Vaccinium alaskaense*/*Oxalis oregana* Association; Henderson et al. 1989
Tsuga heterophylla/*Vaccinium alaskaense-Oxalis oregana*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Vaccinium alaskaensis*/*Oxalis oregana* Forest; Chappell 2005 NPK

Tsuga heterophylla-Thuja plicata-(Abies amabilis)/Gaultheria shallon/Blechnum spicant Forest

Western Hemlock-Western Redcedar-(Pacific Silver Fir)/Salal/Deer Fern Forest



Acronym: TSUHET-THUPLI-(ABIAMA)/GAUSHA/BLESPI

NatureServe Code: CEGL000221

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest

Alliance: *Tsuga heterophylla-Thuja plicata* Hypermaritime Forest

Classification Confidence Level: 2

Range: This association occurs on the western coastal plain of the Olympic Peninsula and in the eastern Willapa Hills.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs on well-drained upland sites. It tends to occur on gentle or rolling topography.

Vegetation Description: The canopy is dominated by *Thuja plicata* and *Tsuga heterophylla*. *Abies amabilis* is sometimes prominent and can infrequently co-dominate. Tree regeneration is dominated by *Tsuga heterophylla* and/or *Abies amabilis*. *Gaultheria shallon* dominates the well-developed shrub layer. *Vaccinium alaskaense*, *V. parvifolium* and *Menziesia ferruginea* are usually present to prominent or occasionally co-dominant. The herb layer is variable in total cover. *Blechnum spicant* is always present and often prominent or dominant in the herb layer. *Polystichum munitum* is absent or present only in low amounts.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S1S2

Rank Justification: This regionally endemic association is limited to a narrow coastal strip on the western Olympic Peninsula, the Willapa Hills, and Vancouver Island. Logging practices have converted many areas to tree plantations.

Synonyms:
CWH vh 1 /11; Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 1 /01s; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 1 /06s; Banner et al. 1993, BC Ministry of Forests 2003
Thuja plicata-Tsuga heterophylla/*Gaultheria shallon*/*Blechnum spicant* Association; WANHP files
Tsuga heterophylla-Thuja plicata-(*Abies amabilis*)/*Gaultheria shallon*/*Blechnum spicant* Forest; Chappell 2005 NPK

Taxus brevifolia/Paxistima myrsinites Shrubland

Pacific Yew/Oregon boxwood Shrubland



Acronym: TAXBRE/PAXMYR

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Taxus brevifolia* Shrubland

Classification Confidence Level: 3

Range: This association is described from the North Cascades and may occur elsewhere in the Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This associations occurs as a stringer of shrubs on steep talus at 1180m (3872 ft) elevation. The talus is on a 64% slope.

Vegetation Description: *Taxus brevifolia* dominates the dense, tall shrub/short tree layer with *Paxistima (=Pachistima) myrsinites* with little else in the understory.

USFWS Wetland System: Not applicable.

Comments: This provisonal type needs more sampling.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Pseudotsuga menziesii-(Abies grandis)/Acer circinatum/Polystichum munitum Forest

Douglas-fir-Grand Fir/Vine Maple/Swordfern Forest



Acronym: PSEMEN-ABIGRA/ACECIR/POLMUN

NatureServe Code: PNWCOAST_149

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3

Range: This association is known to occur in the Olympic Mountains, in the southern end of the Puget Lowland in Washington, and in northwestern Oregon.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This lowland and montane foothill forest association is known to occur on gentle to moderately steep, generally northerly aspects in Oregon.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* with *Abies grandis* or *Acer macrophyllum* in the canopy; little or no *Tsuga heterophylla* or *Thuja plicata* is present. A generally dense tall shrub layer of *Acer circinatum* with *Corylus cornuta* appears with a diverse understory of shorter shrubs, *Mahonia (=Berberis) nervosa*, *Rosa gymnocarpa*, and herbaceous species. *Polystichum munitum* always occurs and is typically over 5% cover.

USFWS Wetland System: Not applicable.

Comments: This is a newly recognized association as a result of the coastal correlation from northwest Oregon and new in Washington. This is not represented in the current data for national parks in Washington. Further sampling is needed to better characterize this association in Washington.

Conservation Rank: S2R

Rank Justification: This occurs within a limited range in Washington with insufficient information to rank.

Synonyms:
Abies grandis/Acer circinatum/Polystichum munitum-NWO; McCain and Diaz 2002a

Pseudotsuga menziesii-(Thuja plicata-Abies grandis)/Vaccinium membranaceum Forest

Douglas-fir-(Western Redcedar-Grand Fir)/Big Huckleberry Forest



Acronym: PSEMEN-(THUPLI-ABIGRA)/VACMEM

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest

Classification Confidence Level: 3

Range: This association occurs in the Cascade Mountains.

Plots: 6, MORA (3), NOCA (3), OLYM (0), Other (0)

Environmental Description: This association occurs at moderate elevations (less than 915 m (3000 ft)) and moderate slopes (20-50%) with varying aspects. Topographic moisture ranges from moderate to moist.

Vegetation Description: *Pseudotsuga menziesii* dominates the semi-open to closed tree canopy. *Thuja plicata* or *Abies grandis* can be prominent. *Tsuga heterophylla* may be present but never prominent. The shrub layer is typically moderately dense and is dominated by *Vaccinium membranaceum* and *V. parvifolium* and *Paxistima (=Pachistima) myrsinites* may be prominent to present. The ground layer is usually poorly developed with *Chimaphila umbellata*, *Linnaea borealis*, and *Pteridium aquilinum* occasionally prominent.

USFWS Wetland System: Not applicable.

Comments: This association may crosswalk to *Tsuga heterophylla /Pachistima myrsinites/Clintonia uniflora* of Lillybridge et al (1995). The *Thuja plicata*/*Vaccinium membranaceum* association (CEGL000487) in Northern Rockies very similar but without Cascadian species (e.g. *Acer circinatum, Mahonia (=Berberis) nervosa*,*Vaccinium parvifolium*).

Conservation Rank: S2S3

Rank Justification: This preliminary association has a narrow geographical and ecological range.

Synonyms:
Tsuga heterophylla /Pachistima myrsinites/Clintonia uniflora; Lillybridge et al. 1995

Pseudotsuga menziesii/Acer circinatum/Mahonia nervosa Forest

Douglas-fir/Vine Maple/Dwarf Oregongrape Forest



Acronym: PSEMEN/ACECIR/MAHNER

NatureServe Code: PNWCOAST_130

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3

Range: This association occurs primarily in the North Cascades but is found elsewhere in the Cascades.

Plots: 17, MORA (5), NOCA (10), OLYM (0), Other (2)

Environmental Description: This association occurs at low to middle elevations 425-850 m (1400-2800 ft) on moderately steep to steep slopes (20-90%). Litter and mosses typically cover the rocky ground. Evidence of past fire is usually present.

Vegetation Description: The typically closed canopy is dominated by *Pseudotsuga menziesii*. *Tsuga heterophylla* or *Thuja plicata* is usually present but never prominent. *Betula papyrifera* can be prominent in the North Cascades. *Mahonia (=Berberis) nervosa* is typically prominent to dominant in the shrub layer. *Acer circinatum* (over 10%) dominates a well-developed tall shrub layer with C*orylus cornuta*, *Acer glabrum* or *Amelanchier alnifolia* also frequently present. Other occasionally prominent shrubs are *Paxistima (=Pachistima) myrsinites*, *Spiraea betulifolia*, *Rosa gymnocarpa*, and *Mahonia aquilifolium*. The herb layer is usually poorly developed. *Trientalis borealis* ssp. *latifolia*, *Chimaphila umbellata*, *Pteridium aquilinum*, and *Maianthemum (=Smilacina) racemosum* are frequently present but with low cover. *Achlys (californica, triphylla)* is absent to sparse. The ground moss layer can be prominent and is often composed of *Hylocomium splendens, Eurhynchium oreganum,* and *Rhytidiadelphus triquetrus*.

USFWS Wetland System: Not applicable.

Comments: This association is similar to *Pseudotsuga menziesii-Tsuga heterophylla*/*Mahonia nervosa* (PNWCOAST_189) but has little (under 10%) to no *Tsuga heterophylla* and features more dry site species (*Spiraea betulifolia*, *Rosa gymnocarpa*, and *Mahonia aquilifolium).* This type may represent a persistent, early seral stage of that association or the*Tsuga heterophylla*/*Mahonia nervosa* Association (Lillybridge et al. 1995) described from the Wenatchee National Forest. The Coastal correlation project identified a *Pseudotsuga menziesii*/*Mahonia nervosa-Acer circinatum* found primarily in the Oregon Cascades. That too is similar to the association described here, however it contains *Achlys (californica, triphylla)*, *Symphoricarpos hesperius (=mollis)*, *Polystichum munitum*, *Whipplea modestus* and *Vancouveria hexandra* which this one does not.

Conservation Rank: S3S4

Rank Justification: This association occurs within a limited geographic range and may be a persistent seral vegetation type maintained by fire.

Synonyms:

Pseudotsuga menziesii/Achlys triphylla Forest

Douglas-fir/Vanilla Leaf Forest



Acronym: PSEMEN/ACHTRI

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3

Range: This association occurs in the southern Cascades of Washington and in the Olympic Mountains.

Plots: 8, MORA (7), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association occurs at mid-elevations (730-1645 m (2400-5000 ft)) on gentle to steep, southerly slopes. The ground surface can be rocky.

Vegetation Description: *Pseudotsuga menziesii* dominates the canopy with few other prominent tree species. *Acer circinatum* is prominent in most stands, few other shrubs are prominent. *Rosa gymnocarpa*. *Mahonia (=Berberis) nervosa*, *Symphoricarpos hesperius (=mollis)* and *Amelanchier alnifolia* are frequently present with low cover. The herb layer is relatively diverse and always contains *Achlys (californica, triphylla)* that is prominent to abundant. Other frequent and prominent species in the herb layer include *Moehringia (=Arenaria) macrophylla*, *Pteridium aquilinum*, *Viola sempervirens*, *Maianthemum (=Smilacina) stellatum*, and *Rubus ursinus*.

USFWS Wetland System: Not applicable.

Comments: This type is essentially the *Abies amabili-Pseudotsuga menziesii/Achlys (californica, triphylla)* association (CEGL000003) without the true firs in the upper canopy, which in this type are also poorly represented in the lower canopy. *Achlys* has not been identifed in the North Cascades, thus the reason this type is restricted to the southern Cascades and Olympic Mountains.

Conservation Rank: S3S4

Rank Justification: This preliminary association occurs in a limited geographic range and may be a persistent seral vegetation type.

Synonyms:

Pseudotsuga menziesii/Gaultheria shallon-Vaccinium parvifolium Forest

Douglas-fir/Salal-Red Huckleberry Forest



Acronym: PSEMEN/GAUSHA-VACPAR

NatureServe Code: PNWCOAST_124

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the eastern and northeastern Olympic Mountains, slopes of Mount Rainier and possibly in the North Cascades.

Plots: 14, MORA (4), NOCA (0), OLYM (10), Other (0)

Environmental Description: This association occurs at low to middle elevations and occupies dry, often steep sites. It is usually found on southern or western aspects, with shallow or gravelly/stony soils.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii*. *Tsuga heterophylla* or *Thuja plicata* may occur in small amounts in the understory (under 5-10% cover), but *Pseudotsuga* is usually the most abundant regernating tree. The shrub layer is well-developed and dominated by *Gaultheria shallon*. *Mahonia (=Berberis) nervosa* is usually prominent and *Vaccinium parvifolium* is usually present. *Acer circinatum* is prominent in many stands. *Holodiscus discolor* and *Rosa gymnocarpa* are frequent in small amounts. The herb layer is absent or rather poorly developed typically. *Festuca occidentalis* or *Linnaea borealis* are often present in small amounts.

USFWS Wetland System: Not applicable.

Comments: The *Pseudotsuga menziesii*/*Gaultheria shallon-Holodiscus discolor* association (PNWCOAST_121) is similar but has higher cover of *Holodiscus discolor* and lacks *Acer circinatum* and *Vaccinium parvifolium*.

Conservation Rank: S3

Rank Justification: In the lowlands, this association has been variously harvested for timber. More intact, higher quality stands occur in the foothills although their extent is unknown.

Synonyms:
CWH xm 1 /03; Green and Klinka 1994, BC Ministry of Forests 2003
Pseudotsuga menziesii Type; Fonda and Bliss 1969
Pseudotsuga menziesii/*Gaultheria shallon* Association; Henderson et al. 1989
Pseudotsuga menziesii/*Gaultheria shallon*-NWW; Henderson et al. 1989
Pseudotsuga menziesii/*Gaultheria shallon-Vaccinium parvifolium* Forest; Chappell 2005 NPK
Tsuga heterophylla-Pseudotsuga menziesii/*Gaultheria shallon* Community Type; Henderson et al. 1979

Pseudotsuga menziesii/Mahonia nervosa/Achlys triphylla Forest

Douglas-fir/Dwarf Oregongrape/Vanilla Leaf Forest



Acronym: PSEMEN/MAHNER/ACHTRI

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3

Range: This association occurs in the northern and eastern Olympic Mountains and slopes of Mount Rainier.

Plots: 10, MORA (6), NOCA (0), OLYM (4), Other (0)

Environmental Description: This association occurs at low to middle elevations 10-900 m (30-3000 ft) on a wide range of slopes, although typically moderately steep and southerly. Evidence of past fire or other stand disturbance such as windthrow are usually present.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* with *Acer macrophyllum* or *Taxus brevifolia* occasionally prominent. *Tsuga heterophylla* is usually present but never prominent. The shrub layer varies from sparse to dense. *Mahonia (=Berberis) nervosa* is usually present and typically prominent to dominant. Other shrubs, such as, *Rosa gymnocarpa*, *Vaccinium parvifolium*, *Paxistima (=Pachistima) myrsinites* are typically present but with low cover. The remaining understory is usually poorly developed. *Achlys (californica, triphylla)* is present with over 1% cover. *Chimaphila umbellata*, *Pteridium aquilinum*, *Rubus ursinus*, *Trientalis borealis* ssp. *latifolia*, and *Linnaea borealis* are frequently present. *Polystichum munitum* if present is less than 5% cover.

USFWS Wetland System: Not applicable.

Comments: This association is essentially the *Pseudotsuga menziesii-Tsuga heterophylla*/*Achlys triphylla* association (CEGL000090) but with little (under 10%) to no *Tsuga heterophylla,* and is likely to be an early seral stage of the same.

Conservation Rank: S3S4Q

Rank Justification: In the Puget lowlands, this association has been variously harvested for timber. More intact, higher quality stands occur in the foothills although their full extent is unknown.

Synonyms:

Pseudotsuga menziesii-Abies grandis/Mahonia nervosa-Gaultheria shallon/Polystichum munitum Forest

Douglas-fir-Grand Fir/Dwarf Oregongrape-Salal/Swordfern Forest



Acronym: PSEMEN-ABIGRA/MAHNER-GAUSHA/POLMUN

NatureServe Code: PNWCOAST_155

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3

Range: This association is found in the foothills surrounding the Willamette Valley in Oregon and can infrequently occur as far north as the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The plot representing this association in the Olympics was located on a southwest-facing terrace at 300 m (980 ft) elevation on a dry topographic position.

Vegetation Description: This type has a *Pseudotsuga menziesii* and *Abies grandis* canopy with *Tsuga heterophylla* present. Typically, *Abies grandis* and *Acer macrophyllum* dominate below the main canopy. *Acer circinatum* and *Mahonia (=Berberis) nervosa* dominate the shrub layer. *Achlys (californica, triphylla)* and *Polystichum munitum* are prominent indicators in the herb layer. Ground mosses are prominent.

USFWS Wetland System: Not applicable.

Comments: As described in Oregon, this association often has *Gaultheria shallon* and *Corylus cornuta* in the shrub layer.

Conservation Rank: SU

Rank Justification: There is insufficient information to rank this association in Washington.

Synonyms:
Abies grandis/*Mahonia nervosa-Gaultheria shallon*-PNW; McCain and Diaz 2002a

Pseudotsuga menziesii-Tsuga heterophylla/Achlys triphylla Forest

Douglas-fir-Western Hemlock/Vanilla Leaf Forest



Acronym: PSEMEN-TSUHET/ACHTRI

NatureServe Code: CEGL000090

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the northern and eastern Olympic Mountains and in the western Cascades.

Plots: 32, MORA (23), NOCA (0), OLYM (9), Other (0)

Environmental Description: This association occurs at low to middle elevation on middle to toe slopes with well-drained, mesic soils.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* or a mixture of that species and *Tsuga heterophylla*. *Tsuga heterophylla* dominates tree regeneration and always has over 10% total cover. *Thuja plicata* is sometimes prominent. The shrub layer varies in density. *Acer circinatum* is usually at least present and typically dominates when the shrub layer is well-developed. *Mahonia (=Berberis) nervosa* is usually present to prominent. *Vaccinium parvifolium* and *Rosa gymnocarpa* are usually present. The herb layer is relatively rich in species and high in cover. *Achlys (californica, triphylla)* is always at least prominent and can be dominant. *Tiarella trifoliata*, *Maianthemum (=Smilacina) stellatum*, and *Linnaea borealis* are usually present to prominent, with no more than 5% cover of *Tiarella. Viola sempervirens*, *Cornus unalaschkensis (=canadensis)*, *Polystichum munitum* and *Clintonia uniflora* are usually present.

USFWS Wetland System: Not applicable.

Comments: This type is restricted to the southern Cascades and Olympic Mountains and *Achlys* has not been identified in the North Cascades.

Conservation Rank: S4

Rank Justification: This association is widespread in the southern Cascades in Washington and in the Olympic Mountains.

Synonyms:
Pseudotsuga menziesii/*Viola sempervirens* Community Type; Franklin et al. 1988
Pseudotsuga menziesii-Tsuga heterophylla/*Achlys triphylla* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Achlys triphylla* (CA); *Tsuga heterophylla*/*Achlys triphylla*-NWO Cascades-PNW; McCain and Diaz 2002b
Tsuga heterophylla/*Achlys triphylla* Association; Franklin et al. 1988, Henderson et al. 1989, Topik et al. 1986
Tsuga heterophylla/*Achlys triphylla*-Dry-NWO Cascades-PNW; McCain and Diaz 2002b
Tsuga heterophylla/*Achlys triphylla*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Mahonia nervosa*/*Achlys triphylla*-NWO Cascades-PNW; McCain and Diaz 2002b

Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon/Polystichum munitum Forest

Douglas-fir-Western Hemlock/Salal/Swordfern Forest



Acronym: PSEMEN-TSUHET/GAUSHA/POLMUN

NatureServe Code: CEGL000091

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs on the western slopes of the Cascades and on the eastern Olympic Peninsula. It is absent from the outer coastal strip and infrequent to rare on the western side of the Olympic Mountains.

Plots: 10, MORA (2), NOCA (0), OLYM (8), Other (0)

Environmental Description: Sites occupied are low to moderate in elevation and moderately moist (mesic) soils.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* or a mixture with *Tsuga heterophylla*. *Thuja plicata* is often present and sometimes prominent to co-dominant. *Tsuga heterophylla* typically dominates tree regeneration and always has over 10% total cover. The moderate to dense shrub layer is dominated by *Gaultheria shallon*. *Acer circinatum*, *Vaccinium parvifolium*, and *Mahonia (=Berberis) nervosa* are usually present and often prominent to co-dominant. The variably dense herb layer is dominated by *Polystichum munitum*, which always occupies over 3% cover. *Blechnum spicant* is usually absent. Dense second-growth forest stands may have sparse understories with *Gaultheria shallon* and *Polystichum munitum* as the most abundant species.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This association is widespread in the lowlands, Cascades and in the Olympics in western Washington.

Synonyms:
CWH dm /04; Green and Klinka 1994, BC Ministry of Forests 2003
Pseudotsuga menziesii-Thuja plicata/*Gaultheria shallon*/*Polystichum munitum* Association; Chappell 1997
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon*/*Polystichum munitum*; Chappell 2006 Puget
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon*/*Polystichum munitum* Association; Chappell 1997, Chappell 2001, Chappell 2005 NPK
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon*/*Polystichum munitum*-WA; Chappell 2004
Thuja plicata/*Pinus contorta*/*Polystichum munitum*-PNW; Atzet et al. 1996
Tsuga heterophylla/*Acer circinatum-Gaultheria shallon*/*Polystichum munitum*-PNW; McCain and Diaz 2002a, b
Tsuga heterophylla/*Acer circinatum-Gaultheria shallon*/*Polystichum munitum*-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/*Acer circinatum-Gaultheria shallon*-SWO-PNW; Atzet et al. 1996
Tsuga heterophylla/*Berberis nervosa-Gaultheria shallon*-Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Berberis nervosa-Gaultheria shallon*-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/*Berberis nervosa-Polystichum munitum* Association; Bigley and Hull 1992
Tsuga heterophylla/*Gaultheria shallon*/*Polystichum munitum* Association; Henderson et al. 1989
Tsuga heterophylla/*Gaultheria shallon*/*Polystichum munitum*-SWO-PNW; Atzet et al. 1996
Tsuga heterophylla/*Gaultheria shallon-Berberis nervosa*-SWO-PNW; Atzet et al. 1996
Tsuga heterophylla/*Gaultheria shallon*-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Gaultheria shallon*-SWOC; Atzet and Wheeler 1984
Tsuga heterophylla/*Mahonia nervosa-Gaultheria shallon*-NWO Cascades-PNW; McCain and Diaz 2002b, Halverson et al. 1986, Hemstrom et al. 1987
Tsuga heterophylla/*Mahonia nervosa-Gaultheria shallon*-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Polystichum munitum* Association; Bigley and Hull 1992
Tsuga heterophylla/*Polystichum munitum-Gaultheria shallon* Association; Henderson et al. 1992
Tsuga heterophylla/*Polystichum munitum-Gaultheria shallon*-NWW; Henderson et al. 1992, Henderson et al. 1989

Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon-Vaccinium parvifolium Forest

Douglas-fir-Western Hemlock/Salal-Red Huckleberry Forest



Acronym: PSEMEN-TSUHET/GAUSHA-VACPAR

NatureServe Code: PNWCOAST_186

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs on the western slopes of the Cascades and on the Olympic Peninsula. It is absent from the outer coastal strip and infrequent to rare on the western side of the Olympic mountains.

Plots: 28, MORA (8), NOCA (2), OLYM (18), Other (0)

Environmental Description: This association occupies relatively low to middle elevations and well-drained soils. These are moderately dry sites.

Vegetation Description: The canopy is usually co-dominated by *Pseudotsuga menziesii* and *Tsuga heterophylla*, though in any one stand one or the other could be dominant. Occasionally *Pseudotsuga* is entirely absent. *Thuja plicata* is usually prominent to occasionally co-dominant. The well-developed shrub layer is dominated by *Gaultheria shallon*. Typically, no other shrubs are prominent, though *Acer circinatum* occasionally can be. *Vaccinium parvifolium* and *Mahonia (=Berberis) nervosa* are usually present in small amounts. The herb layer is absent to rather sparse with *Linnaea borealis* the most frequent species. *Blechnum spicant* is usually absent, or if present, only in small amounts.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Pseudotsuga menziesii-Tsuga heterophylla*/*Gaultheria shallon-Mahonia nervosa* association. The former is strongly dominated by *Gaultheria shallon* with no or only low cover of *Mahonia nervosa* and generally less diverse, sparse understory

Conservation Rank: S4

Rank Justification: In western Washington, this association is widespread in the lowlands and Cascade and Olympic Mountains. Low elevation sites which occur outside the national parks are more likely logged to some degree or near residential development.

Synonyms:
CWH dm /01; Green and Klinka 1994, BC Ministry of Forests 2003
CWH dm /03; Green and Klinka 1994, BC Ministry of Forests 2003
CWH ds 1 /03; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 2 /03; Green and Klinka 1994, BC Ministry of Forests 2003
Pseudotsuga menziesii/*Gaultheria shallon*/*Eurhynchium oreganum* Community Type; del Moral and Long 1977
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Vaccinium parvifolium* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Gaultheria shallon* Association; Henderson et al. 1989, Henderson et al. 1992; Topik et al. 1986
Tsuga heterophylla/*Gaultheria shallon*-GP-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Tsuga heterophylla/*Gaultheria shallon*-NWO Cascades-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Tsuga heterophylla/*Gaultheria shallon*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga heterophylla/*Gaultheria shallon-Vaccinium membranaceum* Association; Henderson et al. 1992
Tsuga heterophylla/*Gaultheria shallon-Vaccinium membranaceum*-NWW; Henderson et al. 1992
Tsuga heterophylla-Pseudotsuga menziesii/*Acer circinatum-Gaultheria shallon* Community Type; Henderson et al. 1979
Tsuga heterophylla-Pseudotsuga menziesii/*Gaultheria shallon* Community Type; Henderson et al. 1979

Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa Forest

Douglas-fir-Western Hemlock/Dwarf Oregongrape Forest



Acronym: PSEMEN-TSUHET/MAHNER

NatureServe Code: PNWCOAST_189

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the northern and eastern Olympics and in the Cascade Mountains.

Plots: 27, MORA (11), NOCA (6), OLYM (3), Other (7)

Environmental Description: This association occurs at low to middle elevations. Sites have well-drained, often shallow, soils and are located on steep mid to upper slopes and ridgetops. This association occurs on dry topographic positions.

Vegetation Description: The typically closed canopy is dominated by *Pseudotsuga menziesii* or co-dominated by that species and *Tsuga heterophylla*. *Tsuga heterophylla* typically dominates tree regeneration and always occupies over10% total cover. This type includes stands with earlier- seral trees, such as *Pinus contorta*. The shrub layer varies from sparse to dense. *Mahonia (=Berberis) nervosa* is always present and typically prominent to dominant. *Acer circinatum* is often present to dominant in a well-developed tall shrub layer. *Vaccinium parvifolium* or *Paxistima (=Pachistima) myrsinites* are usually present. The herb layer is usually poorly developed with shade- tolerant species such as *Chimaphila umbellata* and *Goodyera oblongifolia* usually present. *Polystichum munitum* and *Linnaea borealis* are frequently present, the former always with under 3% cover.

USFWS Wetland System: Not applicable.

Comments: Several North Cascades plots may represent a different colder, drier association. These plots have *Paxistima myrsinites* prominent in the understory, which is unusual for this association and suggests a strong similarity to the *Tsuga heterophylla/Mahonia nervosa* association as described on the Wenatchee National Forest (Lillybridge et al. 1995). The latter association has more *Abies grandis* and *Vaccinium membranaceum* and less *Acer circinatum* than the North Cascades plots described above.

Conservation Rank: S4

Rank Justification: In western Washington, this association is widespread in the lowlands and Cascade and Olympic Mountains. Low elevation sites which occur outside the national parks are more likely logged to some degree or near residential development.

Synonyms:
Pseudotsuga menziesii-Tsuga heterophylla/Berberis nervosa Association; Chappell 1997
Pseudotsuga menziesii-Tsuga heterophylla/Berberis nervosa Community Type; Dyrness & Franklin 1975
Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa; Chappell 2006 Puget
Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa Forest; Chappell 2005 NPK
Pseudotsuga menziesii-Tsuga heterophylla/Pinus contorta-WA; Chappell 2004
Tsuga heterophylla/Acer circinatum-Berberis nervosa Association; Henderson et al. 1992
Tsuga heterophylla/Acer circinatum-Berberis nervosa-NWW; Henderson et al. 1992
Tsuga heterophylla/Berberis nervosa Association; Henderson et al. 1989, Henderson et al. 1992, Topik et al. 1986
Tsuga heterophylla/Berberis nervosa/Achlys triphylla-PNW; McCain and Diaz 2002b
Tsuga heterophylla/Berberis nervosa-Chimaphila menziesii Association; Henderson et al. 1992
Tsuga heterophylla/Berberis nervosa-Dep-NWW; Henderson et al. 1989
Tsuga heterophylla/Berberis nervosa-Gaultheria shallon-PNW; McCain and Diaz 2002b, Halverson et al. 1986, Hemstrom et al. 1987
Tsuga heterophylla/Berberis nervosa-NWW; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/Berberis nervosa-PNW; Topik et al. 1986
Tsuga heterophylla/Depauperate Association; Henderson et al. 1989
Tsuga heterophylla/Mahonia nervosa-Dry-NWO Cascades-PNW; McCain and Diaz 2002b
Tsuga heterophylla/Mahonia nervosa-NWO Cascades-PNW; McCain and Diaz 2002b, Halverson et al. 1986, Hemstrom et al. 1987

Pseudotsuga menziesii-Tsuga heterophylla/Paxistima myrsinites/Linnaea borealis Forest

Douglas-fir-Western Hemlock/Oregon boxwood/Twinflower Forest



Acronym: PSEMEN-TSUHET/PAXMYR/LINBOR

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3

Range: This association occurs in the North Cascades.

Plots: 6, MORA (0), NOCA (2), OLYM (0), Other (4)

Environmental Description: This association occurs at mid elevations (700-1220 m (2300- 4000 ft)) on moderately steep to steep slopes with dry and rocky soils

Vegetation Description: This association contains stands with a canopy of *Pseudotsuga menziesii* with *Tsuga heterophylla* and/or *Thuja plicata* prominent to co-dominant. *Pinus monticola* can be prominent. A sparse shrub layer typically has *Paxistima (=Pachistima) myrsinites* as prominent to dominant. *Vaccinium membranaceum* and *Mahonia (=Berberis) nervosa* are often present but less than 5% cover. The herb layer is also usually sparse with *Linnaea borealis*, *Chimaphila umbellata*, *Goodyera oblongifolia*, and *Pyrola asarifolia* present but with low cover. Moss ground cover is common often with *Rhytidiopsis robusta* codominant.

USFWS Wetland System: Not applicable.

Comments: This preliminary association is similar to a British Columbia association: *Tsuga heterophylla- Pseudotsuga menziesii-Abies amabilis*/*Paxistima myrsinites* (CEGL002836) but would expand the range of that association 125 miles to the south. The B.C. type lacks *Abies amabilis* and has higher cover of *Vaccinium membranaceum* and less *Linnaea borealis*.

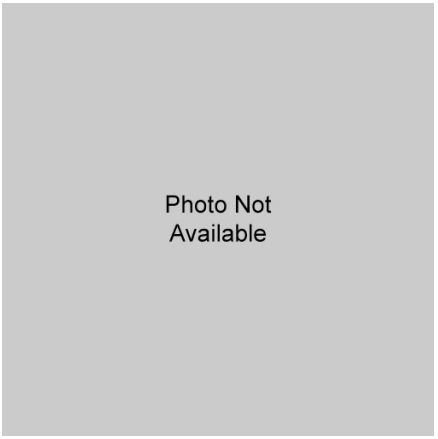
Conservation Rank: S2S3

Rank Justification: This preliminary association occurs in the North Cascades into British Columbia. As described, it has few threats and is protected.

Synonyms:

Pseudotsuga menziesii-Tsuga heterophylla/Rhododendron macrophyllum/Polystichum munitum Forest

Douglas-fir-Western Hemlock/Pacific Rhododendron/Swordfern Forest



Acronym: PSEMEN-TSUHET/RHOMAC/POLMUN

NatureServe Code: PNWCOAST_198

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the eastern Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association occurs at low elevations on low to middle slopes of varying steepness. Sites have well-drained, mesic soils.

Vegetation Description: The canopy is typically co-dominated by *Pseudotsuga menziesii* and *Tsuga heterophylla*. *Thuja plicata* is usually prominent. *Tsuga heterophylla* dominates tree regeneration. The shrub layer is well-developed and dominated or co-dominated by *Rhododendron macrophyllum*. *Gaultheria shallon* and/or *Mahonia (=Berberis) nervosa* usually co-dominate. The well-developed herb layer is dominated by *Polystichum munitum* (always under 3% cover). *Linnaea borealis* and *Viola sempervirens* are usually present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs in the Olympic Mountains. Many low elevation sites outside the park have been logged.

Synonyms:
Pseudotsuga menziesii-Tsuga heterophylla/*Rhododendron macrophyllum*/*Polystichum munitum* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Rhododendron macrophyllum*/*Oxalis oregana*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Tsuga heterophylla/*Rhododendron macrophyllum*/*Polystichum munitum* Association; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum*/*Polystichum munitum*-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Rhododendron macrophyllum*/*Polystichum munitum*-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/*Rhododendron macrophyllum-Berberis nervosa*/*Oxalis oregana*; unpublished SWO data
Tsuga heterophylla/*Rhododendron macrophyllum-Berberis nervosa*-Coast-PNW; McCain and Diaz 2002a
Tsuga heterophylla/*Rhododendron macrophyllum-Berberis nervosa*-SWOC; unpublished SWO data
Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon*-SWOC; Atzet et al. 1996
Tsuga heterophylla/*Rhododendron macrophyllum-Mahonia nervosa*-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Rhododendron macrophyllum-Polystichum munitum*-NWW; Henderson et al. 1989

Tsuga heterophylla-(Pseudotsuga menziesii)/Vaccinium alaskaense/Cornus unalaschkensis Forest

Western Hemlock-(Douglas-fir)/Alaska Blueberry/Bunchberry Forest



Acronym: TSUHET-(PSEMEN)/VACALA/CORUNA

NatureServe Code: PNWCOAST_257

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and southern and western Olympic Mountains.

Plots: 20, MORA (10), NOCA (0), OLYM (10), Other (0)

Environmental Description: This association occurs at low to middle elevations on mid to toe slopes, valley bottoms and benches with well-drained, moist soils.

Vegetation Description: The canopy is dominated by *Tsuga heterophylla* or co-dominated by that species and *Pseudotsuga menziesii*. *Thuja plicata* is often prominent. *Tsuga heterophylla* dominates tree regeneration and *Abies amabilis* is often present in small amounts. The moderate to dense shrub layer is dominated or co-dominated by *Vaccinium alaskaense*. *Vaccinium parvifolium* is usually present and sometimes co-dominant. *Gaultheria shallon* and *Acer circinatum* are frequently present, the latter sometimes prominent. The herb layer is generally poorly developed. *Blechnum spicant*, *Polystichum munitum*, and *Cornus unalaschkensis (=canadensis)* are usually present in small amounts.

USFWS Wetland System: Not applicable.

Comments: The set of plots of this type from National Parks in Washington has more *Tiarella trifoliata* than most citations for this association, indicating somewhat more moist sites. It also suggests a possible transition to the *Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Tiarella trifoliata* association (CEGL000009).

Conservation Rank: S4

Rank Justification: This association occurs in the mountains of western Washington and has been impacted by logging.

Synonyms:
Tsuga heterophylla-(*Pseudotsuga menziesii*)/*Vaccinium alaskaensis*/*Cornus unalaschkensis* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Vaccinium alaskaense* Association; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/*Vaccinium alaskaense*/*Cornus canadensis* Association; Topik et al. 1986
Tsuga heterophylla/*Vaccinium alaskaense*/*Cornus canadensis*-PNW; McCain and Diaz 2002b, Topik et al. 1986, Halverson et al. 1986, Hemstrom et al. 1987
Tsuga heterophylla/*Vaccinium alaskaense*-NWW; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/*Vaccinium ovalifolium* Association; Douglas 1971

Tsuga heterophylla-(Pseudotsuga menziesii)/Vaccinium alaskaense-Mahonia nervosa-(Gaultheria shallon) Forest

Western Hemlock-(Douglas-fir)/Alaska Blueberry-Dwarf Oregongrape-(Salal) Forest



Acronym: TSUHET-(PSEMEN)/VACALA-MAHNER-(GAUSHA)

NatureServe Code: PNWCOAST_260

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and the Olympic Mountains.

Plots: 18, MORA (3), NOCA (4), OLYM (11), Other (0)

Environmental Description: This association occurs at middle elevations on moderate to very steep slopes, most often with south or west aspects. Sites typically have well-drained soils.

Vegetation Description: The canopy is dominated or co-dominated by *Tsuga heterophylla*, with *Pseudotsuga menziesii* usually co-dominant. *Thuja plicata* is usually prominent. *Tsuga heterophylla* usually dominates tree regeneration. The well-developed shrub layer always has *Vaccinium alaskaense* and either *Mahonia (=Berberis) nervosa* or *Gaultheria shallon* prominent to co-dominant. The herb layer is usually poorly developed. *Clintonia uniflora* and *Cornus unalaschkensis (=canadensis)* are frequently present. *Blechnum spicant* has less than 2% cover or is absent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3S4

Rank Justification: This association occurs in the mountains of western Washington and has been impacted by logging.

Synonyms:

Abies amabilis/*Vaccinium alaskaense* Association; Bigley and Hull et al. 1992
Tsuga heterophylla-(*Pseudotsuga menziesii*)/*Vaccinium alaskaense-Mahonia nervosa*-(*Gaultheria shallon*) Forest; Chappell 2005 NPK
Tsuga heterophylla/*Vaccinium alaskaense-Berberis nervosa* Association; Henderson et al. 1992
Tsuga heterophylla/*Vaccinium alaskaense-Berberis nervosa*-NWW; Henderson et al. 1992
Tsuga heterophylla/*Vaccinium alaskaense-Gaultheria shallon* Association; Bigley and Hull 1992, Topik et al. 1986
Tsuga heterophylla/*Vaccinium alaskaense-Gaultheria shallon*-PNW; Topik et al. 1986

Tsuga heterophylla-Pseudotsuga menziesii/Mahonia nervosa-Chimaphila menziesii Forest

Western Hemlock-Douglas-fir/Dwarf Oregongrape-Pipsissewa Forest



Acronym: TSUHET-PSEMEN/MAHNER-CHIMEN

NatureServe Code: CEGL000492

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the western Cascades and in the eastern to northern Olympics.

Plots: 24, MORA (10), NOCA (6), OLYM (5), Other (3)

Environmental Description: This association occurs mostly at middle elevations on mid to upper slopes. Sites occupied have well-drained, often shallow soils. These are relatively dry, cool sites compared to average *Tsuga heterophylla* sites.

Vegetation Description: The canopy is dominated by *Tsuga heterophylla* or co-dominated by that species and *Pseudotsuga menziesii*. The latter and *Thuja plicata* are almost always present. *Thuja plicata* is often prominent to occasionally co-dominant. *Abies amabilis* is frequent in small amounts. The understory is always relatively sparse. *Mahonia (=Berberis) nervosa* is always present in small amounts. *Chimaphila menziesii*, *Chimaphila umbellata,* or *Corallorhiza* spp. are present and diagnostic. *Vaccinium parvifolium* and *V. alaskaense* are also usually present.

USFWS Wetland System: Not applicable.

Comments: This association is easily confused with the preliminary *Pseudotsuga menziesii -Tsuga heterophylla* /Dep. Association. It is distinguished from that association by the presence of *Mahonia nervosa,* and at least one of the *Chimaphila* spp. or *Corallorhiza* spp. and the absence of moist-site indicators.

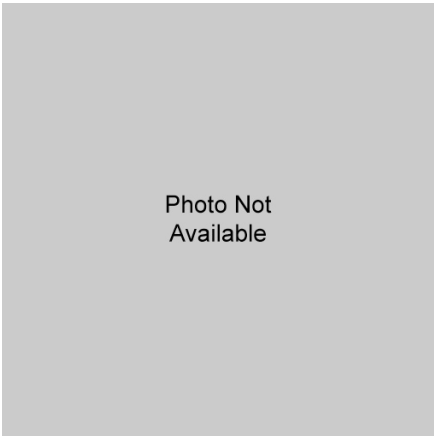
Conservation Rank: S3

Rank Justification: This association occurs within a narrow environmental range in the mountains of western Washington.

Synonyms:
Tsuga heterophylla/*Berberis nervosa*-CHME-NWW; Henderson et al. 1992
Tsuga heterophylla-Pseudotsuga menziesii/*Mahonia nervosa-Chimaphila menziesii* Forest; Chappell 2005 NPK

Tsuga heterophylla-Pseudotsuga menziesii/Vaccinium alaskaense/Oxalis oregana Forest

Western Hemlock-Douglas-fir/Alaska Blueberry/Oregon Oxalis Forest



Acronym: TSUHET-PSEMEN/VACALA/OXAORE

NatureServe Code: PNWCOAST_258

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the southwestern Olympic Mountains and possibly in the Carbon River valley at Mount Rainier.

Plots: 7, MORA (0), NOCA (0), OLYM (7), Other (0)

Environmental Description: This association occurs at low elevations usually on gentle slopes.

Vegetation Description: The canopy is co-dominated by *Pseudotsuga menziesii* and *Tsuga heterophylla*, with the latter dominating tree regeneration. The well-developed shrub layer is dominated or co-dominated by *Vaccinium alaskaense*. *Acer circinatum* and *Vaccinium parvifolium* are usually present to co-dominant. The well-developed herb layer is dominated by *Oxalis oregana*. *Polystichum munitum* is usually present to prominent. *Cornus unalaschkensis (=canadensis)* is usually present.

USFWS Wetland System: Not applicable.

Comments: Fires are more frequent and the major factor distinguishing this association from the *Tsuga heterophylla*/*Vaccinium alaskaense*/*Oxalis oregana* Forest association (PNWCOAST_232). This type is distinguished from other associations with *Oxalis* by the prominence of both *Pseudotsuga menziesii* and *Vaccinium alaskaense*. The plots from the Olympics have a different set of associated species (e.g. less *Acer circinatum* and more *Blechnum spicant* and *Rubus pedatus*) than those from Oregon and the southern Washington Cascades. The plots described here appear to be transitional to *Tsuga heterophylla/Vaccinium alaksaensis/Oxalis oregana* and are less distinct from that association than the ones from farther south.

Conservation Rank: S3

Rank Justification: This association occurs within a narrow geographic range and has been impacted by timber harvesting outside the parks.

Synonyms:
Tsuga heterophylla/*Vaccinium alaskaense*/*Oxalis oregana* Association; Topik et al. 1986, Bigley and Hull 1992
Tsuga heterophylla/*Vaccinium alaskaense*/*Oxalis oregana*-NWO Coast-PNW; McCain and Diaz 2002a
Tsuga heterophylla/*Vaccinium alaskaense*/*Oxalis oregana*-PNW; Topik et al. 1986
Tsuga heterophylla-Pseudotsuga menziesii/*Vaccinium alaskaensis*/*Oxalis oregana* Forest; Chappell 2005 NPK

Tsuga heterophylla-Thuja plicata/Taxus brevifolia Forest

Western Hemlock-Western Redcedar/Pacific Yew Forest

Acronym: TSUHET-THUPLI/TAXBRE

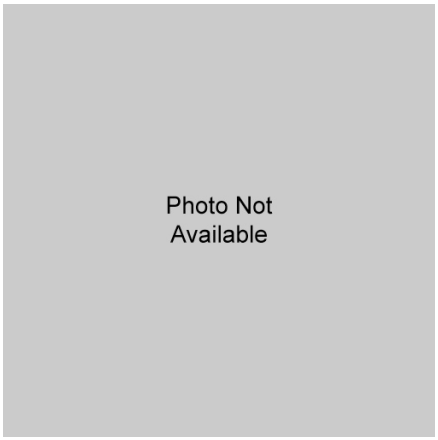
NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis)* Forest Alliance

Classification Confidence Level: 3



Range: This association is defined from one plot in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The plot representing this type occurs on a very steep valley wall with some small rocky outcrops and an abundance of down woody debris. It is located on a dry topographic position.

Vegetation Description: The dense canopy is co-dominated by *Tsuga heterophylla* and *Thuja plicata*. The lower canopy has a dense layer of *Taxus brevifolia* and *Tsuga heterophylla*. *Vaccinium parvifolium* dominates the shrub layer although *Acer circinatum*, *Oplopanax horridus*, *Vaccinium scoparium* and *Vaccinium ovalifolium* are present. The herb layer is comprised of a variety of moist-site species including *Adiantum pedatum*, *Blechnum spicant*, *Clintonia uniflora*, *Cornus unalaschkensis (=canadensis)*, and *Trientalis borealis* ssp. *latifolia*, none of which have cover over 3%.

USFWS Wetland System: Not applicable.

Comments: This provisional type is represented by a single plot.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank or verify this provisional association.

Synonyms:

Betula papyrifera-(Thuja plicata)/Acer circinatum/Mahonia nervosa Forest

Paper Birch-(Western Redcedar)/Vine Maple/Dwarf Oregongrape Forest



Acronym: BETPAP-(THUPLI)/ACECIR/MAHNER

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 2

Range: This association is described from data from the North Cascades.

Plots: 6, MORA (0), NOCA (6), OLYM (0), Other (0)

Environmental Description: This low to mid-elevation association occurs on east- to north-facing, 20-40% slopes. It occupies mesic to dry topographic positions, sometimes described as debris aprons, near rock slides, and rocky outcroppings. Stands typically display evidence of past disturbance by blow down events (downed trees and broken trees) or fire (charcoal and fire scars).

Vegetation Description: The tree canopy is dominated by *Betula papyrifera* with conifers, *Pseudotsuga menziesii* or *Thuja plicata,* or occasionally the broadleaf tree *Acer macrophyllum* as prominent to co-dominant. The canopy is often very dense. *Acer circinatum* and *Mahonia (=Berberis) nervosa* dominate the tall and dwarf shrub layers. Several other shrub species are common (e.g. *Acer glabrum*, *Paxistima (=Pachistima) myrsinites*, *Prunus emarginata*, *Rosa gymnocarpa* and *Rubus parvifolius*). The herb layer is sparse but diverse with most species rarely exceeding 5% cover. Understory cover and diversity increases in canopy gaps, with species such as *Cornus unalaschkensis (=canadensis)*, *Trientalis borealis* ssp. *latifolia*, *Spiraea betulifolia*, and *Linnaea borealis* present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S3

Rank Justification: The preliminary association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:

Pinus contorta var. contorta-Pseudotsuga menziesii/Gaultheria shallon Forest

Lodgepole Pine-Douglas-fir/Salal Forest



Acronym: PINCON-PSEMEN/GAUSHA

NatureServe Code: CEGL000150

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the Puget Lowlands, and the Olympic and North Cascade Mountains.

Plots: 10, MORA (0), NOCA (2), OLYM (8), Other (0)

Environmental Description: This association occurs in a wide range of environments. Most locations are less than 850 m (2800 ft) elevation. Sites vary from flat terrain to steep slopes on variable aspects. These sites are dry to moderately dry and appear to have relatively nutrient-poor soil. This type occurs on gravelly, sandy loam outwash deposits, glacial till, and sedimentary residuum. Soil depth can be quite shallow.

Vegetation Description: *Pinus contorta* usually dominates the tree layer with *Pseudotsuga menziesii* typically prominent to co-dominant. *Pinus monticola* is often present and can be prominent in the canopy. *Tsuga heterophylla* is usually present but with low abundance. The understory is a dense layer of *Gaultheria shallon* often with scattered *Vaccinium parvifolium*. *Vaccinium ovatum* is a common member of Puget Lowland representatives of this association. *Pteridium aquilinum*, *Mahonia (=Berberis) nervosa*, *Gaultheria ovatifolia* and *Pyrola picta* are frequent species in the typically depauperate ground cover. The lichen *Cladonia bellidiflora* occurrs in most plots.

USFWS Wetland System: Not applicable.

Comments: This is a persistent or long-lived, fire-maintained seral stage of either the *Pseudotsuga menziesii-Tsuga heterophylla*/*Gaultheria shallon* association (CEGL000084) or *Pseudotsuga menziesii/Gaultheria shallon-Vaccinium parvifolium* association (PNWCOAST_124). The distinction between varieties *contorta* and *latifolia* in the lowlands west to the Cascades is rarely determined in field data. We assume that all *Pinus contorta* at low elevation (under 1970ft, 600 m) west of the Cascades is variety *contorta*.

Conservation Rank: S3

Rank Justification: This community has a somewhat restricted natural range in portions of the Puget Lowland and Georgia Depression of Washington and British Columbia. This is a mid-seral forest community that naturally depended upon a relatively specific fire regime or a fire mosaic landscape for its regeneration. Its area has been reduced by industrial forestry practices that emphasize monocultures of Douglas-fir. There are very few if any viable occurrences remaining, at least in Washington. Fire suppression is a long-term threat that may result in the future extinction of this community type. Management of the community with fire is currently unfeasible because of landscape conditions and societal constraints associated with high-intensity fire.

Synonyms:
Pinus contorta var. *contorta-Pseudotsuga menziesii*/*Gaultheria shallon*; Chappell 2006 Puget
Pinus contorta-Pseudotsuga menziesii/*Gaultheria shallon* Community; WANHP files
Pinus contorta-Pseudotsuga menziesii/*Gaultheria shallon*-WA; Chappell 2004

Pseudotsuga menziesii-(Pinus contorta)/Arctostaphylos uva-ursi/Racomitrium canescens Woodland

Douglas-fir-(Lodgepole Pine)/Kinnikinnick/Racomitrium Moss Woodland



Acronym: PSEMEN-(PINCON)/ARCUVA/RACCAN

NatureServe Code: CEGL000134

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the northern and eastern Olympic Mountains, slopes of Mount Rainier, and western North Cascades.

Plots: 14, MORA (2), NOCA (4), OLYM (8), Other (0)

Environmental Description: This association occurs primarily at middle elevations, though it can also occur at low elevations. It occurs on excessively drained or very shallow soils located on lahars, lava flows, steep rocky slopes and ridgetops.

Vegetation Description: This closed to typically open forest canopy association is dominated by *Pinus contorta* and/or *Pseudotsuga menziesii*. The latter is always present. Many other tree species can be present, though usually subordinate in importance. *Taxus brevifolia* can be abundant. A shrub layer is typically absent or rather sparse, but occasionally can have significant patches of *Gaultheria shallon*. *Holodiscus discolor*, *Symphoricarpos hesperius (=mollis)*, *Rosa gymnocarpa*, and *Paxistima (=Pachistima) myrsinites* occur frequently but usually only in small amounts.The dwarf-shrub *Arctostaphylos uva-ursi* can form a dense, patchy understory layer. Many other species may occur, especially *Lomatium martindalei*, *Hieracium albiflorum*, *Festuca occidentalis*, and *Chimaphila umbellata*. *Racomitrium canescens* characterizes a well-developed, diverse moss layer.

USFWS Wetland System: Not applicable.

Comments: Two similar plots on Mount Rainier lahars lack *Racomitrium canescens* and *Arctostaphylos uva-ursi* but have *A. nevadensis* and well-developed moss layers dominated by *Pleurozium schreberi* in one plot and *Hylocomium splendens* in the other. Further sampling may clarify if these plots represent variation of the association described here or unique vegetation units. Plots are represented the synthesis tables as PSEMEN/ARCNEV Dep and PSEMEN/HYLSPE.

Conservation Rank: S3

Rank Justification: This association occurs within a narrow geographic and ecological range.

Synonyms:
Pinus contorta/*Arctostaphylos uva-ursi*; Franklin 1966
Pinus contorta/*Arctostaphylos uva-ursi* Community; Franklin 1966
Pinus contorta/*Holodiscus discolor* Association; Bigley and Hull 1992
Pseudotsuga menziesii-(*Pinus contorta*)/*Arctostaphylos uva-ursi*/*Racomitrium canescens* Woodland; Chappell 2005 NPK
Pseudotsuga menziesii/*Arctostaphylos uva-ursi* Association; Franklin et al. 1988, Henderson et al. 1989
Pseudotsuga menziesii/*Arctostaphylos uva-ursi*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Arctostaphylos uva-ursi* Association; Henderson and Peter 1983 draft
Tsuga heterophylla-Pseudotsuga menziesii/*Arctostaphylos uva-ursi* Community Type; Henderson et al. 1979

Pseudotsuga menziesii/Gaultheria shallon-Mahonia nervosa/Polystichum munitum Forest

Douglas-fir/Salal-Dwarf Oregongrape/Swordfern Forest



Acronym: PSEMEN/GAUSHA-MAHNER/POLMUN

NatureServe Code: PNWCOAST_122

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 3

Range: This association occurs through much of lowland western Washington.

Plots: 5, MORA (1), NOCA (0), OLYM (4), Other (0)

Environmental Description: These low elevation sites are moderately dry to mesic and appear to be relatively nutrient-rich. Sites are flat to fairly steep, with aspects more often southerly to westerly. The plots represent a variety of slope positions, including plateaus/plains. Parent materials are variable, including glacial till, glacial outwash, and various bedrock (including ultramafics). Soil textures are loam to loamy sand, usually with abundant coarse fragments.

Vegetation Description: Canopy is dominated by *Pseudotsuga menziesii* or occasionally co-dominated by *Acer macrophyllum*, with little to no *Tsuga heterophylla, Thuja plicata* or *Abies grandis* present. *Gaultheria shallon* or *Mahonia (=Berberis) nervosa* dominates or co-dominates the understory and *Polystichum munitum* is always prominent to dominant in the herb layer. *Holodiscus discolor*, *Acer circinatum*, and/or *Corylus cornuta* can form a prominent to co-dominant tall shrub layer. *Rubus ursinus* (an increaser with disturbance), and *Symphoricarpos albus* or *Rosa gymnocarpa* are often prominent in the shrub or dwarf-shrub layers. *Achlys (californica, triphylla), Galium triflorum*, *Trientalis borealis* ssp. *latifolia*, and *Festuca subulata* are frequently occurring herbs.

USFWS Wetland System: Not applicable.

Comments: This association is primarily a persistent, early seral stage of *Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon/Polystichum munitum* (CEGL000091) and *Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa-Polystichum munitum* associations (PNWCOAST_191).

Conservation Rank: S4S5

Rank Justification: In the lowlands, this association appears in the landscape now as young stands regenerating from previous harvest of *Pseudotsuga menziesii-Tsuga heterophylla* stands and many have been fragmented by development. More intact, higher quality stands occur in the foothills although their extent is unknown.

Synonyms:
Pseudotsuga menziesii/*Gaultheria shallon*/*Polystichum munitum*; Chappell 2006 Puget
Pseudotsuga menziesii/*Gaultheria shallon*/*Polystichum munitum* Forest; Chappell 2001
Pseudotsuga menziesii/*Gaultheria shallon*/*Polystichum munitum*-WA; Chappell 2004
Tsuga heterophylla/*Acer circinatum-Gaultheria shallon*/*Polystichum munitum*-NWO Coast; McCain and Diaz 2002b
Tsuga heterophylla/Acer circinatum-Gaultheria shallon-PNW;

Pseudotsuga menziesii-Tsuga heterophylla/Depauperate undergrowth Forest

Douglas-fir-(Western Hemlock)/Depauperate



Acronym: PSEMEN-(TSUHET)/Dep.

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in lowlands throughout western Washington.

Plots: 24, MORA (13), NOCA (3), OLYM (7), Other (1)

Environmental Description: This association can be found across a wide range of environments. Sites range between 300 and 1310 m (4300 ft) elevation, flat to 65% slopes on all aspects. Most stands represent a stagnation phase of stand development following fire, while others are associated with debris flow surfaces.

Vegetation Description: This association is characterized by dense canopy of *Tsuga heterophylla* and/or *Thuja plicata* often co-dominated to dominated by *Pseudotsuga menziesii*. Other canopy trees include *Abies procera* and *Populus balsamifera* ssp. *trichocarpa*. The primary feature of this association is little to no vascular plant understory.

USFWS Wetland System: Not applicable.

Comments: These communities are distingushed by a lack vascular plant diversity, understory development and indicator vascular species. However, they are prevalent in all three parks and occupy a large acreage within areas dominated by the North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Conservation Rank: S3S4

Rank Justification: This association is relatively widespread in the mountains of western Washington.

Synonyms:
Tsuga heterophylla/Depauperate Association; Henderson et al. 1989

Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon/Xerophyllum tenax Forest

Douglas-fir-Western Hemlock/Salal/Beargrass Forest



Acronym: PSEMEN-TSUHET/GAUSHA/XERTEN

NatureServe Code: PNWCOAST_183

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs on the southeastern Olympic Peninsula, slopes of Mount Rainier and southern Cascades in Washington.

Plots: 9, MORA (9), NOCA (0), OLYM (0), Other (0)

Environmental Description: Sites occupied are mid to upper slopes with shallow soils and mostly south to west aspects, or relatively flat with very coarse textured glacial soils (latter only on Olympic Peninsula). Sites are located at low to especially middle elevations.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* and/or *Tsuga heterophylla*. Both of these species are always present. *Thuja plicata* is occasionally present to prominent. The well-developed shrub layer is always dominated by *Gaultheria shallon*. *Mahonia (=Berberis) nervosa* is usually present and often prominent. *Acer circinatum* often forms a prominent taller shrub layer often with *Vaccinium parvifolium*. The herb layer is dominated by *Xerophyllum tenax*, which always occupies over 5% cover. *Linnaea borealis* is frequent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3S4

Rank Justification: This association is narrowly distributed in the more southern Cascades in Washington and in the Olympics.

Synonyms:
Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon/Xerophyllum tenax Forest; Chappell 2005 NPK
Tsuga heterophylla/Gaultheria shallon Association; Franklin et al. 1988
Tsuga heterophylla/Gaultheria shallon/Xerophyllum tenax Association; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/Gaultheria shallon-Xerophyllum tenax-NWW; Henderson et al. 1992, Henderson et al. 1989

Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon-Holodiscus discolor Forest

Douglas-fir-Western Hemlock/Salal-Oceanspray Forest



Acronym: PSEMEN-TSUHET/GAUSHA-HOLDIS

NatureServe Code: PNWCOAST_184

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs on the northern and eastern Olympic Peninsula and possibly in the western Cascades. It is most common in the Puget Lowland between the Cascades and Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: Sites are at low to occasionally moderate elevations on shallow or rocky well-drained soils, mostly on southerly or westerly aspects.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* or a mixture of that species and *Tsuga heterophylla*. *Thuja plicata* is often present and sometimes prominent to co-dominant. *Tsuga heterophylla* dominates tree regeneration and typically occupies over 10% total cover. The well-developed shrub layer is always dominated by *Gaultheria shallon*. *Holodiscus discolor* is always present and usually has over 2% cover. *Mahonia (=Berberis) nervosa* is usually prominent. *Rosa gymnocarpa* and *Symphoricarpos hesperius* (=*mollis*) are usually present. The herb layer is usually sparse. Typical species include *Linnaea borealis*, *Chimaphila umbellata*, *Achlys (californica, triphylla)*, and *Campanula scouleri.*

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S2S3

Rank Justification: The range of this association is somewhat restricted in the Puget Lowland and in the Olympic Mountains. Low elevation sites which occur outside the national parks are more likely logged to some degree or near residential development.

Synonyms:
Pseudotsuga menziesii-Abies grandis-Tsuga heterophylla/*Gaultheria shallon-Holodiscus discolor* Community; Agee 1987
Pseudotsuga menziesii-Thuja plicata/*Gaultheria shallon-Holodiscus discolor*-WA; Chappell 2004
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Holodiscus discolor*; Chappell 2006
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Holodiscus discolor* Association; Chappell 1997
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Holodiscus discolor* Forest; Chappell 2001, Chappell 2005 NPK
Tsuga heterophylla/*Gaultheria shallon-Holodiscus discolor* Association; Henderson et al. 1989
Tsuga heterophylla/*Gaultheria shallon-Holodiscus discolor*-NWW; Henderson et al. 1989

Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon-Mahonia nervosa Forest

Douglas-fir-Western Hemlock/Salal-Dwarf Oregongrape Forest



Acronym: PSEMEN-TSUHET/GAUSHA-MAHNER

NatureServe Code: PNWCOAST_185

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs on the western slopes of the Cascades and on the eastern Olympic Peninsula. It is absent from the outer coastal strip and infrequent to rare on the western side of the Olympic mountains.

Plots: 21, MORA (9), NOCA (2), OLYM (10), Other (0)

Environmental Description: It occurs on low to middle elevations on well-drained soils.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* or a mixture of that species and *Tsuga heterophylla*. *Thuja plicata* is often present and sometimes prominent to co-dominant. *Tsuga heterophylla* typically dominates tree regeneration and always occupies over 10% total cover. The moderate to dense shrub layer is dominated by *Gaultheria shallon* or co-dominated by that species and *Mahonia (=Berberis) nervosa*. *Mahonia nervosa* always has over 5% cover. *Acer circinatum* is sometimes present to to co-dominant. *Vaccinium parvifolium* is almost always present and often prominent. The herb layer is absent to moderate. *Polystichum munitum* is frequently present in small amounts (under 3% cover), and *Linnaea borealis* is usually present to sometimes dominant.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Pseudotsuga menziesii-Tsuga heterophylla*/*Gaultheria shallon-Vaccinium parvifolium* association (PNWCOAST_186). The former has high cover of *Mahonia nervosa* and frequently has some *Polystichum munitum* present.

Conservation Rank: S4

Rank Justification: In western Washington, this association is widespread in the lowlands and Cascade and Olympic Mountains. Low elevation sites which occur outside the national parks are more likely logged to some degree or near residential development.

Synonyms:
CWH mm 1 /03; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 1 /01; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 2 /01; Green and Klinka 1994, BC Ministry of Forests 2003
Pseudotsuga menziesii-Tsuga heterophylla Type; Fonda and Bliss 1969
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Berberis nervosa* Forest; Chappell 2001
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Mahonia nervosa*; Chappell 2006 Puget
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Mahonia nervosa* Forest; Chappell 2005 NPK
Pseudotsuga menziesii-Tsuga heterophylla/*Gaultheria shallon-Pinus contorta*-WA; Chappell 2004
Tsuga heterophylla/*Berberis nervosa-Gaultheria shallon* Association; Bigley and Hull 1992
Tsuga heterophylla/*Berberis nervosa-Gaultheria shallon* Association; Topik et al. 1986
Tsuga heterophylla/*Berberis nervosa-Gaultheria shallon*-GP-PNW; Topik et al. 1986
Tsuga heterophylla/*Gaultheria shallon* Association; Franklin et al. 1988
Tsuga heterophylla/*Gaultheria shallon-Berberis nervosa* Association; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/*Gaultheria shallon-Berberis nervosa*-NWW; Henderson et al. 1992, Henderson et al. 1989

Pseudotsuga menziesii-Tsuga heterophylla/Rhododendron macrophyllum Forest

Douglas-fir-Western Hemlock/Pacific Rhododendron Forest



Acronym: PSEMEN-TSUHET/RHOMAC

NatureServe Code: PNWCOAST_197

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the eastern Olympic Mountains and adjacent lowlands.

Plots: 25, MORA (0), NOCA (0), OLYM (25), Other (0)

Environmental Description: This association occurs at low to moderate elevations on mid to upper slopes, ridgetops, and benches, especially on south to west aspects. Sites have dry, well-drained soils that are often shallow or very rocky.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* and *Tsuga heterophylla*. Both are always present and the latter dominates tree regeneration. The well-developed shrub layer is dominated or co-dominated by *Rhododendron macrophyllum*. *Gaultheria shallon* and *Mahonia (=Berberis) nervosa* are usually present and either can co-dominate. The herb layer varies from sparse to well-developed; when prominent it is dominated by *Xerophyllum tenax*. *Linnaea borealis* is often present. If *Polystichum munitum* is present, it has less than 3% cover.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This association occurs in the Olympic Mountains. Many low elevation sites outside the park have been logged.

Synonyms:
Pseudotsuga menziesii-Thuja plicata/*Rhododendron macrophyllum*; Chappell 2006 Puget
Pseudotsuga menziesii-Thuja plicata/*Rhododendron macrophyllum*-WA; Chappell 2004
Pseudotsuga menziesii-Tsuga heterophylla/*Rhododendron macrophyllum* Forest; Chappell 2005 NPK
Pseudotsuga menziesii-Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon* Association; Chappell 1997
Tsuga heterophylla/*Acer circinatum-Rhododendron macrophyllum*-PNW; Atzet et al. 1996, -SWOC; Atzet et al. 1996
Tsuga heterophylla/*Gaultheria shallon-Rhododendron macrophyllum*-SWO-PNW; Atzet et al. 1996
Tsuga heterophylla/*Rhododendron macrophyllum* Association; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum*/*Linnaea borealis*-PNW; McCain and Diaz 2002b
Tsuga heterophylla/*Rhododendron macrophyllum*/*Xerophyllum tenax* Association; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum*/*Xerophyllum tenax*-NWO Cascades-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Tsuga heterophylla/*Rhododendron macrophyllum-Berberis nervosa* Association; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum-Berberis nervosa*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum-Berberis nervosa*-SWO; Atzet et al. 1996, SWO-PNW; Atzet et al. 1996
Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon* Association; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon*-NWO Cascades-PNW; McCain and Diaz 2002b, Halverson et al. 1986, Atzet et al. 1986, Hemstrom et al. 1987
Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon*-SWO-PNW; Atzet et al. 1996
Tsuga heterophylla/*Rhododendron macrophyllum-Mahonia nervosa*-NWO Cascades-PNW; McCain and Diaz 2002b, Halverson et al. 1986, Atzet et al. 1986, Hemstrom et al. 1987
Tsuga heterophylla/*Rhododendron macrophyllum*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Rhododendron macrophyllum-Xerophyllum tenax*-NWW; Henderson et al. 1989
Tsuga heterophylla-Pseudotsuga menziesii/*Rhododendron macrophyllum* Community Type; Henderson et al. 1979
Tsuga heterophylla-Thuja plicata/*Rhododendron macrophyllum*-PNW; Atzet et al. 1996

Pseudotsuga menziesii-Tsuga heterophylla/Vaccinium alaskaense/Xerophyllum tenax Forest

Douglas-fir-Western Hemlock/Alaska Blueberry/Beargrass Forest



Acronym: PSEMEN-TSUHET/VACALA/XERTEN

NatureServe Code: PNWCOAST_203

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor)* Forest Alliance

Classification Confidence Level:

Range: This association occurs in the southeastern Olympic Mountains and Cascades Mountains south of Snoqualmie, WA.

Plots: 14, MORA (11), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs at mid elevations. Sites occupied are mid to upper slopes and ridgetops, have shallow rocky soils, and are moderately to very steep.

Vegetation Description: The canopy is co-dominated by *Pseudotsuga menziesii* and *Tsuga heterophylla*. *Thuja plicata* and *Abies amabilis* occur in about half the sampled stands, and the former can be prominent. The shrub layer can be rather sparse to well-developed. *Vaccinium alaskaense* may be absent but can dominate the shrub layer. *Mahonia (=Berberis) nervosa* is always present and often prominent. *Gaultheria shallon* and *Vaccinium parvifolium* are usually present. *Acer circinatum* is present and can be prominent. The herb layer is dominated by *Xerophyllum tenax*, which is always over 5% cover. *Linnaea borealis* and *Chimaphila umbellata* are frequent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs within a narrow environment in the Olympic and southern Cascade Mountains in Washington.

Synonyms:
Pseudotsuga menziesii-Tsuga heterophylla/*Vaccinium alaskaensis*/*Xerophyllum tenax* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Berberis nervosa-Xerophyllum tenax* Association; Bigley and Hull 1992
Tsuga heterophylla/*Vaccinium alaskaense*/*Xerophyllum tenax* Association; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/*Vaccinium alaskaense-Gaultheria shallon* Association; Bigley and Hull 1992
Tsuga heterophylla/*Vaccinium alaskaense-Xerophyllum tenax*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Xerophyllum tenax* Association; Henderson et al. 1989
Tsuga heterophylla/*Xerophyllum tenax*-NWW; Henderson et al. 1989

Pseudotsuga menziesii-(Alnus rubra-Tsuga heterophylla)/Rubus spectabilis Forest

Douglas-fir-(Red Alder-Western Hemlock)/Salmonberry



Acronym: PSEMEN-(ALNRUB-TSUHET)/RUBSPE

NatureServe Code: PNWCOAST_158

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in Olympic National Park and in the western Cascades.

Plots: 10, MORA (1), NOCA (0), OLYM (9), Other (0)

Environmental Description: As defined, this association does not occur on floodplains. Sites are on lower or toe slopes or valley bottoms with moist, but not wet, soils but are otherwise not well described in Washington. Most of these stands are relatively young in age, having regenerated after fire, blowdown or logging.

Vegetation Description: This is a conifer-dominated or mixed conifer-hardwood association. The canopy is dominated by *Pseudotsuga menziesii*, *Alnus rubra*, and/or *Tsuga heterophylla*. One or more of the conifers is always at least co-dominant. The well-developed shrub layer is dominated or co-dominated by *Rubus spectabilis*. *Gaultheria shallon* or *Acer circinatum* are sometimes co-dominant. The well-developed herb layer is dominated or co-dominated by *Polystichum munitum*. *Oxalis oregana* can be co-dominant in the western Olympics. *Claytonia (=Montia) sibirica* and *Galium triflorum* are usually present.

USFWS Wetland System: Not applicable.

Comments: This association was first described during the coastal correlation effort and it includes elements of several previously recognized conifer forest association (NatureServe: CEGL000114, CEGL000102, CEGL000092).

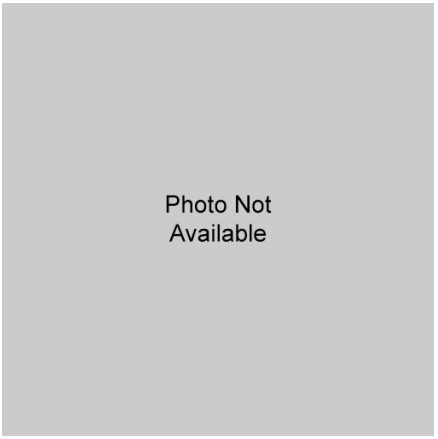
Conservation Rank: S4S5

Rank Justification: This association occurs within a narrow geographic and ecological range. It is currently recognized as a natural vegetation type that has been altered by logging. Most occurrences of this association, outside the national parks, are a result of regeneration after logging, though there are probably some natural-origin stands as well.

Synonyms:
Pseudotsuga menziesii-(*Alnus rubra-Tsuga heterophylla*)/*Rubus spectabilis* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Rubus spectabilis-Acer circinatum*-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Rubus spectabilis-Gaultheria shallon*-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Rubus spectabilis*-NWO Coast-PNW; McCain and Diaz 2002a
Tsuga heterophylla/*Rubus spectabilis*-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Rubus spectabilis*-SWOC; Atzet et al. 1996

Pseudotsuga menziesii-Tsuga heterophylla/(Acer circinatum)/Polystichum munitum Forest

Douglas-fir-Western Hemlock/(Vine Maple)/Swordfern Forest



Acronym: PSEMEN-TSUHET/(ACECIR)/POLMUN

NatureServe Code: PNWCOAST_195

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and on the Olympic Peninsula, except for the western coastal plain.

Plots: 2, MORA (1), NOCA (0), OLYM (1), Other (0)

Environmental Description: Elevations are relatively low and soils are well-drained and mesic to moist.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* and/or *Tsuga heterophylla*. Both are always present and *Tsuga heterophylla* always contributes over 10% total cover. Tree regeneration is mostly *Tsuga heterophylla*. A well-developed tall-shrub layer dominated by *Acer circinatum* is often present. Other shrubs have low cover if they are present. The herb layer is dominated by *Polystichum munitum*. Other herbs are usually not very abundant. If present, *Tiarella trifoliata*, *Blechnum spicant*, *Dryopteris expansa (=austriaca)*, and *Athyrium filix-femina* have very low percent cover.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This association is widespread in the southern Cascades in Washington and in the Olympic Mountains.

Synonyms:

Pseudotsuga menziesii/*Polystichum munitum*/*Eurynchium oreganum* Community Type; del Moral and Long 1977
Pseudotsuga menziesii/*Polystichum munitum-Linnaea borealis*/*Eurynchium oreganum-Hylocomium splendens* Community Type; del Moral and Long 1977
Pseudotsuga menziesii-Tsuga heterophylla/(*Acer circinatum*)/*Polystichum munitum* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Acer circinatum*/*Polystichum munitum*-NWO Cascades-PNW; McCain and Diaz 2002b
Tsuga heterophylla/*Acer circinatum*/*Polystichum munitum*-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Acer circinatum*/*Polystichum munitum*-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/*Polystichum munitum* Association; Topik et al. 1986
Tsuga heterophylla/*Polystichum munitum*-GP-PNW; Topik et al. 1986
Tsuga heterophylla/*Polystichum munitum*-NWO Cascades-PNW; McCain and Diaz 2002b, Halverson et al. 1986, Hemstrom et al. 1987
Tsuga heterophylla/*Polystichum munitum*-NWO Coast-PNW; McCain and Diaz 2002a, Halverson et al. 1986, Hemstrom and Logan 1986
Tsuga heterophylla/*Polystichum munitum*-Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Polystichum munitum*-SWOC; Atzet et al. 1996

Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa-Polystichum munitum Forest

Douglas-fir-Western Hemlock/Dwarf Oregongrape-Swordfern Forest



Acronym: PSEMEN-TSUHET/MAHNER-POLMUN

NatureServe Code: PNWCOAST_191

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and Olympic Peninsula although it is absent from the outer coastal strip.

Plots: 24, MORA (8), NOCA (1), OLYM (14), Other (1)

Environmental Description: This association occurs at low elevations. Sites have well-drained, mesic soils and are located on mid to toe slopes, benches and bottoms.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii* or co-dominated by that species and *Tsuga heterophylla*. *Thuja plicata* is usually present, often prominent and occasionally co-dominant. The well-developed shrub layer has *Mahonia (=Berberis) nervosa* prominent to co-dominant. *Acer circinatum* is sometimes co-dominant, forming a taller layer. *Gaultheria shallon* is usually present, but always in small amounts. The typically well-developed herb layer is dominated by *Polystichum munitum* usually with low abundance of other species.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

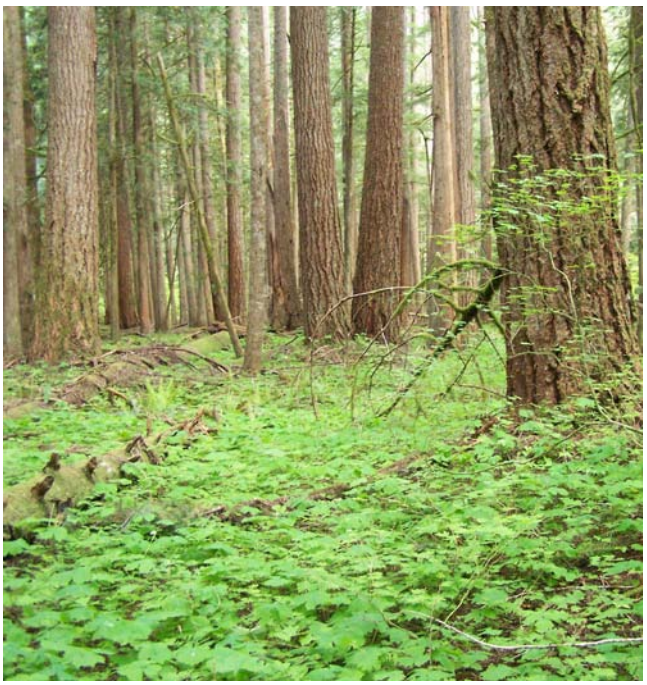
Rank Justification: This association is widespread in the Puget Lowlands, and the Cascade and Olympic Mountains in western Washington. Foothill and montane sites have been less impacted by development and logging.

Synonyms:

Pseudotsuga menziesii-Tsuga heterophylla/Berberis nervosa/Polystichum munitum Association; Chappell 1997
Pseudotsuga menziesii-Tsuga heterophylla/Berberis nervosa/Polystichum munitum Forest; Chappell 2001
Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa-Polystichum munitum; Chappell 2006 Puget
Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa-Polystichum munitum Forest; Chappell 2005 NPK
Pseudotsuga menziesii-Tsuga heterophylla/Pinus contorta/Polystichum munitum-WA; Chappell 2004
Tsuga heterophylla/Berberis nervosa/Polystichum munitum Association; Henderson et al. 1989, Topik et al. 1986
Tsuga heterophylla/Berberis nervosa/Polystichum munitum-PNW; Topik et al. 1986
Tsuga heterophylla/Berberis nervosa/Polystichum munitum-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/Mahonia nervosa/Polystichum munitum-NWO Cascades-PNW; McCain and Diaz 2002b, Halverson et al. 1986
Tsuga heterophylla/Mahonia nervosa/Polystichum munitum-NWO Coast-PNW; McCain and Diaz 2002a
Tsuga heterophylla/Mahonia nervosa-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/Polystichum munitum-Berberis nervosa Association; Henderson et al. 1992
Tsuga heterophylla/Polystichum munitum-Berberis nervosa-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga heterophylla-Pseudotsuga menziesii/Acer circinatum-Berberis nervosa Community Type; Henderson et al. 1979

Pseudotsuga menziesii-Tsuga heterophylla/Polystichum munitum-Oxalis oregana Forest

Douglas-fir-Western Hemlock/Swordfern-Oregon Oxalis Forest



Acronym: PSEMEN-TSUHET/POLMUN-OXAORE

NatureServe Code: PNWCOAST_196

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier and in the Olympic Mountains.

Plots: 14, MORA (7), NOCA (0), OLYM (7), Other (0)

Environmental Description: This association occurs at low elevation on lower slopes or valley bottoms with moist but well-drained soils.

Vegetation Description: The canopy is typically co-dominated by *Pseudotsuga menziesii* and *Tsuga heterophylla*. *Tsuga heterophylla* dominates tree regeneration. The shrub layer is rather sparse to moderate. *Acer circinatum* often forms a prominent tall-shrub layer. *Mahonia (=Berberis) nervosa* and *Vaccinium parvifolium* are usually present and occasionally prominent. The well-developed herb layer is co-dominated by *Polystichum munitum* and *Oxalis oregana*.

USFWS Wetland System: Not applicable.

Comments: This type is distinguished from similar associations by the presence of *Pseudotsuga menziesii* and *Mahonia (=Berberis) nervosa*, and the lack of *Blechnum spicant* and *Vaccinium alaskaense*.

Conservation Rank: S3

Rank Justification: This association occurs within a narrow environmental range in western Washington and much of its former extent has been reduced by logging.

Synonyms:

Pseudotsuga menziesii-Thuja plicata/*Oxalis oregana*; Chappell 2006 Puget
Pseudotsuga menziesii-Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Forest; Chappell 2001
Pseudotsuga menziesii-Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Forest; Chappell 2005 NPK
Pseudotsuga menziesii-Tsuga heterophylla/*Polystichum munitum-Oxalis oregana*-WA; Chappell 2004
Tsuga heterophylla/*Oxalis oregana-Achlys triphylla*-PNW; McCain and Diaz 2002a
Tsuga heterophylla/*Oxalis oregana-Achlys triphylla*-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/*Oxalis oregana*-Coast-PNW; McCain and Diaz 2002a
Tsuga heterophylla/*Oxalis oregana*-NWO Cascades-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Tsuga heterophylla/*Oxalis oregana*-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Oxalis oregana*-SWOC; McCain and Diaz 2002a
Tsuga heterophylla/*Polystichum munitum-Oxalis oregana* Association; Chappell 1997, Henderson et al. 1989, Topik et al. 1986
Tsuga heterophylla/*Polystichum munitum-Oxalis oregana*-PNW; Topik et al. 1986
Tsuga heterophylla/*Tiarella trifoliata* Association; Bigley and Hull 1992
Tsuga heterophylla-Pseudotsuga menziesii/*Polystichum munitum-Oxalis oregana* Community Type; Henderson et al. 1979

Tsuga heterophylla-(Pseudotsuga menziesii)/Tiarella trifoliata-Gymnocarpium dryopteris Forest

Western Hemlock-(Douglas-fir)/Foamflower-Western Oakfern Forest



Acronym: TSUHET-(PSEMEN)/TIATRI-GYMDRY

NatureServe Code: PNWCOAST_256

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and Olympic Mountains.

Plots: 25, MORA (14), NOCA (0), OLYM (9), Other (2)

Environmental Description: This association is found from low to middle elevations on valley bottoms, riverine terraces and floodplains, as well as on gentle toe slopes. Soils are typically subirrigated.

Vegetation Description: The canopy is usually dominated by *Tsuga heterophylla* and *Pseudotsuga menziesii*, although the latter can be absent. *Thuja plicata* is usually prominent to co-dominant, and *Abies grandis* is often present to prominent. The shrub layer is poorly developed and usually has small amounts of *Acer circinatum*, *Oplopanax horridus*, and *Vaccinium parvifolium*. The herb layer tends to be well developed and usually includes *Tiarella trifoliata*, *Gymnocarpium dryopteris*, *Blechnum spicant*, *Linnaea borealis*, *Polystichum munitum* (low percent cover), *Athyrium filix-femina*, and *Cornus unalaschkensis (=canadensis)*. *Tiarella trifoliata* and *Gymnocarpium dryopteris* each occupy over 1% cover.

USFWS Wetland System: Palustrine.

Comments:

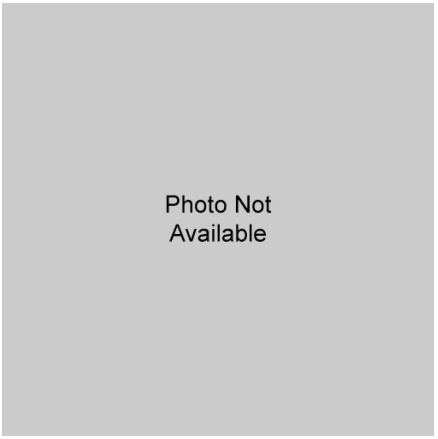
Conservation Rank: S2S3

Rank Justification: This association occurs within a narrow environmental range in western Washington and has been impacted by logging.

Synonyms:
Tsuga heterophylla-(*Pseudotsuga menziesii*)/*Tiarella trifoliata-Gymnocarpium dryopteris* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Tiarella trifoliata*-GYDR-NWW; Henderson et al. 1992
Tsuga heterophylla/*Tiarella trifoliata-Gymnocarpium dryopteris* Association; Henderson et al. 1992

Tsuga heterophylla-(Pseudotsuga menziesii)/Vaccinium alaskaense/Polystichum munitum Forest

Western Hemlock-(Douglas-fir)/Alaska Blueberry/Swordfern Forest



Acronym: TSUHET-(PSEMEN)/VACALA/POLMUN

NatureServe Code: PNWCOAST_259

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and in the Olympic Mountains.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: Sites are mostly lower and toe slopes or benches with well-drained soils at moderately low elevations.

Vegetation Description: The canopy is co-dominated by *Tsuga heterophylla*, *Pseudotsuga menziesii* and/or *Thuja plicata*. *Tsuga heterophylla* dominates tree regeneration and occupies over 10% total cover. *Abies amabilis* is usually present in small amounts as regeneration. The shrub layer is usually present but rarely dense. *Vaccinium alaskaense* is always prominent to co-dominant. *Vaccinium parvifolium* is usually prominent. *Mahonia (=Berberis) nervosa* or *Acer circinatum* sometimes occur, the latter prominently. The herb layer is diverse and well-developed. *Polystichum munitum* is always prominent to co-dominant. *Blechnum spicant* is usually prominent. *Clintonia uniflora*, *Tiarella trifoliata* var. *unifoliata*, and *Cornus unalaschkensis (=canadensis)* are usually present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs within a narrow environmental range in the mountains of western Washington and has been impacted by logging outside of the national parks.

Synonyms:
Tsuga heterophylla-(*Pseudotsuga menziesii*)/*Vaccinium alaskaensis*/*Polystichum munitum* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Vaccinium alaskaense-Polystichum munitum* Association; Henderson et al. 1992
Tsuga heterophylla/*Vaccinium alaskaense-Polystichum munitum*-NWW; Henderson et al. 1992
Tsuga heterophylla-Pseudotsuga menziesii/*Vaccinium alaskaense* Community Type; Henderson et al. 1979

Tsuga heterophylla-Pseudotsuga menziesii-(Thuja plicata)/Oplopanax horridus/Polystichum munitum Forest

Western Hemlock-Douglas-fir-(Western Redcedar)/Devil's Club/Swordfern Forest



Acronym: TSUHET-PSEMEN-(THUPLI)/OPLHOR/POLMUN

NatureServe Code: CEGL000497

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Maritime Douglas-fir-Western Hemlock Forest

Alliance: *Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and on the Olympic Peninsula.

Plots: 13, MORA (10), NOCA (2), OLYM (1), Other (0)

Environmental Description: This association occurs at low to moderate elevations on lower slopes, terraces or depressions and is often associated with springs, seeps, or streams. Soils are subirrigated and poorly drained due to a shallow to an impermeable layer that perches moving groundwater.

Vegetation Description: The canopy is a variable mixture of *Tsuga heterophylla*, *Pseudotsuga menziesii*, *Thuja plicata*, and/or *Alnus rubra*. *Tsuga heterophylla* or *Thuja plicata* always occupy at least 10% total cover and dominate tree regeneration. *Oplopanax horridus* (over 10% cover) co-dominates or dominates the shrub layer. *Acer circinatum* and *Rubus spectabilis* are frequent and sometimes co-dominant. The well-developed, diverse herb layer almost always has *Polystichum munitum* present to co-dominant. Other frequent to co-dominant herbs include *Oxalis oregana*, *Athyrium filix-femina*, and *Tiarella trifoliata*.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S4

Rank Justification: This association is widespread and occurs within a narrow environmental range in the mountains of western Washington.

Synonyms:
CWH ds 1 /07; Green and Klinka 1994, BC Ministry of Forests 2003
Thuja plicata-Tsuga heterophylla/Oplopanax horridum/Athyrium filix-femina Community Type; Franklin & Dyrness 1973
Thuja plicata-Tsuga heterophylla/Oplopanax horridus/Polystichum munitum; Chappell 2006 Puget
Tsuga heterophylla-(*Pseudotsuga menziesii-Thuja plicata*)/*Oplopanax horridus*/*Polystichum munitum* Forest; Chappell 2005 NPK
Tsuga heterophylla-(*Thuja plicata*)/*Oplopanax horridus*/*Polystichum munitum* Forest; Chappell 2001
Tsuga heterophylla-(*Thuja plicata*)/*Oplopanax horridus*/*Polystichum munitum*-WA; Chappell 2004
Tsuga heterophylla/*Oplopanax horridum* Association; Chappell 1997, Franklin et al. 1988, Henderson et al. 1989
Tsuga heterophylla/*Oplopanax horridum* Community Type; Mycek 1994
Tsuga heterophylla/*Oplopanax horridum*/*Polystichum munitum* Association; Topik et al. 1986
Tsuga heterophylla/*Oplopanax horridum-Athyrium filix-femina* Association; Henderson et al. 1992
Tsuga heterophylla/*Oplopanax horridus* Association; Chappell et al. 1999
Tsuga heterophylla/*Oplopanax horridus*/*Maianthemum stellatum*-PNW; McCain and Diaz 2002b, Halverson et al. 1986
Tsuga heterophylla/*Oplopanax horridus*/*Oxalis oregana*-PNW; McCain and Diaz 2002b, Halverson et al. 1986
Tsuga heterophylla/*Oplopanax horridus*/*Polystichum munitum*-PNW; Topik et al. 1986
Tsuga heterophylla/*Oplopanax horridus-Athyrium filix-femina*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga heterophylla/*Oplopanax horridus*-NWO Coast-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Tsuga heterophylla/*Oplopanax horridus*-NWW; Henderson et al. 1989
Tsuga heterophylla/*Oplopanax horridus*-WArip; Chappell 1999
Tsuga heterophylla/*Vaccinium alaskaense-Oplopanax horridus*-PNW; McCain and Diaz 2002b, Halverson et al. 1986

Tsuga heterophylla-Abies amabilis-(Thuja plicata)/Vaccinium alaskaense/Blechnum spicant Forest

Western Hemlock-Pacific Silver Fir-(Western Redcedar)/Alaska Blueberry/Deer Fern Forest



Acronym: TSUHET-ABIAMA-(THUPLI)/VACALA/BLESPI

NatureServe Code: PNWCOAST_274

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla / (Blechnam spicant)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs on the lower western slopes of the Olympic Mountains and at Mount Rainier.

Plots: 3, MORA (1), NOCA (0), OLYM (2), Other (0)

Environmental Description: This type occurs on relatively moist, relatively nutrient-poor sites.

Vegetation Description: The canopy is dominated by a somewhat variable mixture of *Tsuga heterophylla*, *Abies amabilis*, and *Thuja plicata*. The latter is sometimes absent. Tree regeneration is dominated by *Abies amabilis* and *Tsuga heterophylla*. The well-developed shrub layer is dominated by *Vaccinium alaskaense*, with *V. parvifolium* prominent to co-dominant and *Menziesia ferruginea* usually prominent. The well-developed herb layer is dominated or co-dominated by *Blechnum spicant*. *Cornus unalaschkensis (=canadensis)* is usually present to prominent. *Oxalis oregana* and *Gaultheria shallon* occupy low cover if they are present.

USFWS Wetland System: Not applicable.

Comments: The association was originally described from British Columbia and is poorly characterized in Washington. The Olympic plots are similar to descriptions of this type in British Columbia while the Mount Rainier location is a young stand with a sparse shrub layer and poorly fits this association.

Conservation Rank: S1

Rank Justification: This association occurs in a narrow environmental and geographic range western Washington with only a few known occurrences.

Synonyms:
Abies amabilis/*Cornus canadensis*-Olympics; Bigley and Hull 1995
CWH mm 1 /06; Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 1 /06; Banner et al. 1993, BC Ministry of Forests 2003
Tsuga heterophylla-Abies amabilis-(*Thuja plicata*)/*Vaccinium alaskaensis*/*Blechnum spicant* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis/Blechnum spicant-Tiarella trifoliata-Polystichum munitum Forest

Western Hemlock-Pacific Silver Fir/Deer Fern-Foamflower-Swordfern Forest

Acronym: TSUHET-ABIAMA/BLESPI-TIATRI-POLMUN

NatureServe Code: CEGL000006

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla / (Blechnam spicant)* Forest Alliance

Classification Confidence Level: 1



Range: This association occurs on the western slopes of the Cascades and on the southern, eastern, and northern sides of the Olympic Mountains.

Plots: 5, MORA (3), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs at low to moderate elevations (150-915 m (500-3000 ft)). It is found on relatively moist sites, often lower slopes, that have lower snowpack than average for most *Abies amabilis* types. Soils are moderately well-drained and may be subirrigated.

Vegetation Description: The canopy is dominated primarily by *Tsuga heterophylla* and secondarily by *Abies amabilis*. These two species usually co-dominate tree regeneration. *Thuja plicata* or *Pseudotsuga menziesii* can be prominent. The shrub layer is sparse to moderately dense, with *Vaccinium alaskaense* and *V. parvifolium* the most abundant species. *Acer circinatum* is sometimes prominent. A typically rich and diverse herb layer is characterized by the prominence to co-dominance of *Polystichum munitum*. *Blechnum spicant* and *Tiarella trifoliata* are usually present to prominent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3S4

Rank Justification: This association occurs in a narrow environmental range in the mountains of western Washington.

Synonyms:
Abies amabilis/Depauperate Association; Bigley and Hull 1995
Abies amabilis/Depauperate-Olympics; Bigley and Hull 1995
Abies amabilis/*Polystichum munitum* Association; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense-Polystichum munitum* Association; Henderson et al. 1989, Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense-Polystichum munitum*-NWW; Henderson et al. 1992, Henderson et al. 1989
CWH vh 1 /06; Green and Klinka 1994, BC Ministry of Forests 2003
CWH vh 2 /06; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 1 /05; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 1 /07; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 2 /05; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 2 /07; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga heterophylla/*Polystichum munitum* Association, *Abies amabilis* Phase; Franklin et al. 1988
Tsuga heterophylla-Abies amabilis/*Blechnum spicant-Tiarella trifoliata-Polystichum munitum* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis/Oxalis oregana-Blechnum spicant Forest

Western Hemlock-Pacific Silver Fir/Oregon Oxalis-Deer Fern Forest



Acronym: TSUHET-ABIAMA/OXAORE-BLESPI

NatureServe Code: PNWCOAST_235

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla / (Blechnam spicant)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs extensively on the western Olympic Peninsula.

Plots: 7, MORA (0), NOCA (0), OLYM (7), Other (0)

Environmental Description: This association occurs at low to moderate elevations. Sites occupied have relatively deep, well-drained, moist soils, and occur on a variety of topography.

Vegetation Description: The canopy is dominated by *Tsuga heterophylla* or co-dominated by that species and *Abies amabilis*. *Abies amabilis* dominates or co-dominates tree regeneration and occupies over 10% total cover. *Pseudotsuga menziesii* is occasionally present to prominent. The shrub layer varies from sparse to moderately dense. When it is more developed (only occasionally), it is dominated by *Gaultheria shallon* or *Vaccinium alaskaense*. *Vaccinium parvifolium* and *Rubus spectabilis* are present or occasionally prominent. The usually well-developed herb layer is dominated or co-dominated by *Oxalis oregana*. *Polystichum munitum* is usually present and occasionally co-dominant. *Blechnum spicant* is almost always present to occasionally prominent. *Maianthemum dilatatum* or *Tiarella trifoliata* is frequently present.

USFWS Wetland System: Not applicable.

Comments: The current set of National Park vegetation plots does not include stands with a prominence of *Gaultheria shallon*.

Conservation Rank: S3S4

Rank Justification: This association occurs in western Olympic Peninsula and has been impacted by logging.

Synonyms:
Abies amabilis/*Gaultheria shallon*/*Oxalis oregana* Forest; Henderson et al. 1989
Abies amabilis/*Gaultheria shallon*/*Oxalis oregana*-Olympics; Bigley and Hull 1995
Abies amabilis/*Gaultheria shallon*/*Polystichum munitum* Association; Chappell 1999
Abies amabilis/*Gaultheria shallon-Oxalis oregana* Association; Bigley and Hull 1995
Abies amabilis/*Gaultheria shallon-Oxalis oregana*-NWW; Henderson et al. 1989
Abies amabilis/*Gaultheria shallon-Pyrola picta* Association; Bigley and Hull 1995
Abies amabilis/*Oxalis oregana* Association; Henderson et al. 1989
Abies amabilis/*Oxalis oregana-Clintonia uniflora* Association; Bigley and Hull 1995
Abies amabilis/*Oxalis oregana*-NWW; Henderson et al. 1989
Abies amabilis/*Oxalis oregana*-WArip; Chappell 1999
Abies amabilis/*Polystichum munitum-Oxalis oregana* Association; Henderson et al. 1989
Abies amabilis/*Polystichum munitum-Oxalis oregana*-NWW; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense-Oxalis oregana* Association; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense-Oxalis oregana*-NWW; Henderson et al. 1989
Abies amabilis-Tsuga heterophylla/*Oxalis oregana* Type; Fonda and Bliss 1969
Tsuga heterophylla-Abies amabilis/*Oxalis oregana-Blechnum spicant* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Rubus pedatus Forest

Western Hemlock-Pacific Silver Fir/Alaska Blueberry/Trailing Raspberry Forest

Acronym: TSUHET-ABIAMA/VACALA/RUBPED

NatureServe Code: PNWCOAST_239

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla / (Blechnam spicant)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs on the western slopes of the Cascades and in the Olympic Mountains.

Plots: 45, MORA (35), NOCA (4), OLYM (6), Other (0)

Environmental Description: This upland forest association occurs at middle elevations. It is very extensive in areal coverage in moist climatic areas, where it occupies well-drained modal sites.



Vegetation Description: The canopy is usually co-dominated by *Tsuga heterophylla* and *Abies amabilis*, though any one stand might be dominated by one or the other. *Abies amabilis* is always present with at least 10% total cover, and typically dominates tree regeneration. *Cupressus (=Chamaecyparis) nootkatensis*, *Thuja plicata*, or *Pseudotsuga menziesii* are occasionally prominent. A well-developed shrub layer is always dominated by *Vaccinium alaskaense* or *V. ovalifolium*. The shrubs *Menziesia ferruginea, Vaccinium membranaceum or V. parvifolium* occur frequently but are rarely prominent. A herbaceous layer is always present and characterized by 3% or more combined cover of the following species: *Clintonia uniflora*, *Cornus unalaschkensis (=canadensis)*, *Rubus pedatus*, *R. lasiococcus* or *Erythronium montanum* (latter is local, others widespread and frequent). *Blechnum spicant* is often present.

USFWS Wetland System: Not applicable.

Comments: Single plots from the North Cascades and the Olympics have high cover of *Acer circinatum* and represent transitions to warmer sites. A legacy plot from Olympic National Park, which appears in the stand table as PSEMEN-TSUHET/RUBPED, may also represent this type. It has *Abies amabilis* in minor amounts, no *Tiarella trifoliata* but an abundance of *Rubus pedatus* and is located within the environmental range of this association.

Conservation Rank: S4S5

Rank Justification: This association is widespread and occurs in the mountains of western Washington.

Synonyms:
Abies amabilis/*Vaccinium alaskaense* Association; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense* Association, Typical Phase; Franklin 1966
Abies amabilis/*Vaccinium alaskaense* Association, *Vaccinium alaskaense* & *Rubus pedatus* Phases; Franklin et al. 1988
Abies amabilis/*Vaccinium alaskaense*/*Erythronium montanum* Association; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense-Clintonia uniflora* Association; Henderson et al. 1989, Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense-Clintonia uniflora*-NWW; Henderson et al. 1989, Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense-Erythronium montanum*-NWW; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense-Linnaea borealis* Association; Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense*-Olympics; Bigley and Hull 1995
Abies amabilis-Tsuga heterophylla/*Vaccinium alaskaense* Community Type; del Moral et al. 1976, Henderson et al. 1979
CWH ds 2 /06; Green and Klinka 1994, BC Ministry of Forests 2003
CWH mm 2 /05; Green and Klinka 1994, BC Ministry of Forests 2003
CWH ms 2 /05; Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 1 /01; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH ws 1 /01; Banner et al. 1993, BC Ministry of Forests 2003
CWH ws 1 /05; Banner et al. 1993, BC Ministry of Forests 2003
CWH ws 2 /01; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH ws 2 /05; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga heterophylla/*Vaccinium ovalifolium*/*Plagiomnium insigne* Community Type; del Moral and Long 1977
Tsuga heterophylla-Abies amabilis/*Vaccinium alaskaensis*/*Rubus pedatus* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Tiarella trifoliata var. unifoliata Forest

Western Hemlock-Pacific Silver Fir/Alaska Blueberry/Foamflower Forest



Acronym: TSUHET-ABIAMA/VACALA/TIATRI

NatureServe Code: CEGL000009

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla / (Blechnam spicant)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the western Cascades and Olympic Mountains.

Plots: 28, MORA (22), NOCA (0), OLYM (6), Other (0)

Environmental Description: This association occurs at middle elevations. Sites have moist, well-drained to subirrigated soils in a variety of topographic positions.

Vegetation Description: The canopy is dominated by *Tsuga heterophylla* and/or *Abies amabilis* (usually both). *Abies amabilis* occupies over 10% total cover (understory and canopy). *Thuja plicata* is occasionally prominent. *Vaccinium alaskaense* dominates the well-developed shrub layer. *Rubus spectabilis* is usually present. The diverse herb layer is usually well-developed. *Blechnum spicant*, *Tiarella trifoliata* var. *unifoliata*, *Streptopus lanceolatus (=roseus) var. curvipes*, *Athyrium filix-femina*, *Clintonia uniflora*, *Cornus unalaschkensis (=canadensis)*, and *Rubus pedatus* are usually present. *Maianthemum dilatatum* sometimes dominates the herb layer.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished from similar types by over 3% combined cover of *Tiarella trifoliata* var. *unifoliata*, *Streptopus lanceolatus* var. *curvipes*, and *Maianthemum dilatatum*.

Conservation Rank: S4

Rank Justification: This association occurs in the mountains of western Washington.

Synonyms:
Abies amabilis/*Vaccinium alaskaense* Association; Bigley and Hull 1995
Abies amabilis/*Vaccinium alaskaense*/*Maianthemum dilatatum* Association; Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense*/*Tiarella unifoliata* Association; Henderson et al. 1989, Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense-Maianthemum dilatatum*-NWW; Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense-Tiarella unifoliata*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis-Tsuga heterophylla Type; Fonda and Bliss 1969
Pseudotsuga menziesii-Tsuga heterophylla/*Vaccinium alaskaense*/Linnea borealis Community Type; del Moral et al. 1976
Tsuga heterophylla-Abies amabilis/*Vaccinium alaskaensis*/*Tiarella trifoliata* var. *unifoliata* Forest; Chappell 2005 NPK

Abies amabilis-(Pseudotsuga menziesii)/Achlys triphylla-Tiarella trifoliata var. unifoliata Forest

Pacific Silver Fir-(Douglas-fir)/Vanilla Leaf-Foamflower Forest



Acronym: ABIAMA-(PSEMEN)/ACHTRI-TIATRI

NatureServe Code: PNWCOAST_007

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs at Mount Rainier and in the eastern and northern Olympic Mountains.

Plots: 15, MORA (13), NOCA (0), OLYM (1), Other (1)

Environmental Description: This association occurs at middle elevations on sites with deep, well-drained, and moist soils.

Vegetation Description: The canopy is dominated by *Abies amabilis*, *Pseudotsuga menziesii*, *Tsuga heterophylla*, and/or *Abies procera*. *Abies amabilis* has over 10% total cover and dominates or co-dominates tree regeneration. The shrub layer varies from sparse to moderate and frequently has abundant *Acer circinatum* or *Vaccinium membranaceum* (the latter usually no more than 10% cover). The well-developed herb layer always has *Achlys (californica, triphylla)* present to more often prominent. *Tiarella trifoliata* var. *unifoliata* and/or *Maianthemum stellatum* are usually present and the combination of the two is typically over 5% cover. *Clintonia uniflora* is usually present to prominent. *Linnaea borealis, Gymnocarpium dryopteris* or *Cornus unalaschkensis (=canadensis)* are occasionally prominent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3S4

Rank Justification: Many natural-origin stands occur on protected lands although many are subject to logging and development.

Synonyms:

Abies amabilis-(*Pseudotsuga menziesii*)/*Achlys triphylla*-*Tiarella trifoliata* var. *unifoliata* Forest; Chappell 2005 NPK
Abies amabilis/*Acer circinatum*/*Tiarella trifoliata*-PNW; McCain and Diaz 2002b
Abies amabilis/*Achlys triphylla*-*Tiarella unifoliata* Association; Henderson et al. 1989
Abies amabilis/*Streptopus curvipes* Association, Typical Phase; Franklin 1966
Abies amabilis/*Tiarella trifoliata*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1987
Abies amabilis/*Tiarella unifoliata* Association; Brockway et al. 1983, Franklin 1966, Franklin et al. 1988

Abies amabilis-(Pseudotsuga menziesii-Tsuga heterophylla)/Rhododendron macrophyllum Forest

Pacific Silver Fir/Pacific Rhododendron Forest

Acronym: ABIAMA-(PSEMEN-TSUHET)/RHOMAC

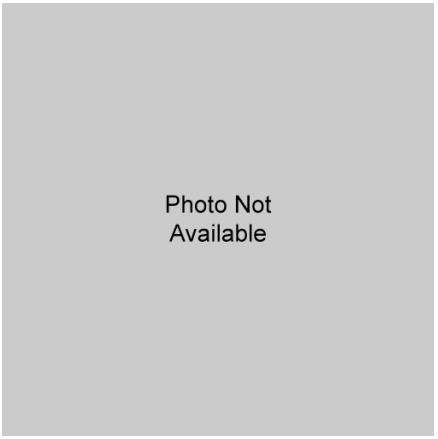
NatureServe Code: CEGL000227

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1



Range: This association occurs in the east-central and especially northeast Olympic Mountains. It is most abundant in western Oregon.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs at middle elevations. Sites have well-drained soils and occur on a variety of slopes.

Vegetation Description: The canopy is usually dominated or co-dominated by *Tsuga heterophylla*. *Pseudotsuga menziesii* and/or *Abies amabilis* usually co-dominate. *Abies amabilis* dominates or co-dominates tree regeneration and contributes over 10% total cover. The often dense tall shrub layer is dominated or co-dominated by *Rhododendron macrophyllum*. *Mahonia nervosa* is usually present and occasionally co-dominates the a dwarf-shrub stratum. *Vaccinium alaskaense* is often present and sometimes prominent to co-dominant. *Gaultheria shallon* or *Acer circinatum* are occasionally prominent to co-dominant. The herb layer is typically sparse. *Linnaea borealis* is frequent and sometimes prominent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however, non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis-(*Pseudotsuga menziesii-Tsuga heterophylla*)/*Rhododendron macrophyllum* Forest; Chappell 2005 NPK
Abies amabilis/*Rhododendron macrophyllum* Association; Henderson et al. 1989
Abies amabilis/*Rhododendron macrophyllum*/*Xerophyllum tenax*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1982, Hemstrom et al. 1987
Abies amabilis/*Rhododendron macrophyllum-Berberis nervosa*-NWW; Henderson et al. 1989
Abies amabilis/*Rhododendron macrophyllum-Gaultheria shallon*-NWW; Henderson et al. 1989
Abies amabilis/*Rhododendron macrophyllum-Mahonia nervosa*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1982, Hemstrom et al. 1987
Abies amabilis/*Rhododendron macrophyllum*-NWW; Henderson et al. 1989
Abies amabilis/*Rhododendron macrophyllum-Vaccinium alaskaense* Association; Henderson et al. 1989
Abies amabilis/*Rhododendron macrophyllum-Vaccinium alaskaense*-NWW; Henderson et al. 1989
Abies amabilis-Tsuga heterophylla/*Rhododendron macrophyllum-Gaultheria shallon*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1982, Hemstrom et al. 1987

Abies amabilis-Pseudotsuga menziesii/Achlys triphylla Forest

Pacific Silver Fir-Douglas-fir/Vanilla Leaf Forest



Acronym: ABIAMA-PSEMEN/ACHTRI

NatureServe Code: CEGL000003

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs at Mount Rainier and in the eastern and northern Olympics.

Plots: 22, MORA (19), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs at middle elevations. Sites have deep, well-drained soils and are environmentally moderate. Aspects tend to be southerly.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii*, *Tsuga heterophylla*, and/or *Abies amabilis*. *Abies amabilis* has over 10% total cover and dominates or co-dominates tree regeneration. *Abies procera* is sometimes prominent. The shrub layer varies from sparse to moderate, and when more developed is dominated by *Acer circinatum*. *Mahonia (=Berberis) nervosa* and *Vaccinium membranaceum* are often present. The well-developed herb layer is dominated or co-dominated by *Achlys (californica, triphylla)*. *Clintonia uniflora, Cornus unalaschkensis (=canadensis)*, and *Linnaea borealis* are usually present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Acer circinatum* Association; Kovalchik 200, Lillybridge et al. 1995, Williams and Smith 1990
Abies amabilis/*Acer circinatum*-PNW; Lillybridge et al. 1995
Abies amabilis/*Achlys triphylla* Association; Henderson et al. 1992
Abies amabilis/*Achlys triphylla* Community Type; Henderson et al. 1979
Abies amabilis/*Achlys triphylla-Clintonia uniflora* Association; Brockway et al. 1983
Abies amabilis/*Achlys triphylla-Clintonia uniflora*-PNW; Brockway et al. 1983
Abies amabilis/*Achlys triphylla*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Rosa gymnocarpa*/*Achlys triphylla*-PNW; Atzet et al. 1996
Abies amabilis-Pseudotsuga menziesii/*Achlys triphylla* Forest; Chappell 2005 NPK

Abies amabilis-Tsuga heterophylla/Depauperate undergrowth Forest

Pacific Silver Fir-Western Hemlock/Depauperate undergrowth Forest



Acronym: ABIAMA-TSUHET/Dep.

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 3

Range: This provisional association is found throughout the range of *Abies amabilis* forests in the Cascades and the Olympic mountains.

Plots: 11, MORA (4), NOCA (2), OLYM (3), Other (2)

Environmental Description: These are generally mid-seral forests with prolonged closed canopies.

Vegetation Description: These forests are dominated by *Abies amabilis* and *Tsuga heterophylla*, and sometimes co-dominated by *Pseudotsuga menziesii. Thuja plicata* is frequently prominent. Deep shade and abundant litter accumulation limit the understory to isolated individuals of vascular plants and mosses and lichens. *Vaccinium parvifolium, V. alaskaense, Orthilia (=Pyrola) secunda,* and *Goodyera oblongifolia* are relatively frequent understory vascular plants.

USFWS Wetland System: Not applicable.

Comments: These communities are distingushed by a lack plant diversity, understory development and indicator vascular species.

Conservation Rank: S3S4Q

Rank Justification: This association appears to be widespread and in protected areas but classification is provisional.

Synonyms:
Abies amabilis/Depauperate Association; Henderson et al. 1989

Abies amabilis-Tsuga heterophylla/Rubus pedatus-Tiarella trifoliata var. unifoliata Forest

Pacific Silver Fir-Western Hemlock/Trailing Raspberry-Foamflower Forest



Acronym: ABIAMA-TSUHET/RUBPED-TIATRI

NatureServe Code: PNWCOAST_012

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the western Cascades and rarely in the Olympics.

Plots: 34, MORA (29), NOCA (0), OLYM (1), Other (5)

Environmental Description: This association occurs at middle elevations on mesic to moist sites, with well-drained soils, mostly on lower slopes.

Vegetation Description: The canopy is co-dominated by *Abies amabilis* and *Tsuga heterophylla*. *Abies procera* and *Thuja plicata* can also be prominent to co-dominant. *Abies amabilis* dominates tree regeneration and occupies over 10% total cover. Plots from the east Cascade plots contain *Picea engelmannii* in the canopy. A shrub layer is absent to sparse, frequently with *Vaccinium alaskaense* or *V. parvifolium* (the latter sometimes prominent). The diverse herb layer is characterized by *Rubus pedatus*, *Streptopus lanceolatus (=roseus) var. curvipes*, *Blechnum spicant*, and *Tiarella trifoliata* var. *unifoliata*, one or more of which is typically prominent. *Achlys (californica, triphylla)* is absent or very low in cover.

USFWS Wetland System: Not applicable.

Comments: In the sample from the parks, *Tiarella trifoliata* and *Rubus pedatus* are much more frequent than the other two indicator species (*Streptopus lanceolatus (=roseus) var. curvipes*, *Blechnum spicant*).

Conservation Rank: S3S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Rubus pedatus-Blechnum spicant* Association; Henderson et al. 1992
Abies amabilis/*Rubus pedatus-Blechnum spicant*-NWW; Henderson et al. 1992
Abies amabilis/*Streptopus roseus* var. *curvipes* Association; Henderson 1981a, 1981b drafts
Abies amabilis/*Tiarella unifoliata-Streptopus roseus* Association; Henderson et al. 1992
Abies amabilis/*Tiarella unifoliata-Streptopus roseus*-NWW; Henderson et al. 1992
Abies amabilis-Tsuga heterophylla/*Rubus pedatus-Tiarella trifoliata* var. *unifoliata* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis-(Pseudotsuga menziesii)/Vaccinium alaskaense Forest

Western Hemlock-Pacific Silver Fir-(Douglas-fir)/Alaska Blueberry Forest



Acronym: TSUHET-ABIAMA-(PSEMEN)/VACALA

NatureServe Code: PNWCOAST_016

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs at middle elevations in the western Cascades and in the Olympic Mountains.

Plots: 41, MORA (23), NOCA (3), OLYM (15), Other (0)

Environmental Description: This association occurs at middle elevations on well-drained soils and moderate to somewhat dry sites on a variety of topographic settings.

Vegetation Description: The canopy is usually co-dominated by *Tsuga heterophylla*, *Abies amabilis*, and *Pseudotsuga menziesii* (latter often absent). *Abies amabilis* dominates tree regeneration and occupies over 10% total cover. The shrub layer is usually well-developed but is occasionally very sparse. *Vaccinium alaskaense* dominates the shrub layer and is always present. *Mahonia (=Berberis) nervosa* is sometimes prominent to co-dominant. The herb layer is usually sparse to occasionally moderate, with *Clintonia uniflora* and *Cornus unalaschkensis (=canadensis)* the only species present in many stands. *Linnaea borealis* or *Xerophyllum tenax* are occasionally prominent to dominant.

USFWS Wetland System: Not applicable.

Comments: This type is distinguished from similar types by either (1) over 5% cover of *Mahonia (=Berberis) nervosa*, *Xerophyllum tenax* or *Linnaea borealis*, (2) co-dominance of *Pseudotsuga menziesii*, or (3) absence or trace amounts of both *Rubus pedatus* and *Blechnum spicant* particularly when total herb layer is under 5%. This concept changes the NatureServe name and follows the Coastal Correlation (Meidinger et al 2005).

Conservation Rank: S4

Rank Justification: This association is widespread and occurs commonly in the mountains of western Washington and has been impacted by logging.

Synonyms:
Abies amabilis/*Vaccinium alaskaense* Association; Brockway et al. 1983
Abies amabilis/*Vaccinium alaskaense*/*Cornus canadensis*-PNW; McCain and Diaz 2002b
Abies amabilis/*Vaccinium alaskaense-Berberis nervosa*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense*-PNW; Brockway et al. 1983
CWH mm 1 /01; Green and Klinka 1994, BC Ministry of Forests 2003
CWH mm 2 /01; Green and Klinka 1994, BC Ministry of Forests 2003
CWH mm 2 /03; Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga heterophylla-Abies amabilis-(*Pseudotsuga menziesii*)/*Vaccinium alaskaensis* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis-Pseudotsuga menziesii/Gaultheria shallon Forest

Western Hemlock-Pacific Silver Fir-Douglas-fir/Salal Forest



Acronym: TSUHET-ABIAMA-PSEMEN/GAUSHA

NatureServe Code: CEGL002626

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the western Cascades and the Olympic Mountains.

Plots: 15, MORA (7), NOCA (2), OLYM (6), Other (0)

Environmental Description: This association occurs at middle elevations. Soils are well-drained and sites are relatively dry compared to average *Abies amabilis* sites.

Vegetation Description: The canopy is typically co-dominated by *Tsuga heterophylla*, *Abies amabilis*, and *Pseudotsuga menziesii*. In any one stand one or more of the canopy species may be less abundant. *Abies amabilis* always occupies over 10% total cover and usually co-dominates tree regeneration with *Tsuga heterophylla*. *Pseudotsuga menziesii* is occasionally absent and *Thuja plicata* is usually prominent. The well-developed shrub layer is dominated by *Gaultheria shallon* (always over 5% cover) or *Vaccinium alaskaense*. *Mahonia (=Berberis) nervosa* is usually present and sometimes prominent. The herb layer is usually sparse and *Linnaea borealis* is the only frequently occuring species.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This association occurs in the mountains of western Washington.

Synonyms:
Abies amabilis/*Gaultheria shallon* Association; Brockway et al. 1983; Franklin 1966, Franklin et al. 1988
Abies amabilis/*Gaultheria shallon-Berberis nervosa* Association; Henderson et al. 1992
Abies amabilis/*Gaultheria shallon-Berberis nervosa*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Gaultheria shallon*-GP-PNW; Brockway et al. 1983
Abies amabilis/*Vaccinium alaskaense-Gaultheria shallon* Association; Bigley and Hull 1992, Brockway et al. 1983, Henderson et al. 1992
Abies amabilis/*Vaccinium alaskaense-Gaultheria shallon*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Vaccinium alaskaense-Gaultheria shallon*-PNW; Brockway et al. 1983, McCain and Diaz 2002b
Abies amabilis-Tsuga heterophylla/*Gaultheria shallon* Community Type; Douglas 1969
Tsuga heterophylla-Abies amabilis-Pseudotsuga menziesii/*Gaultheria shallon* Forest; Chappell 2005 NPK

Tsuga heterophylla-Abies amabilis-Pseudotsuga menziesii/Mahonia nervosa Forest

Western Hemlock-Pacific Silver Fir-Douglas-fir/Dwarf Oregongrape Forest



Acronym: TSUHET-ABIAMA-PSEMEN/MAHNER

NatureServe Code: CEGL000217

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla)* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the western Cascades and in the Olympic Mountains.

Plots: 13, MORA (10), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association is found at middle elevations typically on moderate to steep slopes with south to west-facing aspects and well-drained soils.

Vegetation Description: The canopy is typically co-dominated by *Tsuga heterophylla*, *Abies amabilis*, and *Pseudotsuga menziesii*. In any one stand, one or more species may be less abundant. *Abies amabilis* always occupies over 10% total cover and usually co-dominates tree regeneration with *Tsuga heterophylla*. The shrub layer is usually moderately dense and is dominated by *Mahonia (=Berberis) nervosa*. *Vaccinium alaskaense* and *V. parvifolium* are usually present. The herb layer is typically sparse and may be absent. *Cornus unalaschkensis (=canadensis)* and *Linnaea borealis* are usually present.

USFWS Wetland System: Not applicable.

Comments:

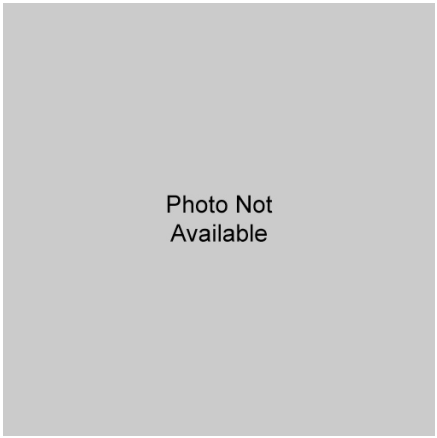
Conservation Rank: S4

Rank Justification: This association occurs in the mountains of western Washington.

Synonyms:
Abies amabilis/*Berberis nervosa* Association; Brockway et al. 1983, Franklin 1966, Franklin et al. 1988, Henderson et al. 1992
Abies amabilis/*Berberis nervosa*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Mahonia nervosa*-PNW; McCain and Diaz 2002b, Brockway et al. 1983, Hemstrom et al. 1982, Hemstrom et al. 1987
Tsuga heterophylla-Abies amabilis-PNW; Atzet et al. 1996
Tsuga heterophylla-Abies amabilis-Pseudotsuga menziesii/*Mahonia nervosa* Forest; Chappell 2005 NPK

Abies amabilis-(Pseudotsuga menziesii)/Vaccinium membranaceum/Achlys triphylla Forest

Pacific Silver Fir-(Douglas-fir)/Big Huckleberry/Vanilla Leaf Forest



Acronym: ABIAMA-(PSEMEN)/VACMEM/ACHTRI

NatureServe Code: PNWCOAST_009

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 1

Range: This association is described primarily from data collected in the east Cascades and south of the parks. However, it occurs on the northeast sides of both Mount Rainier and the Olympic Mountains.

Plots: 8, MORA (6), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs at middle elevations. Sites are typically gentlly sloping, east or south facing middle to lower slopes.

Vegetation Description: The canopy is dominated by *Pseudotsuga menziesii*, *Tsuga heterophylla*, and/or *Abies amabilis*. *Abies amabilis* occupies over 10% total cover and dominates tree regeneration. The shrub layer is typically moderately dense and is dominated by *Vaccinium membranaceum*. *Acer circinatum* sometimes forms a tall shrub layer. *Mahonia nervosa, Chimaphila umbellata* and *Paxistima myrsinites* are usually present in small amounts. The herb layer always has *Achlys (californica, triphylla)* present to prominent. *Clintonia uniflora*, *Rubus lasiococcus, Orthilia (=Pyrola) secunda* and *Viola sempervirens* are frequent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands although some are subject to logging and development.

Synonyms:
Abies amabilis-(*Pseudotsuga menziesii*)/*Vaccinium membranaceum*/*Achlys triphylla* Forest; Chappell 2005 NPK
Abies amabilis/*Achlys triphylla* Association; Franklin 1966
Abies amabilis/*Achlys triphylla* Wen Association; Kovalchik 2001, Lillybridge et al. 1995
Abies amabilis/*Achlys triphylla*-Wen-PNW; Lillybridge et al. 1995
Abies amabilis/*Vaccinium membranaceum*/*Clintonia uniflora* Association; Brockway et al. 1983
Abies amabilis/*Vaccinium membranaceum*/*Clintonia uniflora*-PNW; McCain and Diaz 2002b, Brockway et al. 1983
Abies amabilis-Tsuga heterophylla/*Vaccinium membranaceum*/*Achlys triphylla*-PNW; Atzet et al. 1996
Tsuga heterophylla/*Vaccinium membranaceum-Acer circinatum*/*Linnaea borealis* Community; del Moral et al. 1976

Abies amabilis-(Pseudotsuga menziesii-Abies procera)/Vaccinium membranaceum/Xerophyllum tenax Forest

Pacific Silver Fir/Big Huckleberry/Beargrass Forest



Acronym: ABIAMA-(PSEMEN-ABIPRO)/VACMEM/XERTEN

NatureServe Code: CEGL000239

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs at Mount Rainier and in the northern and eastern Olympics.

Plots: 32, MORA (32), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association occurs at middle to high elevations. Sites are dry, usually on mid to upper slopes or ridgetops, with shallow or rocky soils and southerly aspects.

Vegetation Description: The canopy is dominated by *Abies amabilis*, *Pseudotsuga menziesii*, *Tsuga heterophylla*, and/or *Abies procera*. *Abies amabilis* or *A. procera* occupy over 10% total cover. *Abies amabilis* typically dominates tree regeneration. The shrub layer varies from sparse to dense but always has *Vaccinium membranaceum*, which usually is dominant. *Xerophyllum tenax* dominates a well-developed herb layer. *Rubus lasiococcus, Orthilia (=Pyrola) secunda*, *Clintonia uniflora* or *Viola sempervirens* are often present.

USFWS Wetland System: Not applicable.

Comments: Three legacy plots at Mount Rainier are dominated by *Pseudotsuga menziesii* with *Abies amabilis* or *Abies procera* present only in small amounts. These are currently recognized as variants of the association described here, though they could possibly be recognized as a distinct association.

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however, non-protected stands are subject to logging and development.

Synonyms:

Abies amabilis-(*Pseudotsuga menziesii-Abies procera*)/*Vaccinium membranaceum*/*Xerophyllum tenax* Forest; Chappell 2005 NPK
Abies amabilis/*Berberis nervosa-Xerophyllum tenax* Association; Bigley and Hull 1992
Abies amabilis/*Vaccinium membranaceum*/*Xerophyllum tenax* Association; Brockway et al. 1983, Henderson et al. 1989, Henderson et al. 1992
Abies amabilis/*Vaccinium membranaceum*/*Xerophyllum tenax*-PNW; McCain and Diaz 2002b, Brockway et al. 1983
Abies amabilis/*Vaccinium membranaceum-Xerophyllum tenax*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Xerophyllum tenax* Association; Henderson et al. 1989, Henderson et al. 1992
Abies amabilis/*Xerophyllum tenax* Association, Seral Phase; Franklin et al. 1988
Abies amabilis/*Xerophyllum tenax* Association, *Tsuga heterophylla* Phase; Franklin et al. 1988
Abies amabilis/*Xerophyllum tenax* Lithosol Association; Franklin 1966
Abies amabilis/*Xerophyllum tenax*-NWW; Henderson et al. 1989, Henderson et al. 1992
Abies amabilis-Tsuga heterophylla/*Vaccinium membranaceum* Association; Franklin 1966
Abies amabilis-Tsuga heterophylla/*Xerophyllum tenax* Community Type; Henderson et al. 1979
Pseudotsuga menziesii/*Xerophyllum tenax* Community Type; Franklin et al. 1988
Tsuga heterophylla-Abies amabilis/*Xerophyllum tenax-Vaccinium membranaceum* Community Type; del Moral and Long 1977

Abies amabilis-(Tsuga heterophylla)/Vaccinium membranaceum Forest

Pacific Silver Fir-(Western Hemlock)/Big Huckleberry Forest

Acronym: ABIAMA-(TSUHET)/VACMEM

NatureServe Code: CEGL000235

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 1



Range: This association occurs in both the Cascades, and less commonly, in the Olympic Mountains.

Plots: 13, MORA (7), NOCA (3), OLYM (1), Other (2)

Environmental Description: This association occurs at middle to high elevations. Sites have well-drained, often shallow or rocky soils, and occur mostly on southerly aspects and mid to upper slopes. Sites east of the Cascade crest are generally more variable in topography and soils.

Vegetation Description: *Abies amabilis*, *Tsuga heterophylla*, and/or *Pseudotsuga menziesii* dominate the canopy, however the latter two species are not always present. *Abies lasiocarpa* is occasionally prominent. *Abies amabilis* has over 10% total cover and usually dominates tree regeneration. The shrub layer ranges from sparse to moderately dense and is characterized by the presence to dominance of *Vaccinium membranaceum*. *Vaccinium alaskaense* occurs only infrequently and in small amounts (under 5% cover). The herb layer is typically sparse but can infrequently have moderate cover. *Clintonia uniflora*, *Rubus lasiococcus*, and *Orthilia (=Pyrola) secunda* are frequently present.

USFWS Wetland System: Not applicable.

Comments: This type is distinguished from similar ones by the infrequent occurrence and low cover, if present, of *Xerophyllum tenax*, *Valeriana sitchensis*, *Arnica latifolia*, *Acer circinatum*, *Vaccinium alaskaense*, and *Achlys (californica, triphylla)*.

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however, some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis-(*Tsuga heterophylla*)/*Vaccinium membranaceum* Forest; Chappell 2005 NPK
Abies amabilis/*Vaccinium membranaceum*/*Clintonia uniflora*-Wen-PNW; Lillybridge et al. 1995
Abies amabilis/*Vaccinium membranaceum-Clintonia uniflora* Wen Association; Kovalchik 2001
Abies amabilis/*Vaccinium membranaceum*-NWW; Henderson et al. 1992
Abies amabilis/*Vaccinium membranaceum-Pyrola secunda*-NWW; Henderson et al. 1992,
Abies amabilis/*Vaccinium membranaceum-Pyrola secunda*-PNW; Lillybridge et al. 1995

Abies amabilis-(Tsuga heterophylla)/Vaccinium membranaceum-Vaccinium alaskaense Forest

Pacific Silver Fir-(Western Hemlock)/Big Huckleberry-Alaska Blueberry Forest

Acronym: ABIAMA-(TSUHET)/VACMEM-VACALA

NatureServe Code: CEGL002610

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 1



Range: This association occurs in the Cascade and the Olympic Mountains.

Plots: 17, MORA (12), NOCA (2), OLYM (3), Other (0)

Environmental Description: This association occurs at middle elevations on well-drained sites. It is absent from the wettest climatic areas such as the western Olympics.

Vegetation Description: *Abies amabilis* co-dominates the canopy with one or more of the following co-dominants: *Tsuga heterophylla* (usually) *Cupressus (=Chamaecyparis) nootkatensis* (occasionally), *Pseudotsuga menziesii* (occasionally prominent) or *Picea engelmannii* (east Cascades only). The shrub layer is usually well-developed and co-dominated by *Vaccinium alaskaense* and *V. membranaceum*. *Menziesia ferruginea* is often present. The herb layer is variable, with *Clintonia uniflora, Rubus pedatus, R. lasiococcus, Orthilia secunda,* and *Goodyera oblongifolia* the most frequent species.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis-(*Tsuga heterophylla*)/*Vaccinium membranaceum*-*Vaccinium alaskaensis* Forest; Chappell 2005 NPK
Abies amabilis/*Vaccinium alaskaense* Association; Lillybridge et al. 1995
Abies amabilis/*Vaccinium alaskaense*-Wen-PNW; Lillybridge et al. 1995
Abies amabilis/*Vaccinium membranaceum-Vaccinium alaskaense* Association; Henderson et al. 1992
Abies amabilis/*Vaccinium membranaceum-Vaccinium alaskaense*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Vaccinium membranaceum-Vaccinium ovalifolium* Community Type; del Moral and Long 1977

Abies amabilis/Menziesia ferruginea Forest

Pacific Silver Fir/Fool's Huckleberry Forest



Acronym: ABIAMA/MENFER

NatureServe Code: CEGL000224

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs commonly at Mount Rainier and rarely in the North Cascades and the Olympic Mountains.

Plots: 33, MORA (28), NOCA (1), OLYM (3), Other (1)

Environmental Description: Sites tend to be moist and well-drained, with more snow than average for middle elevations. Aspects tend to be northerly.

Vegetation Description: The canopy is dominated or co-dominated by *Abies amabilis* with *Tsuga heterophylla* usually prominent to co-dominant. *Pseudotsuga menziesii* is occasionally prominent. The well-developed shrub layer is co-dominated by *Menziesia ferruginea* and one or more of the following: *Vaccinium alaskaense*, *V. membranaceum*, and *V. ovalifolium*. The herb layer is variable. *Clintonia uniflora*, *Orthilia secunda*, *Rubus lasiococcus* and *R. pedatus* are usually present. *Xerophyllum tenax* or *Erythronium montanum* can be prominent to co-dominant.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Menziesia ferruginea* Association; Brockway et al. 1983, Franklin et al. 1988, Lillybridge et al. 1995
Abies amabilis/*Menziesia ferruginea* Forest; Chappell 2005 NPK
Abies amabilis/*Menziesia ferruginea* Wen Association; Kovalchik 2001
Abies amabilis/*Menziesia ferruginea*-PNW; McCain and Diaz 2002b, Brockway et al. 1983
Abies amabilis/*Menziesia ferruginea*-Wen-PNW; Lillybridge et al. 1995
Abies amabilis/*Vaccinium membranaceum*/*Clintonia uniflora* Community Type; del Moral et al. 1976
Abies amabilis/*Vaccinium ovalifolium* Association; Franklin 1966
Abies amabilis-Tsuga heterophylla/*Vaccinium membranaceum-Menziesia ferruginea* Community Type; del Moral and Long 1977

Abies amabilis/Rhododendron albiflorum Forest

Pacific Silver Fir/Cascade Azalea Forest



Acronym: ABIAMA/RHOALB

NatureServe Code: CEGL000225

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 1

Range: This association occurs in the Cascade and the Olympic Mountains.

Plots: 32, MORA (28), NOCA (1), OLYM (2), Other (1)

Environmental Description: This association occurs at middle to high elevations on northerly aspects. Sites occur on middle to upper slopes and are often steep with rocky or shallow well-drained soils.

Vegetation Description: *Abies amabilis* dominates the canopy or co-dominates with *Tsuga heterophylla*, *Abies lasiocarpa*, or *Pseudotsuga menziesii*. The often dense shrub layer is dominated or co-dominated by *Rhododendron albiflorum*. *Vaccinium membranaceum* is usually prominent to co-dominant. *Vaccinium alaskaense* or *Menziesia ferruginea* are occasionally co-dominant. The herb layer is variable in composition and density. *Rubus lasiococcus* is the only consistent herb, and is sometimes prominent. *Valeriana sitchensis, Orthilia (=Pyrola) secunda*, and *Rubus pedatus* are frequent. *Erythronium montanum* is occasionally prominent to co-dominant.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Rhododendron albiflorum* Association; Brockway et al. 1983, Franklin 1966, Franklin et al. 1979
Abies amabilis/*Rhododendron albiflorum* Forest; Chappell 2005 NPK
Abies amabilis/*Rhododendron albiflorum*/*Clintonia uniflora*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1982, Hemstrom et al. 1987
Abies amabilis/*Rhododendron albiflorum*/Depauperate Community; Wooten and Morrison 1995
Abies amabilis/*Rhododendron albiflorum*/*Xerophyllum tenax*-PNW; McCain and Diaz 2002b, Hemstrom et al. 1982, Hemstrom et al. 1987
Abies amabilis/*Rhododendron albiflorum*-GP-PNW; Brockway et al. 1983
Abies amabilis/*Rhododendron albiflorum*-*Vaccinium alaskaense* Association; Henderson et al. 1992
Abies amabilis/*Rhododendron albiflorum*-*Vaccinium alaskaense*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Rhododendron albiflorum*-*Vaccinium membranaceum* Association; Henderson et al. 1992, Lillybridge et al. 1995
Abies amabilis/*Rhododendron albiflorum*-*Vaccinium membranaceum* Wen Association; Kovalchik 2001
Abies amabilis/*Rhododendron albiflorum*-*Vaccinium membranaceum*-NWW; Henderson et al. 1992
Abies amabilis/*Rhododendron albiflorum*-*Vaccinium membranaceum*-Wen-PNW; Lillybridge et al. 1995
Abies amabilis/*Vaccinium alaskaense*-*Rhododendron albiflorum* Association; Henderson et al. 1989
Abies amabilis-*Picea engelmannii*/*Rhododendron albiflorum*-*Vaccinium membranaceum* Community; del Moral et al. 1976

Abies amabilis/Vaccinium membranaceum /Rubus lasiococcus Forest

Pacific Silver Fir/Big Huckleberry/ Dwarf Bramble Forest



Acronym: ABIAMA/VACMEM/RUBLAS

NatureServe Code: CEGL000236

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Mesic Silver Fir-Western Hemlock Forest

Alliance: *Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in both the Cascade, and less commonly, the Olympic Mountains.

Plots: 44, MORA (37), NOCA (0), OLYM (3), Other (4)

Environmental Description: This association occurs at middle to high elevations. Sites have well-drained, often shallow or rocky soils, and occur mostly on south to west aspects and mid to upper slopes. Sites east of the Cascade crest are generally more variable in topography and soils.

Vegetation Description: The canopy is dominated by *Abies amabilis*, *Abies procera,* and/or *Cupressus (=Chamaecyparis) nootkatensis*. *Abies amabilis* has over 10% total cover and usually dominates tree regeneration. *Tsuga heterophylla*, and/or *Pseudotsuga menziesii* are occasionally prominent. Although *Tsuga mertensiana* occurs frequently, it always displays less than 10% cover. The presence to dominance of *Vaccinium membranaceum* characterizes the open to moderately dense shrub layer. Other shrubs such as *Sorbus sitchensis, Rhododendron albiflorum*, and *Vaccinium ovalifolium* occur only infrequently and in small amounts (under 5% cover). The herb layer is typically sparse or infrequently moderate in cover. *Valeriana sitchensis, Arnica latifolia*, *Rubus lasiococcus*, and *Erythronium montanum* are frequently present. *Achlys (californica, triphylla), Clintonia uniflora, Rubus pedatus,* and *Tiarella trifoliata* can be prominent.

USFWS Wetland System: Not applicable.

Comments: The citations describing this association do not fit well within the types described in the coastal correlation project (Meidinger et al. 2005) and were not included in that work. This type is distinguished from similar ones by frequent occurrence and significant cover of *Valeriana sitchensis*, *Arnica latifolia*, and *Rubus lasiococcus*. Higher elevation sites with *Abies lasiocarpa* are *Abies lasiocarpa-(Abies amabilis)/Vaccinium membranaceum/Valeriana sitchensis* Forest (CEGL002612).

Conservation Rank: S3S4

Rank Justification: Many natural-origin stands occur on protected lands although many are subject to logging and development.

Synonyms:
Abies amabilis/*Rubus lasiococcus Rubus lasiococcus* phase; Franklin et al. 1988
Abies amabilis/*Vaccinium membranaceum-Valeriana sitchensis*; Henderson et al. 1992
Abies amabilis/*Rubus lasiococcus;* Lillybridge et al. 1995, p166

Acer macrophyllum-(Pseudotsuga menziesii)/Polystichum munitum Forest

Bigleaf Maple-(Douglas-fir)/Swordfern Forest



Acronym: ACEMAC-(PSEMEN)/POLMUN

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest

Alliance: *Acer macrophyllum*-(*Pseudotsuga menziesii*) Forest

Classification Confidence Level: 3

Range: This association occurs in the Olympic and the Cascade Mountains.

Plots: 9, MORA (0), NOCA (1), OLYM (8), Other (0)

Environmental Description: This association occurs at elevations generally below 760 m (2500 ft). Slope gradients are moderate to very steep. Sites are sometimes associated with old debris flows or on slopes. Some stands show evidence of disturbance from mass movements or tree harvesting. Sites can be heavily browsed. This association is seral, developing very commonly after logging and less commonly after fire.

Vegetation Description: This broadleaf or mixed forest association is dominated to co-dominated by *Acer macrophyllum. Pseudotsuga menziesii* is often co-dominant. Shrubs, usually *Mahonia (=Berberis) nervosa*, or less often *Holodiscus discolor*, are typically scattered when present but can form dense patches. *Acer circinatum* can occur abundantly as a tall shrub layer. *Rubus ursinus* is a frequent dwarf-shrub. *Polystichum munitum* characteristically dominates the understory and may appear to be the only understory species. Typically other herbaceous species are present to prominent, including *Achlys (californica, triphylla)*, *Prosartes (=Disporum) hookeri*, *Trientalis borealis* ssp. *latifolia* and *Asarum caudatum*.

USFWS Wetland System: Not applicable.

Comments: There is possible confusion or overlap between this association and *Acer macrophyllum-Alnus rubra/Polystichum munitum-Tellima grandiflora* (CEGL003334) of the Puget Trough lowlands. The latter is confined to coastal bluffs or landslide slopes and is characterized by substantial *Tellima grandiflora,* with much greater abundance of *Rubus spectabilis, Sambucus racemosa, Oemleria cerasiformis* and *Urtica dioica. Acer macrophyllum-(Pseudotsuga menziesii)/Polystichum munitum* also commonly occurs in the Puget Trough lowlands where it is apparently confined to previously logged sites.

Conservation Rank: S4S5

Rank Justification: This association occurs in a wide range of environments and is associated with past disturbances.

Synonyms:

Acer macrophyllum/Paxistima myrsinites Shrubland

Bigleaf Maple/Oregon boxwood Shrubland



Acronym: ACEMAC/PAXMYR

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest

Alliance: *Acer macrophyllum*-(*Pseudotsuga menziesii*) Forest

Classification Confidence Level: 3

Range: This association is represented by a single plot in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association occurs at 945 m (3100 ft) elevation on a steep, southwest facing, old debris avalanche slope (72% gradient). Soil is rocky with very little soil development. Fire scars and charcoal are present on downed trees.

Vegetation Description: A well-developed tall shrub layer is dominated by shrub-form *Acer macrophyllum*. Other tall shrub species are *Acer circinatum* and *Amelanchier alnifolia* with the shorter shrub, *Paxistima (=Pachistima) myrsinites*, abundant. The herb layer is sparse with *Pteridium aquilinum* most abundant.

USFWS Wetland System: Not applicable**.**

Comments:

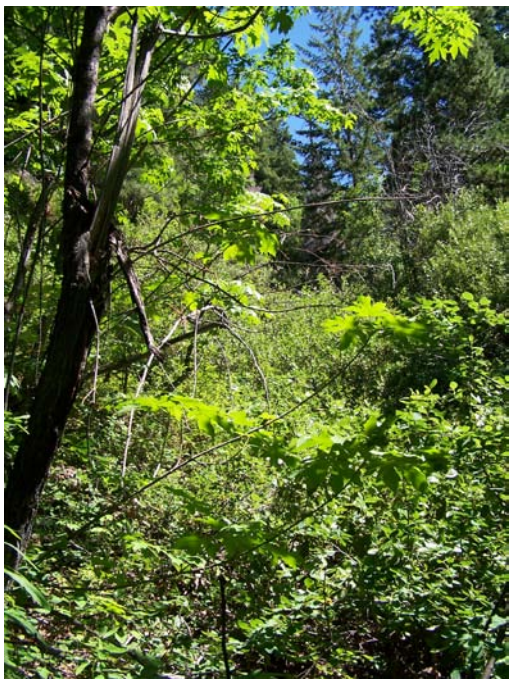
Conservation Rank: S2S4Q

Rank Justification: There is insufficient information to assess this provisional association.

Synonyms:

Acer macrophyllum/Symphoricarpos albus Forest

Bigleaf Maple/Common Snowberry Forest



Acronym: ACEMAC/SYMALB

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest

Alliance: *Acer macrophyllum*-(*Pseudotsuga menziesii*) Forest

Classification Confidence Level: 3

Range: This association is described from the North Cascades.

Plots: 4, MORA (0), NOCA (4), OLYM (0), Other (0)

Environmental Description: This low to mid-elevation association appears mostly on moderately steep slopes, including talus.

Vegetation Description: This broadleaf forest is typically dominated by *Acer macrophyllum* and/or co-dominated by *Pseudotsuga menziesii*. The canopy can occasionally be of short stature. A dense shrub layer characterizes this association. *Symphoricarpos albus* is the most common shrub and is often very abundant. *Cornus nuttallii* and *Salix scouleriana* can be prominent tall shrubs. Other shrubs include *Paxistima (=Pachistima) myrsinites*, *Rubus parviflorus*, *Rosa gymnocarpa* or *Philadelphus lewisii*. *Maianthemum (=Smilacina) racemosum*, *Prosartes (=Disporum) hookeri*, *Osmorhiza berteroi (=chilensis)*, *Pteridium aquilinum*, and *Elymus glaucus* are frequent and prominent members of the herb layer.

USFWS Wetland System: Not applicable.

Comments: Two plots contain typical east Cascades species, such as, *Pinus ponderosa* and *Calamagrostis rubescens*. Although similarly named, the Willamette valley *Acer macrophyllum-Abies grandis*/*Symphoricarpos albus* Forest association (CEGL000512) is a riparian type and has a very different list of associated species.

Conservation Rank: S3S4Q

Rank Justification: This is a preliminary association currently represented by four locations all within protected areas. It may be more extensive.

Synonyms:

Alnus rubra/Alnus viridis ssp. sinuata Forest

Red Alder/Sitka Alder Forest



Acronym: ALNRUB/ALNVIR

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest

Alliance: *Alnus rubra*-(*Picea sitchensis*-*Tsuga heterophylla*) Forest and Woodland

Classification Confidence Level: 3

Range: This association is described from Mount Rainier and could occur elsewhere in the Cascades and Olympic Mountains.

Plots: 3, MORA (3), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at mid-elevations 750-920 m (2500-3000 ft) on gentle north facing slopes. It appears near rivers, debris chute runouts or other frequently disturbed sites. Surficial sandy soil indicative of flooding can be present as well as flood-transported woody debris. These features suggest relatively frequent flooding and/or early successional status.

Vegetation Description: Young *Alnus rubra* forests are typical of this association. Large-diameter *Pseudotsuga menziesii* snags or remnant trees are usually present. *Tsuga heterophylla*, *Thuja plicata* or *Abies amabilis* are usually present with low cover. *Alnus rubra* tree canopy is dense but relatively short-statured. *Alnus viridis* ssp. *sinuata* and *Rubus spectabilis* are prominent in the patchy, diverse shrub layer. Other shrubs include *Acer circinatum*, *Oplopanax horridus*, *Salix scouleriana*, *Sambucus racemosa*, and *Ribes lacustre*. A sparse herb layer contains *Polystichum munitum*, *Athyrium filix-femina*, and *Asarum caudatum*.

USFWS Wetland System: Not applicable.

Comments: This provisional type may be transitory and not represent a stable plant association. More riparian sampling is needed to fully describe this type and resolve its status.

Conservation Rank: S3S4Q

Rank Justification: This provisional association occurs on naturally disturbed sites and currently is represented in protected areas.

Synonyms:

Alnus rubra/Polystichum munitum Forest

Red Alder/Swordfern Forest



Acronym: ALNRUB/POLMUN

NatureServe Code: CEGL000638

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Doug fir Forest

Alliance: *Alnus rubra*-(*Picea sitchensis*-*Tsuga heterophylla*) Forest and Woodland

Classification Confidence Level: 2

Range: This association is described from the Puget Lowlands, Mount Rainier and the Olympic Mountains.

Plots: 4, MORA (1), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs on upland slopes (varying steepness) usually with mesic, well-drained soils. It is not associated with riparian landforms, rather it is result of succession after fires, logging, landslides or slope failures.

Vegetation Description: This forest association is dominated by *Alnus rubra*. The herb layer is always dominated by *Polystichum munitum*. Other frequently occurring species include *Claytonia (=Montia) sibirica*, *Athyrium filix-femina*, *Anaphalis margaritacea*, and *Tellima grandiflora*. If present, a well-developed shrub layer is usually dominated by *Rubus spectabilis*.

USFWS Wetland System: Not applicable.

Comments: Sites found on landslide deposits, especially at lower elevations, are similar to the *Acer macrophyllum - Alnus rubra* / *Polystichum munitum - Tellima grandiflora* Forest (CEGL003334) but differ in no or low cover of *Acer macrophyllum, Holodiscus discolor, Rubus parviflorus, Blechnum spicant,* and *Tiarella trifoliata*.

Conservation Rank: S4

Rank Justification: This association occurs in a wide range and is associated with past disturbances.

Synonyms:
Alnus rubra/*Polystichum munitum*; Chappell 2006 Puget, Chappell 2001, Chappell 2005 NPK
Alnus rubra/*Polystichum munitum-Pteridium aquilinum*/*Eurynchium oreganum* Community Type; del Moral and Long 1977
Alnus rubra-Tsuga heterophylla/*Polystichum munitum* Community; Agee 1987

Populus balsamifera ssp. trichocarpa/Gaultheria shallon/Polystichum munitum Forest

Black Cottonwood/Salal/Swordfern Forest



Acronym: POPBAL/GAUSHA/POLMUN

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest

Alliance: *Populus balsamifera ssp. trichocarpa-Tsuga heterophylla* Forest

Classification Confidence Level: 3

Range: This type is described from one plot at Mount Rainier.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: The plot defining this association is located on an old lahar or debris flow surface at 750 m (2460 ft) elevation on a 5% slope.

Vegetation Description: This forest is co-dominated by *Populus balsamifera* ssp. *trichocarpa, Tsuga heterophylla* and *Thuja plicata*. *Populus balsamifera* ssp. *trichocarpa* and *Alnus rubra* established on the newest lahar or debris flow surface and co-occur with remnant *Thuja plicata*. The diverse herb layer is dominated by *Polystichum munitum.* The shrub layer is dominated by *Gaultheria shallon*, with *Thuja plicata* regeneration and a dense moss ground cover.

USFWS Wetland System: Not applicable.

Comments: The one plot of this type may represent a unique vegetation type or may represent variant of the *Pseudotsuga menziesii-Tsuga heterophylla*/*Gaultheria shallon*/*Polystichum munitum* association (CEGL000091).

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Populus balsamifera ssp. trichocarpa-Alnus rubra/Rubus ursinus-Equisetum arvense Forest

Black Cottonwood-Red Alder/Pacific Blackberry-Field Horsetail Forest



Acronym: POPBAL-ALNRUB/RUBURS-EQUARV

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland and Montane Rainforest

Group: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest

Alliance: *Populus balsamifera ssp. trichocarpa-Tsuga heterophylla* Forest

Classification Confidence Level: 3

Range: This association is described from one plot at Mount Rainier.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This vegetation appears at 775 m (2540 ft) elevation on an old lahar surface.

Vegetation Description: This mixed forest canopy is co-dominated by *Populus balsamifera* ssp. *trichocarpa* and *Alnus rubra*. *Tsuga heterophylla* and *Thuja plicata* are occasionally prominent. An open shrub layer of *Rubus spectabilis* may be present. The herbaceous layer is dominated by *Rubus ursinus* and *Pyrola asarifolia. Polystichum munitum* and *Equisetum arvense* are prominent.

USFWS Wetland System: Not applicable.

Comments: The one plot of this type may represent a unique type or may represent a variant of the riparian *Populus balsamifera* ssp. *trichocarpa-Alnus rubra*/*Rubus spectabilis* association (CEGL003407).

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Abies lasiocarpa-(Pinus contorta)/Lupinus (arcticus, latifolius) Woodland

Subalpine Fir/Lupine Woodland



Acronym: ABILAS-(PINCON)/LUPARC

NatureServe Code: CEGL000316

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies lasiocarpa - (Picea engelmannii) / (Rubus lasiococcus)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs only in the northeastern Olympic Mountains.

Plots: 5, MORA (0), NOCA (0), OLYM (5), Other (0)

Environmental Description: Sites are dry, upper slopes and ridgetops on southwestern aspects between 1500 and 1850 m (4900-6070 ft) elevation within the driest portion of the rainshadow.

Vegetation Description: The upper canopy of this woodland or open forest association is relatively short. In the plots from the parks, the canopy is dominated by *Abies lasiocarpa. Pinus contorta* can be dominant or co-dominant. A shrub layer is largely absent, although the dwarf-shrub *Juniperus communis* is occasionally prominent. The herb layer is dominated by *Lupinus (arcticus ssp. subalpinus, latifolius)*, which has a mean cover of 15%, and occasionally co-dominated by *Arnica cordifolia*. Other frequent understory species that occur in low abundance are *Paxistima (=Pachistima) myrsinites*, *Lomatium martindalei*, *Orthilia (=Pyrola) secunda*, *Hieracium albiflorum*, and *Valeriana sitchensis*.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished from similar associations by having over 3% cover of *Lupinus (arcticus, latifolius)*, along with little to no *Abies amabilis*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Rhododendron albiflorum* (under 10%), *Vaccinium membranaceum* (under 5%), *Valeriana sitchensis*, or *Luzula glabrata* var. *hitchcockii* (under 3%).

Conservation Rank: S2

Rank Justification: This association has a very limited geographic and environmental range, specifically dry sites at high elevations in the extreme rainshadow of the northeastern Olympic Mountains. It probably has not declined much and is mostly in good condition, nor does it face significant near-term threats. The global rank was changed from G3 to G2 to reflect its limited environmental range and occurrence near treeline; this type may be sensitive to compositional changes related to global climate change.

Synonyms:
Abies lasiocarpa-(*Pinus contorta*)/*Lupinus arcticus* ssp. *subalpinus* Woodland; Chappell 2005 NPK
Abies lasiocarpa/*Lupinus latifolius* Association; Henderson et al. 1989
Abies lasiocarpa/*Lupinus latifolius*-NWW; Henderson et al. 1989

Abies lasiocarpa/Vaccinium scoparium/Valeriana sitchensis *Woodland*

Subalpine Fir/Grouse Whortleberry/Sitka Valerian Woodland



Acronym: ABILAS/VACSCO/VALSIT

NatureServe Code: Preliminary

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies lasiocarpa - (Picea engelmannii) / (Rubus lasiococcus)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in Mount Rainier.

Plots: 6, MORA (5), NOCA (0), OLYM (0), Other (1)

Environmental Description: This parkland forest association occurs at high elevation on steep slopes. Sites have well-drained soils and often have southern aspects.

Vegetation Description: This is a conifer forest or woodland of relatively short stature. *Abies lasiocarpa* is always dominant (less than 50% cover). *Picea engelmannii* or *Pinus contorta* may sometimes occur in the canopy. The dwarf-shrub *Vaccinium scoparium* is prominent to dominant. The herbaceous understory is relatively diverse but typically with low cover. *Valeriana sitchensis*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Luzula glabrata* var. *hitchcockii*, *Xerophyllum tenax*, *Arnica latifolia* and *Polemonium pulcherrimum* are usually present to prominent.

USFWS Wetland System: Not applicable.

Comments: This is a Cascadian version of the Northern and Central Rocky Mountain *Abies lasiocarpa - Picea engelmannii / Vaccinium scoparium / Thalictrum occidentale Forest* (CEGL005919). The Rocky Mountain association has an abundance of *Thalictrum occidentale* and lacks more Cascadian species such as *Rubus lasiococcus*.

Conservation Rank: S3Q

Rank Justification: This preliminary association occurs within a limited range with few threats. Climate change will likely affect this vegetation.

Synonyms:
Abies lasiocarpa/Vaccinium scoparium Arnica latifolia Association; Lillybridge et al. 1995
Abies lasiocarpa/Vaccinium scoparium-Luzula hitchcockii Association; Lillybridge et al. 1995

Abies lasiocarpa-Picea engelmannii/Phyllodoce empetriformis Woodland

Subalpine Fir-Engelmann spruce/Pink Mountain-heather Woodland



Acronym: ABILAS-PICENG/PHYEMP

NatureServe Code: CEGL000920

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies lasiocarpa - (Picea engelmannii) / (Rubus lasiococcus)* Forest Alliance

Classification Confidence Level: 3

Range: This association occurs in the eastern North Cascades and isolated high peaks in the Okanogan Highlands in Washington and adjacent British Columbia.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This cold, dry, montane woodland association occurs at elevations from 2040 to 2150 m (6700-7050 ft). Stands occur on very cold sites on upper slopes on northern aspects.

Vegetation Description: The tree canopy is co-dominated by *Abies lasiocarpa* and *Picea engelmannii* and contains *Pinus albicaulis* and *Pinus contorta* in the canopy. The shrub layer is patchy but dense and co-dominated by *Phyllodoce empetriformis* and *Vaccinium scoparium*. Herbaceous species are rare to absent. Lichens are common.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data set of vegetation plots in national parks in Washington. This is a recommended name change for the NatureServe association *Abies lasiocarpa*/*Phyllodoce empetriformis* (CEGL000920).

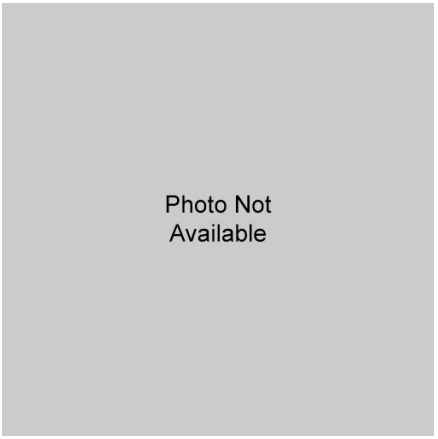
Conservation Rank: S3S4

Rank Justification: This association occurs within a restricted range with few threats. Climate change will likely effect this vegetation.

Synonyms:
Abies lasiocarpa-Picea engelmannii/*Phyllodoce empetriformis* Woodland; Chappell 2005 NPK
Abies lasiocarpa / *Phyllodoce empetriformis;* Williams and Lillybridge 1983, Clausnitzer & Zamora 1987
Abies lasiocarpa-Picea engelmannii/Phyllodoce empetriformis-Vaccinium scopulorum Association; Annable & Peterson *1988*

Abies lasiocarpa-(Pinus contorta)/Juniperus communis-Lomatium martindalei Woodland

Subalpine Fir-(Lodgepole Pine)/Common Juniper-Cascade Desert-parsley Woodland



Acronym: ABILAS-(PINCON)/JUNCOM-LOMMAR

NatureServe Code: CEGL000330

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies lasiocarpa - (Picea engelmannii) / (Rubus lasiococcus)* Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the northeast Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at high elevations. Sites have shallow, well-drained soils and occur on ridgetops or southwest aspects.

Vegetation Description: The canopy is dominated by *Pinus contorta* and/or *Abies lasiocarpa*. *Abies lasiocarpa* usually dominates tree regeneration and typically has over 10% total cover. *Pseudotsuga menziesii* is sometimes present to prominent. A dwarf-shrub layer dominated by *Juniperus communis* is characteristic. Other shrubs and dwarf-shrubs are sparse or absent. The rather sparse herb layer usually has *Lomatium martindalei*, *Phlox diffusa*, *Achillea millefolium*, *Penstemon procerus*, *Carex rossii*, *Festuca roemeri (=idahoensis)*,and *Orthilia (=Pyrola) secunda*. *Lupinus (arcticus* ssp. *subalpinus, latifolius*) is occasionally prominent but always less abundant than *Juniperus communis*.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current plot data for Olympic National Park where it is expected to occur.

Conservation Rank: S2S3

Rank Justification: This association is apparently represented at few sites in protected areas. Threats are few, although climate change will likely affect this vegetation.

Synonyms:
Abies lasiocarpa-(*Pinus contorta*)/*Juniperus communis-Lomatium martindalei* Woodland; Chappell 2005 NPK
Abies lasiocarpa/*Juniperus communis* Association; Henderson et al. 1989
Abies lasiocarpa/*Juniperus communis*-NWW; Henderson et al. 1989

Abies lasiocarpa-(Abies amabilis)/Menziesia ferruginea Forest

Subalpine Fir-(Pacific Silver Fir)/Fool's Huckleberry Forest



Acronym: ABILAS-(ABIAMA)/MENFER

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 3

Range: This association occurs in the North Cascades.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: This association occurs at subalpine elevations on sites that tend to be moist and well-drained and with more "continental" climate than average for the elevation.

Vegetation Description: The canopy is dominated or co-dominated by *Abies lasiocarpa* with *Abies amabilis* or *Picea engelmannii* prominent to co-dominant. The well-developed shrub layer is dominated or co-dominated by *Menziesia ferruginea* and *Vaccinium membranaceum*. The herb layer is rather variable with only *Valeriana sitchensis* prominent in both stands.

USFWS Wetland System: Not applicable.

Comments: The plots assigned to this type may represent variation within the *Abies amabilis*/*Menziesia ferruginea* (CEGL000224) association in the Cascades and Coast Ranges. That association differs by having much less *Abies lasiocarpa* and more *Tsuga heterophylla*.

Conservation Rank: S2Q

Rank Justification: This association has a provisional classification status represented by only two locations that are protected in the National Park system.

Synonyms:

Abies lasiocarpa-(Abies amabilis)/Vaccinium membranaceum/Valeriana sitchensis Forest

Subalpine Fir-(Pacific Silver Fir)/Big Huckleberry/Sitka Valerian Forest



Acronym: ABILAS-(ABIAMA)/VACMEM/VALSIT

NatureServe Code: CEGL002612

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the Cascades and in the northeastern Olympic Mountains.

Plots: 52, MORA (24), NOCA (12), OLYM (10), Other (6)

Environmental Description: This association occurs at relatively high elevations and usually in relatively dry climatic zones. Sites have well-drained soils and usually southern aspects.

Vegetation Description: *Abies lasiocarpa* dominates or co-dominates in a forest with a semi-open to closed tree canopy. *Abies amabilis* is usually present as the dominant regenerating tree and occasionally is co-dominant in the canopy. *Picea engelmanii* is sometimes prominent to co-dominant. The shrub layer is typically moderate in density and dominated by *Vaccinium membranaceum*. *Sorbus sitchensis* and *V. deliciosum* are frequent. Occasionally shrubs are only sparsely represented. The well-developed, diverse, and variable herbaceous layer almost always has *Valeriana sitchensis* prominent to co-dominant. *Rubus lasiococcus*, *Arnica latifolia* and *Veratrum viride* are usually present to co-dominant. *Clintonia uniflora*, *Rubus pedatus, Tiarella trifoliata, Luzula glabrata* var. *hitchcockii* and *Erythronium montanum* are less frequent but can be prominent to co-dominant.

USFWS Wetland System: Not applicable.

Comments: This type differs from *Abies lasiocarpa*/*Valeriana sitchensis* (CEGL000345) by having a greater abundance of *Vaccinium membranaceum* and *Abies amabilis* and a more diverse flora. One plot at North Cascades (NCF-54) is dominated by *Vaccinium membranaceum* and *Linnaea borealis* without *Valeriana sitchensis* or *Arnica latifolia*. It is similar to this association due to the presence of *Abies amabilis*, *Tsuga mertensiana*, other mesic indicators and the absence of high elevation or east Cascades species. It is in the stand table as ABILAS-(PSEMEN)/VACMEM.

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands. Some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Veratrum viride* Association; Franklin 1966
Abies lasiocarpa Type; Fonda and Bliss 1969
Abies lasiocarpa-(*Abies amabilis*)/*Vaccinium membranaceum*/*Valeriana sitchensis* Forest; Chappell 2005 NPK
Abies lasiocarpa/*Valeriana sitchensis* Community Type; Franklin et al. 1988

Abies lasiocarpa-(Abies amabilis)/Vaccinium membranaceum/Xerophyllum tenax Forest

Subalpine fir-(Pacific Silver Fir)/Big Huckleberry/Beargrass Forest



Acronym: ABILAS-(ABIAMA)/VACMEM/XERTEN

NatureServe Code: Preliminary

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier and in the northern and eastern Olympic Mountains.

Plots: 16, MORA (11), NOCA (0), OLYM (5), Other (0)

Environmental Description: This association occurs at middle to high elevations. Sites occupied are dry, usually on mid to upper slopes or ridgetops, with shallow or rocky soils and southerly aspects.

Vegetation Description: The typically open canopy is dominated by *Abies lasiocarpa (*always over 10% total cover) and *A. amabilis* or *A. procera. Cupressus (=Chamaecyparis) nootkatensis* or *Pseudotsuga menziesii* may be prominent in the canopy. The shrub layer always has *Vaccinium membranaceum*, which usually is dominant. The well-developed herb layer is dominated by *Xerophyllum tenax,* often with *Rubus lasiococcus, Orthilia (=Pyrola) secunda*, *Lupinus (arcticus ssp. subalpinus, latifolius)* or *Vaccinium scoparium*

USFWS Wetland System: Not applicable.

Comments: This is similar to *Abies amabilis*-(*Pseudotsuga menziesii-Abies procera*)/*Vaccinium membranaceum*/ *Xerophyllum tenax* Forest (CEGL000239) but is found on colder sites.

Conservation Rank: S2S4Q

Rank Justification: This association has a preliminary classification status and apparently represented at many sites in protected areas.

Synonyms:
Abies amabilis/*Xerophyllum tenax* Association, *Tsuga mertensiana* Phase; Franklin et al. 1988
Abies amabilis/*Xerophyllum tenax* Lithosol Association; Franklin 1966

Abies lasiocarpa/Erythronium montanum Forest

Subalpine Fir/Avalanche Lily Forest



Acronym: ABILAS/ERYMON

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 3

Range: This association is described only from the Olympic Mountains.

Plots: 4, MORA (0), NOCA (0), OLYM (4), Other (0)

Environmental Description: This association occurs at elevations of 1400-1800 m (4600-6000 ft) on 20-55% slopes with south to southeast aspects.

Vegetation Description: *Abies lasiocarpa* always dominates (mean cover 60%) with *Tsuga mertensiana* or *Cupressus (=Chamaecyparis) nootkatensis* sometimes prominent. A shrub layer is largely absent: *Vaccinium membranaceum* was present with less than 5% cover. The lush herbaceous understory is dominated by the forb *Erythronium montanum* (mean cover 50%). *Rubus lasiococcus*, *Polygonum bistortoides*, *Lupinus (arcticus* ssp. *subalpinus, latifolius*), and *Juncus parryi* can infrequently be prominent to co-dominant.

USFWS Wetland System: Not applicable.

Comments: This provisional type might be included within the variation of the *Abies lasiocarpa*/*Valeriana sitchensis* association (CEGL000345), but more data are needed.

Conservation Rank: S2Q

Rank Justification: This provisional association occurs within a limited range with few threats. Climate change will likely affect this vegetation type.

Synonyms:

Abies lasiocarpa/Rhododendron albiflorum/Rubus lasiococcus Forest

Subalpine Fir/Cascade Azalea/Dwarf Bramble Forest



Acronym: ABILAS/RHOALB/RUBLAS

NatureServe Code: PNWCOAST_030

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the northeastern Olympics and in the Cascades, including northeastern Mount Rainier.

Plots: 9, MORA (3), NOCA (0), OLYM (6), Other (0)

Environmental Description: This forest or woodland association occurs at high elevations (1400-1820 m (4600-6000 ft)). Sites are usually near avalanche chutes or on slopes with northwestern to eastern aspects with well-drained, shallow soils.

Vegetation Description: The canopy is dominated by *Abies lasiocarpa* with *Cupressus (=Chamaecyparis) nootkatensis* as a frequent co-dominant. *Pinus contorta* and *Pseudotsuga menziesii* have been recorded as codominants outside the parks. *Abies lasiocarpa* usually dominates tree regeneration and always has over 10% total cover. The moderate to dense shrub layer is dominated by *Rhododendron albiflorum*, with *Vaccinium membranaceum* usually present and occasionally co-dominant. *Paxistima (=Pachistima) myrsinites* is very frequent. The herb layer is sparse to moderately dense and is usually co-dominated by *Rubus lasiococcus*. *Xerophyllum tenax* occasionally co-dominates.

USFWS Wetland System: Not applicable.

Comments: This association differs from the similar east Cascades and Rocky Mountain association *Abies lasiocarpa*/*Rhododendron albiflorum* (CEGL000330) by greater cover of *Rubus lasiococcus, Cupressus nootkatensis* and *Lupinus (arcticus, latifolius*), and little to no *Picea engelmannii*, *Vaccinium scoparium*, and *V. myrtillus*. One Olympic plot (OCF-40) at 1250 m (4100 ft) elevation and co-dominated by *Phyllodoce empetriformis* is considered a variant of this association following Henderson et al. (1989). The plot appears as ABILAS/RHOALB/PHYEMP in the stand tables.

Conservation Rank: S3

Rank Justification: Natural-origin stands occur on protected lands and few are subject to logging and development.

Synonyms:
Abies lasiocarpa/*Rhododendron albiflorum* Association; Henderson et al. 1989
Abies lasiocarpa/*Rhododendron albiflorum*/*Rubus lasiococcus* Forest; Chappell 2005 NPK
Abies lasiocarpa/*Rhododendron albiflorum*-NWW; Henderson et al. 1989

Abies lasiocarpa/Vaccinium membranaceum/Lupinus (arcticus ssp. subalpinus,latifolius) Woodland

Subalpine Fir/Big Huckleberry/Lupine Woodland



Acronym: ABILAS/VACMEM/LUPARC

NatureServe Code: PNWCOAST_032

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the northern and eastern Olympic Mountains and northern and eastern slopes of Mount Rainier.

Plots: 5, MORA (2), NOCA (0), OLYM (3), Other (0)

Environmental Description: This woodland or open forest association occurs at high elevations. Sites are mostly on southeastern-facing slopes on shallow well-drained soils.

Vegetation Description: The canopy is usually dominated by *Abies lasiocarpa* or co-dominated by that species and *Pseudotsuga menziesii*. *Abies lasiocarpa* usually dominates tree regeneration and always has over 10% total cover. *Pinus contorta* is occasionally prominent. The typically well-developed shrub layer is dominated by *Vaccinium membranaceum*. *Paxistima (=Pachistima) myrsinites* is always present and often prominent. The herb layer ranges from sparse to dense and always has *Lupinus (arcticus* ssp. *subalpinus, latifolius)*. *Xerophyllum tenax* can occur as a dominant. Other frequent species are *Achillea millefolium*, *Juncus parryii*, *Hieracium albiflorum*, and *Phlox diffusa*.

USFWS Wetland System: Not applicable.

Comments: Stands with low cover of *Vaccinium membranaceum* and low cover of herbs are included. This association differs from the *Abies lasiocarpa - Picea engelmannii/ Vaccinium membranaceum* Rocky Mountain (CEGL0000341) association in the east Cascades by the presence of *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, and the lack or low abundance of more east Cascades indicators such as *Picea engelmannii*, *Vaccinium scoparium*, and *Calamagrostis rubescens*.

Conservation Rank: S3

Rank Justification: Natural-origin stands occur on protected lands within a restricted range. Climate change will like effect this vegetation.

Synonyms:
Abies lasiocarpa/*Vaccinium membranaceum* Association; Henderson et al. 1989
Abies lasiocarpa/*Vaccinium membranaceum*/*Lupinus arcticus* ssp. *subalpinus* Woodland; Chappell 2005 NPK
Abies lasiocarpa/*Vaccinium membranaceum*-NWW; Henderson et al. 1989
Abies lasiocarpa-Tsuga mertensiana/*Vaccinium membranaceum* Community Type (Dose); Henderson et al. 1979

Abies lasiocarpa/Vaccinium ovalifolium (alaskaense)/Lupinus (arcticus, latifolius) Woodland

Subalpine Fir/Alaska Blueberry/Subalpine Lupine Woodland



Acronym: ABILAS/VACALA/LUPARC

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 3

Range: This is described from one plot in the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This plot is located at 1660m (5450ft) elevation on a 36% valley wall slope.

Vegetation Description: Tree cover is 13%. Total shrub cover is near 50% and is co-dominated by short *Abies lasiocarpa* (20% cover), and *Vaccinium alaskaense*, *Sorbus sitchensis* and *Spiraea splendens* (=*densiflora*), each contributing 8% cover. Several herbaceous species,(e.g. *Lupinus* (*arcticus* ssp. *subalpinus*, *latifolius*)) occur but with low percent cover.

USFWS Wetland System: Not applicable.

Comments: This vegetation type is a provisional association that may be more appropriately included as a shrub association. An Olympic plot appears in the table as SORSIT-ALNVIR and represents a similar type of vegetation as this one in avalanche tracks but without *Abies lasiocarpa*.

Conservation Rank: S2Q

Rank Justification: This provisional association occurs within a limited range with few threats.

Synonyms:

Abies lasiocarpa/Valeriana sitchensis Forest

Subalpine Fir/Sitka Valerian Forest



Acronym: ABILAS/VALSIT

NatureServe Code: CEGL000345

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the Cascade Range and northeastern Olympic Mountains.

Plots: 19, MORA (8), NOCA (3), OLYM (8), Other (0)

Environmental Description: This association occurs at elevations between 1400-2000 m (4600-6600ft). It is most common in the rainshadows of the coast ranges. Sites have well-drained soils and southerly aspects.

Vegetation Description: This is a conifer forest or woodland of relatively short stature. *Abies lasiocarpa* is always dominant and typically forming a partially open canopy. This type can occur as tree islands in subalpine parkland settings. Small amounts of *Tsuga mertensiana* or *Abies amabilis* may sometimes occur in the tree regeneration layer. *Cupressus (=Chamaecyparis) nootkatensis* or *Picea engelmannii* may be locally abundant. A shrub layer is largely absent. The relatively lush herbaceous understory is dominated by *Valeriana sitchensis* and sometimes *Rubus lasiococcus*, or the graminoid *Luzula glabrata* var. *hitchcockii*. Other frequent understory species that typically occur in low abundance are *Arnica latifolia*, *Veratrum viride*, *Viola orbiculata*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Polemonium pulcherrimum*, *Pedicularis racemosa*, and *Ligusticum grayi*.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished from similar associations by having over 5% cover of *Valeriana sitchensis*, *Arnica latifolia, or Rubus lasiococcus,* along with little to no *Abies amabilis*, *Tsuga heterophylla*, *Tsuga mertensiana*, *Rhododendron albiflorum* (under 10%), *Vaccinium membranaceum* (under 5%), *Vaccinium scoparium*, or *Phyllodoce empetriformis*. Several plots are included here with low herbaceous cover (generally less than 25%) and with the indicator species between 1 and 5% cover. *Abies lasiocarpa-Picea engelmannii*/*Valeriana sitchensis* (CEGL005823) has less than 1% *Luzula glabrata var. hitchcockii* and no *Vaccinium deliciosum*. This association broadly overlaps with other moist forb *Abies lasiocarpa* associations in the east Cascades and interior British Columbia.

Conservation Rank: S3

Rank Justification: This association occurs within a restricted range with few threats. Climate change will likely effect this vegetation.

Synonyms:
Abies lasiocarpa/Valeriana sitchensis Association; Henderson et al. 1992
Abies lasiocarpa/Valeriana sitchensis Community Type; Henderson et al. 1979
Abies lasiocarpa/Valeriana sitchensis-NWW; Henderson et al. 1992
Abies lasiocarpa/*Rubus lasiococcus* Association; John et al. 1988, Kovalchik 2001, Lillybridge et al. 1995
Abies lasiocarpa/*Rubus lasiococcus* Woodland; Chappell 2005 NPK

Abies lasiocarpa/Veratrum viride Woodland

Subalpine Fir/Green False Hellebore Woodland



Acronym: ABILAS/VERVIR

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 3

Range: This association is described from Mount Rainier, elsewhere in the Cascades, and Olympic Mountains.

Plots: 4, MORA (1), NOCA (0), OLYM (2), Other (1)

Environmental Description: This association is described at elevations of 1850-2010 m (6100-6600 ft) on 15-60% slopes. Sites have very moist soils.

Vegetation Description: This association features an open canopy dominated by *Abies lasiocarpa*. The relatively lush herbaceous understory is dominated by *Veratrum viride,* usually accompanied by *Valeriana sitchensis* and/or *Luzula glabrata var. hitchcockii* var. *hitchcockii*. If present, shrubs have low cover . Other frequent understory species are *Polemonium pulcherrimum*, *Heracleum maximum (=lanatum)*, *Senecio triangularis*, *Arnica latifolia*, and *Lupinus (arcticus ssp. subalpinus, latifolius)*.

USFWS Wetland System: Palustrine

Comments: These are distinct and often small vegetation patches within conifer forest or parkland landscapes.

Conservation Rank: S2Q

Rank Justification: This provisional association occurs within a limited range with some threat of logging off of National Parks.

Synonyms:

Abies lasiocarpa-Cupressus nootkatensis/Mahonia nervosa/Valeriana sitchensis Forest

Subalpine Fir-Alaska yellow-cedar/Dwarf Oregongrape/Sitka Valerian Forest



Acronym: ABILAS-CUPNOO/MAHNER/VALSIT

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 3

Range: Identified solely from data from the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The single plot representing this type is located at the head of an avalanche track on a bench at the base of a cliff.

Vegetation Description: This is a dense stand co-dominated by *Abies lasiocarpa* and *Cupressus (=Chamaecyparis) nootkatensis.* It has a depauperate undergrowth, with a sparse layer of *Mahonia (=Berberis) nervosa* and *Paxistima (=Pachistima) myrsinites*. *Valeriana sitchensis*, *Achlys (californica, triphylla)* and *Thalictrum occidentale* are the most abundant species in the sparse herbaceous layer.

USFWS Wetland System: Not applicable.

Comments: This single plot may represent part of the variation of the preliminary *Abies lasiocarpa-Pseudotsuga menziesii/Mahonia nervosa* association. It is distinct in its co-dominance of *Cupressus nootkatensis.*

Conservation Rank: S2S4Q

Rank Justification: This association has a provisional classification status and is represented at just a few sites on protected areas.

Synonyms:

Abies lasiocarpa-Pseudotsuga menziesii/Mahonia nervosa Forest

Subalpine Fir-Douglas-fir/Dwarf Oregongrape Forest



Acronym: ABILAS-PSEMEN/MAHNER

NatureServe Code: Preliminary

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies amabilis-Abies lasiocarpa* Forest and Woodland

Classification Confidence Level: 3

Range: This association occurs in the northeastern Olympics and may occur in the Cascades.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs on relatively steep (60% slope), rocky, dry slopes between 1060 and 1460 m (3500 and 4790 ft) elevation on east or west aspects.

Vegetation Description: *Pseudotsuga menziesii* var. *menzeisii* and *Abies lasiocarpa* are dominants in the semi-open to closed tree canopy. Tree regeneration most commonly consists of *Abies lasiocarpa* although *Abies amabilis* and *Cupressus (=Chamaecyparis) nootkatensis* regeneration may occur as well. The shrub layer is typically moderately dense and is dominated by the *Mahonia (=Berberis) nervosa,* with *Vaccinium membranaceum* and *Rosa gymnocarpa* present. The undergrowth layer can be abundant and includes mesic-site species such as *Achlys (californica, triphylla)*, *Chimaphila umbellata Clintonia uniflora*, *Linnaea borealis Streptopus lanceolatus (=roseus), Tiarella trifoliata* and *Orthilia (=Pyrola) secunda*. The forest floor can have abundant moss cover.

USFWS Wetland System: Not applicable.

Comments: One plot (OCF-68) of this preliminary type occurs on a toe slope and lacks *Mahonia (=Berberis) nervosa* but otherwise has a similar understory. The provisional *Abies lasiocarpa-Cupressus nootkatensis*/*Mahonia nervos/Valeriana sitchensis* association is similar but differs in being co-dominated by *Cupressus nootkatensis* with sparse understory.

Conservation Rank: S2Q

Rank Justification: This association has a preliminary classification status and is represented at few sites on protected areas.

Synonyms:

Abies lasiocarpa Krummholz Shrubland

Subalpine Fir Krummholz Shrubland



Acronym: KRUMM ABILAS

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies lasiocarpa-Tsuga mertensiana-Abies amabilis-Cupressus nootkatensis* Krummholz

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 5, MORA (3), NOCA (0), OLYM (1), Other (1)

Environmental Description: This association occurs at high elevations. Sites are located at the upper edge of the subalpine parkland and the lower edge of the alpine zone. Soils are well-drained.

Vegetation Description: The vegetation is dominated by shrub-form *Abies lasiocarpa*. Upright trees are absent or limited to occasional "flag" stems. Associated understory species are variable. Usually this vegetation occurs as well-defined patches near upper treeline. Understory species are mostly those typical of subalpine meadows: *Phyllodoce empetriformis*, *Lupinus (arcticus ssp. subalpinus, latifolius), Vaccinium deliciosum*, and *Vaccinium scoparium*. Alpine krummholz sites are shorter, more sparsely vegetated and contain species such as *Juniperus communis*, *Phyllodoce glanduliflora,* and *Cassiope mertensiana.*

USFWS Wetland System: Not applicable.

Comments: Two legacy krummholz plots in the Olympics are co-dominated by *Cupressus (=Chamaecyparis) nootkatensis* and are listed in the table as KRUMM CUPNOO. They are considered variants of the *Abies lasiocarpa* krummholz provisional association. This provisional association differs from *Abies lasiocarpa-Picea englemanni* Krummholz (CEGL000985) in having a presence of Cascadian species such as *Cupressus nootkatensis* and *Vaccinium deliciosum*.

Conservation Rank: S3

Rank Justification: This association occurs within a restricted range and ecological amplitude in Washington with few threats. Climate change may affect this vegetation.

Synonyms:
Abies lasiocarpa Krummholz Shrubland; Chappell 2005 NPK
Abies lasiocarpa Krummholz-Central; Douglas and Bliss 1977
Abies lasiocarpa Krummholz-West; Douglas and Bliss 1977
Abies lasiocarpa/*Vaccinium myrtillus*/*Luzula hitchcockii-Phlox diffusa* Community; del Moral 1979

Tsuga mertensiana Krummholz Shrubland

Mountain Hemlock Krummholz



Acronym: KRUMM TSUMER

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Abies lasiocarpa-Tsuga mertensiana-Abies amabilis-Cupressus nootkatensis* Krummholz

Classification Confidence Level: 3

Range: This shrubland association occurs in the Olympic and Cascade Mountains, except in the rainshadow areas of the northeastern Olympics and northeastern parts of Mount Rainier.

Plots: 3, MORA (1), NOCA (0), OLYM (2), Other (0)

Environmental Description: This shrubland association occurs near upper treeline in the upper subalpine parkland and the lower alpine zones.

Vegetation Description: This conifer shrubland occurs as small patches of wind-blasted shrub-form (krummholz) trees dominated by *Tsuga mertensiana*. Other high elevation tree species may also occur in lesser amounts. Associated shrubs, dwarf-shrubs and herbs are somewhat variable. *Vaccinium deliciosum*, *V. membranaceum*, *Phyllodoce empetriformis*, and *Cassiope mertensiana* are frequent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3S4

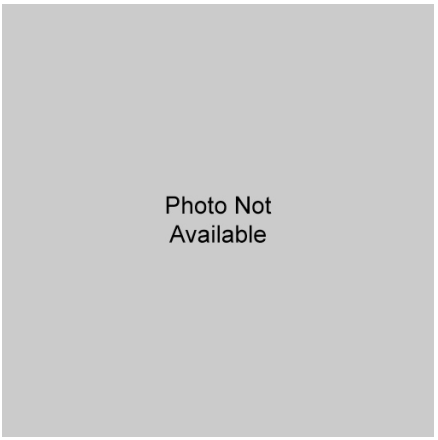
Rank Justification: This occurs within a restricted geographic range and ecological amplitude in Washington with few threats. Climate change may affect this vegetation.

Synonyms:

MH mmp1 /02; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga mertensiana Krummholz Shrubland.; Chappell 2005 NPK
Tsuga mertensiana/Krummholz-NWW; unpubl data

Cupressus nootkatensis/Oplopanax horridus-(Alnus viridis ssp. sinuata) Woodland

Alaska yellow-cedar/Devil's-club-(Sitka Alder) Woodland



Acronym: CUPNOO/OPLHOR-(ALNVIR)

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Cupressus nootkatensis* Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at middle elevations. Sites are typically steep avalanche chutes with subirrigated moist to wet soils.

Vegetation Description: The vegetation type generally consists of an open canopy of short-statured trees, sometimes no taller than the abundant shrubs. The tree component is dominated by *Cupressus (=Chamaecyparis) nootkatensis*. *Abies amabilis* is usually present and sometimes co-dominant. *Tsuga mertensiana* and *Abies lasiocarpa* also occur occasionally. The generally dense shrub layer is usually dominated by *Oplopanax horridus*, *Acer circinatum*, and/or *Alnus viridis* ssp. *sinuata*. *Oplopanax horridus* has over 5% cover. Commonly occuring herbs include *Athyrium filix-femina*, *Tiarella trifoliata* var. *unifoliata*, and *Viola glabella*.

USFWS Wetland System: Palustrine.

Comments: This type is not represented in the current dataset of vegetation plots for national parks in Washington. This type may be merged with other *Cupressus nootkatensis* avalanche and debris chutes types (e.g. CUPNOO/STRLAN).

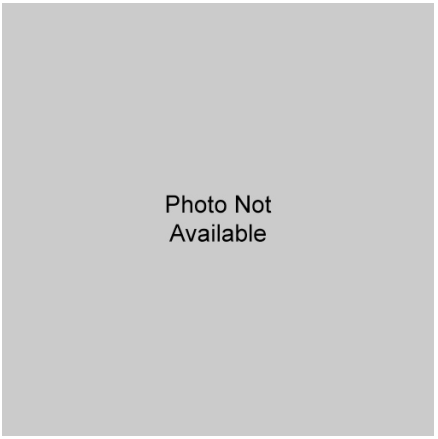
Conservation Rank: S3?

Rank Justification: This association occurs within a narrow range of environments that are restricted to the mountains of the coastal Pacific Northwest. There are few threats associated with this type.

Synonyms:
Cupressus nootkatensis/*Oplopanax horridus* Woodland; Chappell 2005 NPK
Stand Group 1; Antos and Zobel 1986

Cupressus nootkatensis/Ribes lacustre Forest

Alaska yellow-cedar/Prickly Currant Forest



Acronym: CUPNOO/RIBLAC

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Cupressus nootkatensis* Forest and Woodland

Classification Confidence Level: 3

Range: This associaton is described from one plot in the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The plot defining this type is located on a steep valley wall at 1177 m (3844 ft) elevation.

Vegetation Description: This is a forest of *Cupressus (=Chamaecyparis) nootkatensis* with some *Abies lasiocarpa* and *Abies amabilis*. *Alnus viridis* ssp. *sinuata* dominated avalanche chutes surround this forest. It has an extremely diverse understory of forbs and shrubs. *Ribes lacustre*, *Rubus spectabilis*, *Rubus parviflorus* and *Vaccinium membranaceum* are prominent. *Tiarella trifoliata*, *Athyrium filix-femina*, *Prosartes (=Disporum) hookeri*, *Maianthemum (=Smilacina) racemosum*, *Polystichum munitum* and *Viola sempervirens* are prominent forbs in this community.

USFWS Wetland System: Not applicable.

Comments: This provisional association may be an outlier representing a unique forest or a variant of avalanche track vegetation with a taller forest structure.

Conservation Rank: S3S5Q

Rank Justification: This provisional association occurs within a narrow range of environments that are restricted to the mountains of the coastal Pacific Northwest. There are few threats associated with this type.

Synonyms:

Cupressus nootkatensis/Streptopus lanceolatus var. curvipes Forest

Alaska yellow-cedar/Rosy twistedstalk Forest



Acronym: CUPNOO/STRLAN

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Cupressus nootkatensis* Forest and Woodland

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 2, MORA (0), NOCA (1), OLYM (1), Other (0)

Environmental Description: This association was sampled on south-facing valley walls at 1160-1465 m (3800-4800 ft). It is found on relatively steep (42-70%) unstable slopes or talus.

Vegetation Description: The open tree canopy consists of *Cupressus (=Chamaecyparis) nootkatensis* in tree or shrub form. A diverse herb layer includes, *Clintonia uniflora*, *Viola glabella*, *Streptopus lanceolatus (=roseus), Rubus pedatus* and the fern *Cryptogramma acrostichoides (=crispa)*. The shrubs *Frangula purshiana*, *Acer circinatum* and *Paxistima (=Pachistima) myrsinites* occur much less abundantly than *Cupressus nootkatensis* in the understory. Mosses and exposed rocks are common ground cover.

USFWS Wetland System: Not applicable.

Comments: This may represent variation within a generalized avalanche chute type or a variant of the *Abies amabilis-Tsuga mertensiana*/*Streptopus lanceolatus* var. *curvipes* Forest (CEGL000125).

Conservation Rank: S2S3Q

Rank Justification: This provisional association occurs within a narrow range of environments that are restricted to the mountains of the coastal Pacific Northwest. There are few threats associated with this type.

Synonyms:

Cupressus nootkatensis/Valeriana sitchensis Forest

Alaska yellow-cedar/Sitka Valerian Forest



Acronym: CUPNOO/VALSIT

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Cupressus nootkatensis* Forest and Woodland

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 5, MORA (0), NOCA (0), OLYM (4), Other (1)

Environmental Description: This association occurs at subalpine elevations on steep slopes (35- 90%). It is described from mid-slope valley walls,often on rocky substrates.

Vegetation Description: This association is characterized by an open *Cupressus (=Chamaecyparis) nootkatensis* canopy with minor regeneration of *Tsuga mertensiana* and *Abies lasiocarpa*. Trees with a crooked sweep beginning at the base of the trunk (pistol butt) are common. A sparse to moderately dense shrub layer often includes *Ribes lacustre* and *Vaccinium membranaceum*. *Valeriana sitchensis* typically dominates a relatively diverse herb layer. *Actea rubra*, *Luzula glabrata* var. *hitchcockii*, *Polemonium pulcherrimum*, and *Veratrum viride* are common.

USFWS Wetland System: Not applicable.

Comments: This provisional type could be included in the *Abies lasiocarpa*-(*Abies amabilis*)/*Vaccinium membranaceum*/ *Valeriana sitchensis* Forest (CEGL002612).

Conservation Rank: S3S4

Rank Justification: This preliminary association occurs within a narrow range of environments that are restricted to the mountains of the coastal Pacific Northwest. There are few threats associated with this type. Climate change will likely affect this vegetation.

Synonyms:

Cupressus nootkatensis-Pseudotsuga menziesii/Acer circinatum Forest

Alaska yellow-cedar-Douglas-fir/Vine Maple Forest



Acronym: CUPNOO-PSEMEN/ACECIR

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Cupressus nootkatensis* Forest and Woodland

Classification Confidence Level: 3

Range: This association is described from one plot at North Cascades National Park.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The plot defining this type occurs at 1025 m (3370 ft) elevation on a 60%, south facing slope.

Vegetation Description: This closed canopy association is co-dominated by a *Cupressus (=Chamaecyparis) nootkatensis* and *Pseudotsuga menziesii* in the tree canopy. The relatively sparse understory features tall shrubs such as *Acer circinatum* (most prominent) and *Acer glabrum.* The herbaceous understory includes *Clintonia uniflora*, *Maianthemum (=Smilacina) stellatum* and *Pteridium aquilifloium.* The ground cover is primarily litter with a small amount of woody debris over a rocky soil.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S3Q

Rank Justification: This provisional association occurs within a very narrow range of environments that are restricted to the mountains of the coastal Pacific Northwest.

Synonyms:

Abies amabilis-Tsuga mertensiana/Menziesia ferruginea Forest

Pacific Silver Fir-Mountain Hemlock/Fool's Huckleberry Forest



Acronym: ABIAMA-TSUMER/MENFER

NatureServe Code: PNWCOAST_017

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies amabilis* Forest and Woodland

Classification Confidence Level: 1

Range: This association occurs at Mount Rainier and in the eastern portion of North Cascades.

Plots: 10, MORA (7), NOCA (2), OLYM (0), Other (1)

Environmental Description: This association occurs at middle to high elevations. Sites tend to be slopes with northern aspects or benches, and soils are relatively moist.

Vegetation Description: The canopy is typically co-dominated by *Abies amabilis* and *Tsuga mertensiana*. The latter has over 10% total cover and the former usually dominates tree regeneration. *Tsuga heterophylla* and *Cupressus (=Chamaecyparis) nootkatensis* are sometimes present to prominent. The well-developed shrub layer is usually co-dominated by *Menziesia ferruginea* and either *Vaccinium membranaceum* or *V. alaskaense*, or both. *V. membranaceum* is almost always present and *Sorbus sitchensis* is frequent. *V. ovalifolium* is occasionally prominent. The herb layer is variable in density and rather species-poor. *Rubus lasiococcus* and *R. pedatus* are usually present.

USFWS Wetland System: Not applicable.

Comments: At Mount Rainier, *Erythronium montanum* sometimes dominates a well-developed herb layer under the shrub layer.

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Menziesia ferruginea* Association; Franklin 1966, Franklin et al. 1988
Abies amabilis-Tsuga mertensiana/*Menziesia ferruginea* Forest; Chappell 2005 NPK
Tsuga mertensiana/*Menziesia ferruginea*; Franklin 1966
Tsuga mertensiana/*Menziesia ferruginea* Association; Brockway et al. 1983, Diaz et al. 1997
Tsuga mertensiana/*Menziesia ferruginea*-NWO-PNW; McCain and Diaz 2002b, Diaz et al. 1997
Tsuga mertensiana/*Menziesia ferruginea*-PNW; Diaz et al. 1997, Brockway et al. 1983
Tsuga mertensiana/*Menziesia ferruginea-Vaccinium alaskaense* Association; Kovalchik 2001, Lillybridge et al. 1995
Tsuga mertensiana/*Menziesia ferruginea-Vaccinium alaskaense*-PNW; Lillybridge et al. 1995
Tsuga mertensiana/*Menziesia ferruginea-Vaccinium membranaceum* Association; Lillybridge et al. 1995
Tsuga mertensiana/*Menziesia ferruginea-Vaccinium membranaceum*-PNW; Lillybridge et al. 1995
Tsuga mertensiana-Abies amabilis/*Vaccinium alaskaense-Menziesia ferruginea* Community Type; del Moral et al. 1976
Tsuga mertensiana-Abies amabilis/*Vaccinium membranaceum-Menziesia ferruginea*; del Moral et al. 1976

Abies amabilis-Tsuga mertensiana/Streptopus lanceolatus var. *curvipes* Forest

Pacific Silver Fir-Mountain Hemlock/Rosy Twistedstalk Forest



Acronym: ABIAMA-TSUMER/STRLAN

NatureServe Code: CEGL000125

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies amabilis* Forest and Woodland

Classification Confidence Level: 1

Range: This association occurs in the Olympic and western Cascade Mountains.

Plots: 15, MORA (7), NOCA (0), OLYM (3), Other (5)

Environmental Description: This association occurs in upper montane forest zones. Sites are generally moist but can be slightly dry.

Vegetation Description: The tree canopy is usually dominated by *Abies amabilis*, and *Tsuga mertensiana* is always at least prominent to co-dominant. *Cupressus (=Chamaecyparis) nootkatensis, Abies lasiocarpa, A. procera,* and *Pseudotsuga menziesii* may be prominent. The shrub layer varies from absent to well-developed. *Vaccinium alaskaense* or *V. membranaceum* can be dominant, however the plots sampled in the parks all had sparse shrubs. An herb layer is always present and the characteristic species are *Rubus pedatus*, *Streptopus lanceolatus (=roseus) var. curvipes,* and *Tiarella trifoliata* var. *unifoliata*. One of the latter two species is always at least prominent in the understory and diagnostic. In the park data, *Tiarella trifoliata* is the most common herb with *Valeriana sitchensis, Rubus lasiococcus* and *Veratrum viride* frequent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis-Tsuga mertensiana/*Streptopus lanceolatus var. curvipes* Forest; Chappell 2005
MH mm 1 /03; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
MH mm 1 /05; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
MH mm 2 /05; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga mertensiana/*Tiarella unifoliata-Streptopus roseus* Association; Henderson et al. 1992
Tsuga mertensiana/*Tiarella unifoliata-Streptopus roseus*-NWW; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium alaskaense-Streptopus roseus* Association; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium alaskaense-Streptopus roseus*-NWW; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Streptopus roseus* Association; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Streptopus roseus*-NWW; Henderson et al. 1992

Abies amabilis-Tsuga mertensiana/Vaccinium membranaceum/Rubus lasiococcus Forest

Pacific Silver Fir-Mountain Hemlock/Big Huckleberry/Dwarf Bramble Forest



Acronym: ABIAMA-TSUMER/VACMEM/RUBLAS

NatureServe Code: CEGL000509

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies amabilis* Forest and Woodland

Classification Confidence Level: 1

Range: This association occurs in the Cascades and the Olympic Mountains.

Plots: 26, MORA (11), NOCA (1), OLYM (8), Other (6)

Environmental Description: This association occurs at high elevations. Soils are well-drained and relatively dry. In the northern portion of this association's range, aspects tend to be southerly and in the southern portion the aspects tend to be northerly.

Vegetation Description: The canopy is typically co-dominated by *Tsuga mertensiana* and *Abies amabilis*. The former has over 10% total cover and the latter usually dominates tree regeneration. *Cupressus (=Chamaecyparis) nootkatensis* and *Abies lasiocarpa* are commonly present and sometimes prominent to co-dominant. The shrub layer varies from sparse to dense and is characterized by the presence to dominance of *Vaccinium membranaceum*. Other shrubs, if present, are low in cover. The herb layer varies from sparse to well-developed. *Rubus lasiococcus* and *R. pedatus* are often present. *Erythronium montanum* sometimes dominates a well-developed herb layer.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands however some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis/*Vaccinium membranaceum*/*Clintonia uniflora* Association; John et al. 1988
Abies amabilis/*Vaccinium membranaceum*/*Clintonia uniflora* Community Type; del Moral et al. 1976
Abies amabilis-Tsuga mertensiana/*Vaccinium membranaceum*/*Rubus lasiococcus* Forest; Chappell 2005 NPK
Tsuga mertensiana/*Rubus lasiococcus* Community Type; Lillybridge et al. 1995
Tsuga mertensiana/*Rubus lasiococcus*-PNW; Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium membranaceum* Association; Henderson et al. 1992 Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium membranaceum*/*Clintonia uniflora* Association; Diaz et al. 1997
Tsuga mertensiana/*Vaccinium membranaceum*/*Clintonia uniflora*-NWO-PNW; McCain and Diaz 2002b, Diaz et al. 1997
Tsuga mertensiana/*Vaccinium membranaceum*/Forb-PNW; unpubl data
Tsuga mertensiana/*Vaccinium membranaceum*-NWW; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Rubus lasiococcus* Association; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Rubus lasiococcus*-NWW; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Sorbus sitchensis*-PNW; McCain and Diaz 2002a
Tsuga mertensiana/*Vaccinium membranaceum*-Wen-PNW; Lillybridge et al. 1995

Abies lasiocarpa-Tsuga mertensiana/Vaccinium scoparium Woodland

Subalpine Fir-Mountain Hemlock/Red Huckleberry Woodland

Acronym: ABILAS-TSUMER/VACSCO

NatureServe Code: CEGL000126

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* amabilis Forest and Woodland

Classification Confidence Level:



Range: This association may occur on eastern or northern slopes of Mount Rainier or in the eastern North Cascades. It is known to occur futher east and south in the Cascades.

Plots: 1, MORA (0), NOCA (0), OLYM (0), Other (1)

Environmental Description: This woodland or open forest association occurs at high elevations on gentle slopes with a variety of aspects. Sites usually have rocky, well-drained soils.

Vegetation Description: The canopy is usually co-dominated by *Abies lasiocarpa* and *Tsuga mertensiana*. *Pinus contorta* is occasionally prominent to co-dominant. The dwarf-shrub layer is well-developed. *Vaccinium scoparium* is prominent to dominant and diagnostic. *Vaccinium deliciosum* is occasionally prominent. Taller shrubs can be absent or moderate in cover. *Vaccinium membranaceum* is often prominent. One or more of the following species may be prominent in the variable herb layer: *Xerophyllum tenax*, *Rubus lasiococcus*, *Arnica latifolia*, and *Luzula glabrata* var. *hitchcockii*.

USFWS Wetland System: Not applicable.

Comments: This type is not represented in the current data set of vegetation plots for national parks in Washington. However, a legacy plot from Mount Rainier may represent this association.

Conservation Rank: S3S4

Rank Justification: This association occurs within a restricted range with few threats.

Synonyms:
Abies lasiocarpa-Tsuga mertensiana/*Vaccinium scoparium* Woodland; Chappell 2005 NPK
Tsuga mertensiana/*Vaccinium scoparium*/*Luzula hitchcockii*-PNW; Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium scoparium*-GP; Diaz et al. 1997
Tsuga mertensiana/*Vaccinium scoparium-Luzula hitchcockii* Forest; Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium scoparium*-NWW; Mt Baker-Snoqualmie NF unpubl data

Tsuga mertensiana-(Abies amabilis-Abies lasiocarpa)/Luzula glabrata var. hitchcockii Woodland

Mountain Hemlock-(Pacific Silver Fir-Subalpine Fir)/Hitchcock's Smooth Woodrush Woodland



Acronym: TSUMER-(ABIAMA-ABILAS)/LUZGLA

NatureServe Code: PNWCOAST_300

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the Cascade Mountains.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This open forest or woodland association occurs at high elevations. Sites tend to be upper slopes or ridgetops but can occur on a variety of positions and aspects. It often occurs adjacent to or as patches within the subalpine parkland.

Vegetation Description: The canopy is dominated by *Tsuga mertensiana*, *Abies lasiocarpa*, and/or *Abies amabilis*. *Tsuga mertensiana* is always present and typically occupies over 10% cover. The shrub layer varies from sparse to moderate. *Vaccinium membranaceum* is usually present to prominent. The well-developed herb layer is dominated by *Luzula glabrata* var. *hitchcockii*. Several forbs may be prominent especially *Arnica latifolia*, *Rubus lasiococcus*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, and *Valeriana sitchensis*. *Arnica latifolia* is usually present.

USFWS Wetland System: Not applicable.

Comments: One related plot from Mount Rainier National Park has an open canopy of *Abies lasiocarpa* with equivalent cover of shorter *Abies amabilis* and a very dense cover of *Luzula glabrata* in the herb layer. It appears in the stand table as ABILAS-ABIAMA/LUZGLA.

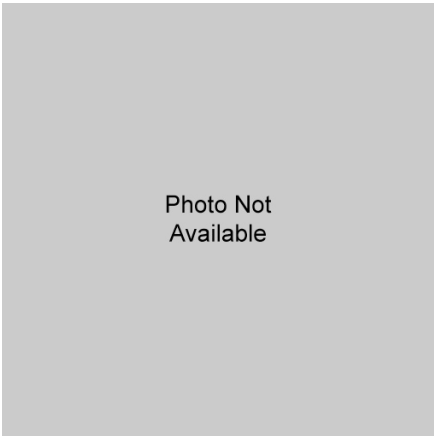
Conservation Rank: S4

Rank Justification: This association occurs within a narrow environmental range with few threats.

Synonyms:
Abies lasiocarpa/*Xerophyllum tenax-Luzula hitchcockii* Association; John et al. 1988
Tsuga mertensiana-(*Abies amabilis-Abies lasiocarpa*)/*Luzula glabrata* var. *hitchcockii* Woodland; Chappell 2005 NPK
Tsuga mertensiana/*Luzula glabrata* var. *hitchcockii*-PNW; McCain and Diaz 2002b
Tsuga mertensiana/*Luzula hitchcockii* Association; Diaz et al. 1997, John et al. 1988, Lillybridge et al. 1995
Tsuga mertensiana/*Luzula hitchcockii*-EWA; Lillybridge et al. 1995
Tsuga mertensiana/*Luzula hitchcockii*-GP; Diaz et al. 1997
Tsuga mertensiana-Abies amabilis (Mature Phase-Closed Group) Community; Douglas 1972

Tsuga mertensiana-Abies amabilis/Depauperate undergrowth Forest

Mountain Hemlock-Pacific Silver Fir/Depauperate Forest



Acronym: TSUMER-ABIAMA/Dep.

NatureServe Code: Preliminary

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 3

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 5, MORA (2), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association can be found across a wide range of environments at mid to high elevations (between 910-1550 m (3000 and 5100 ft)). Most stands represent a stagnation phase of stand development following fire.

Vegetation Description: This association consists of stands with a very dense canopy of *Tsuga mertensiana* and often *Abies amabilis* with little to no vascular plant understory. However, *Vaccinium ovalifolium* and/or V. *alaskense* are present in most stands.

USFWS Wetland System: Not applicable.

Comments: These communities are distingushed by a lack plant diversity, understory development and indicator vascular species. However, they are prevalent in all three parks and occupy a large acreage within areas dominated by the North Pacific Maritime Mesic Subalpine Forest, Woodland, & Tree Island Group.

Conservation Rank: S3S5Q

Rank Justification: This provisional association appears to be widespread.

Synonyms:

Tsuga mertensiana-Abies amabilis/Rhododendron albiflorum Forest

Mountain Hemlock-Pacific Silver Fir/Cascade Azalea Forest



Acronym: TSUMER-ABIAMA/RHOALB

NatureServe Code: CEGL002632

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 1

Range: This association occurs in the Cascades and the northern and eastern Olympics.

Plots: 66, MORA (26), NOCA (4), OLYM (22), Other (14)

Environmental Description: This forest or woodland association is found at high elevations on mid to upper slopes or ridgetops on sites with well-drained soils.

Vegetation Description: The canopy is usually co-dominated by *Tsuga mertensiana* and *Abies amabilis* or occasionally *Cupressus (=Chamaecyparis) nootkatensis. Abies lasiocarpa* is occasionally prominent. The usually dense shrub layer is at least co-dominated by *Rhododendron albiflorum*. *Vaccinium alaskaense, V. ovalifolium* or *V. membranaceum* usually co-dominate and *Menziesia ferruginea* is sometimes prominent to co-dominant. The herb layer is sparse to moderate and is occasionally dominated by *Rubus pedatus*, *R. lasiococcus,* or *Xerophyllum tenax*.

USFWS Wetland System: Not applicable.

Comments:

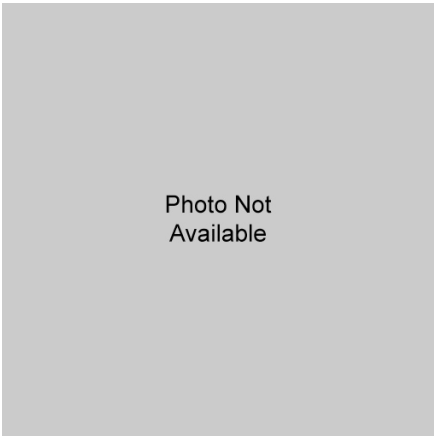
Conservation Rank: S4

Rank Justification: This association occurs throughout the upper elevations of the mountains in western Washington.

Synonyms:
Abies amabilis/*Rhododendron albiflorum* Association; Franklin et al. 1988, John et al. 1988, Williams and Lillybridge 1983
Abies amabilis/*Rhododendron albiflorum*/*Clintonia uniflora* Association; John et al. 1988
Abies amabilis/*Vaccinium membranaceum-Rhododendron albiflorum*/*Rubus lasiococcus* Community Type; del Moral et al. 1976
Abies lasiocarpa-Tsuga mertensiana/*Vaccinium membranaceum-Rhododendron albiflorum*/*Rubus lasiococcus* Community Type; del Moral et al. 1976
Chamaecyparis nootkatensis/*Rhododendron albiflorum*/Gley Podzol Association; Franklin 1966
MH mmp1 /01; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Mixed Forest Type; del Moral 1973
Tsuga mertensiana/*Rhododendron albiflorum* Association; Brockway et al. 1983, Diaz et al. 1997
Tsuga mertensiana/*Rhododendron albiflorum*/*Clintonia uniflora*-PNW; McCain and Diaz 2002b
Tsuga mertensiana/*Rhododendron albiflorum*/*Xerophyllum tenax*-PNW; McCain and Diaz 2002b
Tsuga mertensiana/*Rhododendron albiflorum*-PNW; Diaz et al. 1997, Brockway et al. 1983
Tsuga mertensiana/*Rhododendron albiflorum-Vaccinium alaskaense* Association; Henderson et al. 1992
Tsuga mertensiana/*Rhododendron albiflorum-Vaccinium alaskaense*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga mertensiana/*Rhododendron albiflorum-Vaccinium alaskaense*-PNW; Lillybridge et al. 1995
Tsuga mertensiana/*Rhododendron albiflorum-Vaccinium membranaceum* Association; Henderson et al. 1989, Henderson et al. 1992, Kovalchik 2001, Lillybridge et al. 1995
Tsuga mertensiana/*Rhododendron albiflorum-Vaccinium membranaceum*-NWW; Henderson et al. 1992, Henderson et al. 1989, Lillybridge et al. 1995, Williams and Lillybridge 1983
Tsuga mertensiana-Abies amabilis/*Rhododendron albiflorum* Forest; Chappell 2005 NPK

Tsuga mertensiana-Abies amabilis/Vaccinium alaskaense/Maianthemum dilatatum Forest

Mountain Hemlock-Pacific Silver Fir/Alaska Blueberry/False Lily of the Valley Forest



Acronym: TSUMER-ABIAMA/VACALA/MAIDIL

NatureServe Code: CEGL002617

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 2

Range: This association may occur in the wettest portions of North Cascades or Olympic National Parks.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at middle elevations. It occupies moist sites on gentle slopes in high precipitation zones.

Vegetation Description: The canopy is co-dominated by *Tsuga mertensiana* and *Abies amabilis*. *Tsuga heterophylla*, *Thuja plicata*, and *Cupressus (=Chamaecyparis) nootkatensis* are frequent and one or more may be prominent to co-dominant. The well-developed shrub layer is dominated by *Vaccinium alaskaense*, sometimes with *V. ovalifolium* co-dominant. The diverse herb layer is at least co-dominated by *Maianthemum dilatatum*. Other frequently occurring species are *Rubus pedatus*, *Clintonia uniflora*, *Cornus unalaschkensis (=canadensis)*, *Blechnum spicant*, and *Streptopus lanceolatus (=roseus) var. curvipes*.

USFWS Wetland System: Not applicable.

Comments: This type is currently known only from Mount Baker-Snoqualmie National Forest and is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S3

Rank Justification: This association occurs within a limited environmental and geographic range in Washington.

Synonyms:
Tsuga mertensiana/*Vaccinium alaskaense-Maianthemum dilatatum* Association; Henderson et al. 1992
Tsuga mertensiana-Abies amabilis/*Vaccinium alaskaensis*/*Maianthemum dilatatum* Forest; Chappell 2005 NPK

Tsuga mertensiana-Abies amabilis/Vaccinium alaskaense/Rubus pedatus Forest

Mountain Hemlock-Pacific Silver Fir/Alaska Blueberry/Trailing Raspberry Forest



Acronym: TSUMER-ABIAMA/VACALA/RUBPED

NatureServe Code: CEGL000512

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the Cascades and Olympic Mountains

Plots: 19, MORA (8), NOCA (0), OLYM (11), Other (0)

Environmental Description: This association occurs at middle to high elevations on a variety of well-drained sites that are moderately dry to moist.

Vegetation Description: The canopy is co-dominated by *Tsuga mertensiana* and *Abies amabilis*. *Tsuga heterophylla* is often prominent and *Cupressus (=Chamaecyparis) nootkatensis* is occasionally prominent to dominant. The typically well-developed shrub layer is at least co-dominated by *Vaccinium alaskaense*. *Vaccinium ovalifolium* or *V. membranaceum* are usually present and occasionally co-dominant. The herb layer is variable. *Rubus pedatus* is the most consistent herb and is sometimes prominent. *Erythronium montanum*, *Clintonia uniflora* and *Xerophyllum tenax* are occasionally prominent to co-dominant but inconsistent in occurrence. *Tiarella trifoliata* var. *unifoliata*, *Streptopus lanceolatus (=roseus) var. curvipes*, and *Maianthemum dilatatum* are absent or present with very low cover.

USFWS Wetland System: Not applicable.

Comments: A legacy plot from Olympic National Park has low species diversity, a low cover understory with *Erythronium montanum* as a dominant and only *Vaccinium membranaceum* and *Xerophyllum tenax* as present. It may represent a variant of this association; see TSUMER-ABIAMA/ERYMON in stand table.

Conservation Rank: S4

Rank Justification: This association occurs throughout the upper elevations of the mountains in western Washington.

Synonyms:
Abies amabilis/*Vaccinium ovalifolium* Community Type; del Moral et al. 1976
Abies amabilis-Tsuga mertensiana/*Vaccinium alaskaense-Xerophyllum tenax* Community Type; Henderson et al. 1979
MH mm 1 /01; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
MH mm 1 /04; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
MH mm 2 /01; Green and Klinka 1994, BC Ministry of Forests 2003
MH mm 2 /04; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga mertensiana/*Vaccinium alaskaense* Association; Henderson et al. 1989, Henderson et al. 1992, Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium alaskaense*/*Erythronium montanum* Association; Henderson et al. 1989
Tsuga mertensiana/*Vaccinium alaskaense*/*Xerophyllum tenax* Association; Henderson et al. 1989
Tsuga mertensiana/*Vaccinium alaskaense-Clintonia uniflora* Association; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium alaskaense-Clintonia uniflora*-NWW; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium alaskaense-Erythronium montanum*-NWW; Henderson et al. 1989
Tsuga mertensiana/*Vaccinium alaskaense*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga mertensiana/*Vaccinium alaskaense*-Wen-PNW; Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium alaskaense-Xerophyllum tenax*-NWW; Henderson et al. 1989
Tsuga mertensiana/*Vaccinium membranaceum-Vaccinium alaskaense* Association; Henderson et al. 1989,Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Vaccinium alaskaense*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga mertensiana-Abies amabilis/*Vaccinium alaskaensis*/*Rubus pedatus* Forest; Chappell 2005 NPK

Tsuga mertensiana-Abies amabilis/Vaccinium membranaceum/Valeriana sitchensis Woodland

Mountain Hemlock-Pacific Silver Fir/Big Huckleberry-Sitka Valerian Woodland



Acronym: TSUMER-ABIAMA/VACMEM/VALSIT

NatureServe Code: CEGL002619

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the Cascades and possibly Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This open forest or woodland association occurs at high elevations on upper slopes and ridgetops with well-drained, rocky or shallow soils.

Vegetation Description: The canopy is usually co-dominated by *Tsuga mertensiana* and *Abies amabilis* (the latter can be absent). Occasionally, *Abies lasiocarpa* or *Cupressus (=Chamaecyparis) nootkatensis* are co-dominant. The well-developed shrub layer is dominated by *Vaccinium membranaceum*. *Sorbus sitchensis* is usually present. The short shrub *Vaccinium deliciosum* is often prominent. The herb layer is well-developed and dominated by *Valeriana sitchensis*. *Veratrum viride* and *Arnica latifolia* are usually present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This association occurs throughout the upper elevations of the mountains in western Washington.

Synonyms:
Abies amabilis/*Rubus lasiococcus* Association, *Erythronium montanum* Phase; Franklin et al. 1988
Tsuga mertensiana/*Vaccinium membranaceum-Valeriana sitchensis* Association; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Valeriana sitchensis*-NWW; Henderson et al. 1992
Tsuga mertensiana-Abies amabilis/*Vaccinium membranaceum*/*Valeriana sitchensis* Woodland; Chappell 2005 NPK

Tsuga mertensiana-Abies amabilis/Vaccinium membranaceum/Xerophyllum tenax Forest

Mountain Hemlock-Pacific Silver Fir/Big Huckleberry-Beargrass Forest



Acronym: TSUMER-ABIAMA/VACMEM/XERTEN

NatureServe Code: CEGL000515

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs within Mount Rainier and the southeastern Olympic Mountains.

Plots: 13, MORA (4), NOCA (0), OLYM (5), Other (4)

Environmental Description: This association occurs at high elevations on sites usually on upper slopes and ridgetops with shallow or rocky well-drained soils. It can occur as stringer forest at upper treeline, where it transitions into *Tsuga mertensiana/Phyllodoce empetriformis-Vaccinium deliciosum* association (PNWCOAST_286).

Vegetation Description: The canopy is typically co-dominated by *Tsuga mertensiana* and *Abies amabilis*. The former occupies over 10% total cover. *Pseudotsuga menziesii* or *Abies lasiocarpa* are occasionally prominent. The well-developed shrub layer is dominated by *Vaccinium membranaceum*. The well-developed herb layer is dominated by *Xerophyllum tenax*. *Rubus lasiococcus* or *Erythronium montanum* are usually present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This association occurs throughout the upper elevations of the mountains in western Washington.

Synonyms:
Abies amabilis/*Xerophyllum tenax* Association, *Tsuga mertensiana* Phase; Franklin et al. 1988
Abies amabilis-Tsuga mertensiana/*Vaccinium membranaceum* Association; Franklin 1966
Abies amabilis-Tsuga mertensiana/*Xerophyllum tenax-Vaccinium membranaceum-Vaccinium alaskaense* Association; del Moral and Long 1977
Tsuga mertensiana/*Vaccinium membranaceum* Association; Brockway et al. 1983
Tsuga mertensiana/*Vaccinium membranaceum*/*Xerophyllum tenax* Association; Diaz et al. 1997, Henderson et al. 1989
Tsuga mertensiana/*Vaccinium membranaceum*/*Xerophyllum tenax*-NWO-PNW; McCain and Diaz 2002b, Diaz et al. 1997, Hemstrom et al. 1987
Tsuga mertensiana/*Vaccinium membranaceum*/*Xerophyllum tenax*-PNW; Diaz et al. 1997
Tsuga mertensiana/*Vaccinium membranaceum-Xerophyllum tenax* Association; Henderson et al. 1992
Tsuga mertensiana/*Vaccinium membranaceum-Xerophyllum tenax*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga mertensiana/*Xerophyllum tenax-Vaccinium membranaceum*-PNW; unpubl data
Abies amabilis/*Vaccinium membranaceum/Xerophyllum tenax;* John 1988
Tsuga mertensiana-Abies amabilis/*Vaccinium membranaceum*/*Xerophyllum tenax* Forest; Chappell 2005 NPK

Tsuga mertensiana-Abies lasiocarpa/Alnus viridis ssp. *sinuata* Woodland

Mountain Hemlock-Subalpine Fir/Sitka Alder Woodland

Acronym: TSUMER-ABILAS/ALNVIR

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

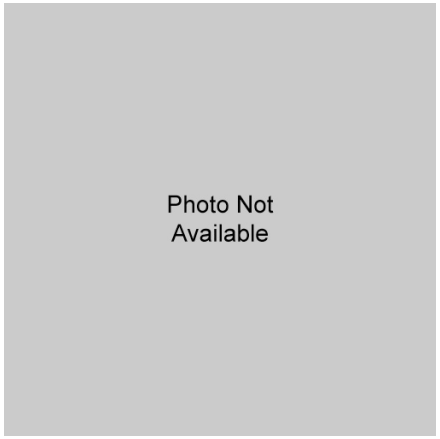
Classification Confidence Level: 3

Range: The plot defining this type is at Mount Rainier.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: The plot is located on a 42% slope.

Vegetation Description: This association has a very open tree canopy (14% cover) of *Abies lasiocarpa* and *Tsuga mertensiana* with a dense shrub layer of *Alnus viridis* ssp. *sinuata* layer. Shorter shrubs *Cassiope mertensiana* and *Rhododendron albiflorum* are present.



USFWS Wetland System: Not applicable.

Comments: This provisional type may be related to either the *Abies lasiocarpa - Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest (CEGL000297) in the Northern Rockies or the *Tsuga mertensiana* / *Alnus viridis* ssp. *sinuata* (CEGL003243) in Alaska. It could also possibly be a variant of the *Alnus viridis* ssp. *sinuata* shrubland (CEGL001154).

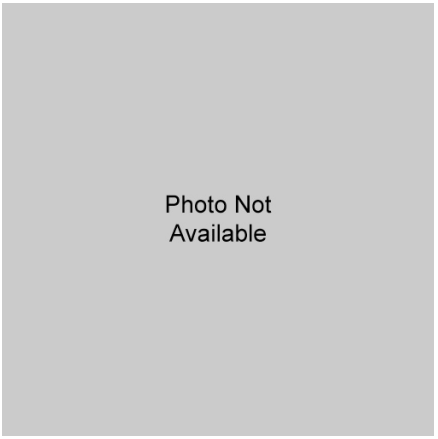
Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Tsuga mertensiana-Abies amabilis-(Cupressus nootkatensis)/Elliottia pyroliflorus-Vaccinium membranaceum Woodland

Mountain Hemlock-Pacific Silver Fir/(Alaska yellow-cedar)/Copperbush-Big Huckleberry Woodland



Acronym: TSUMER-ABIAMA/(CUPNOO)/ELLPYR-VACMEM

NatureServe Code: CEGL000503

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies* lasiocarpa Forest and Woodland

Classification Confidence Level: 2

Range: This association occurs in the northwestern Cascade Range and may occur in the national parks.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This woodland association occurs in very wet climatic areas. In Washington, it occurs at elevations of 910-1525 m (3000-5000 ft), primarily on north-facing slopes, mid to upper slopes, and on shallow soils.

Vegetation Description: The relatively short tree canopy is dominated by *Tsuga mertensiana*, which averages 40% cover. *Abies amabilis* is always present in smaller amounts, and *Cupressus (=Chamaecyparis) nootkatensis* is usually prominent or co-dominant. The understory is dominated by a relatively dense layer of deciduous broad-leaved shrubs, mostly *Vaccinium alaskaense* and *Elliottia (=Cladothamnus) pyroliflorus*, and to a lesser degree *Vaccinium membranaceum* and *Menziesia ferruginea*. The dwarf-shrubs *Phyllodoce empetriformis* and *Vaccinium deliciosum* are sometimes present and occasionally prominent, mostly at the upper elevational limits of the type. The herbaceous layer is dominated by *Rubus pedatus* and *Blechnum spicant*, each averaging about 10% cover.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished from similar associations by over 5% cover of *Elliottia pyroliflorus* and low cover of wet site indicators such as *Caltha leptosepala* (*=biflora, leptosepala*) or *Oplopanax horridus*. This type is not represented in the current dataset of vegetation plots for national parks in Washington

Conservation Rank: G5S2

Rank Justification: This association occurs within a limited environmental and geographic range in Washington.

Synonyms:
MH mm 1 /02; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
MH mm 2 /02; Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga mertensiana/*Cladothamnus pyroliflorus -Rubus pedatus*-NWW; Henderson et al. 1992
Tsuga mertensiana/*Cladothamnus pyroliflorus/Blechnum spicant* Association; Henderson drafts 1982, 1983, 1984
Tsuga mertensiana/*Cladothamnus pyroliflorus*/*Rubus pedatus* Association; Henderson et al. 1992
Tsuga mertensiana-Abies amabilis-(*Cupressus nootkatensis*)/*Elliottia pyroliflorus-Vaccinium membranaceum* Woodland; Chappell 2005 NPK

Abies lasiocarpa-(Tsuga mertensiana)/Eucephalus ledophyllus-Lupinus (arcticus, latifolius) Woodland

Subalpine Fir-(Mountain Hemlock)/Cascade Aster-Lupine Woodland



Acronym: ABILAS-(TSUMER)/EUCLED-LUPARC

NatureServe Code: PNWCOAST_299

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa- Cupressus nootkatensis* Tree Island

Classification Confidence Level: 2

Range: This association occurs on northeastern slopes of Mount Rainier.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at high elevations. Sites are above continuous forest and below upper treeline, with well-drained, mesic to moist soils.

Vegetation Description: This association typically occurs as tree islands or ribbons in subalpine parkland. The tree canopy is dominated by *Tsuga mertensiana* and/or *Abies lasiocarpa*. Either can be absent. *Abies amabilis* is sometimes prominent to co-dominant. *Pinus albicaulis* sometimes occurs but does not co-dominate. A shrub layer is largely absent. The very well-developed herb layer is dominated by *Eucephalus (=Aster) ledophyllus*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, and/or *Polemonium pulcherrimum*. *Eucephalus ledophyllus* and *Lupinus (arcticus* ssp. *subalpinus, latifolius*) are at least prominent. *Luzula glabrata* var. *hitchcockii* is usually present to prominent. *Phlox diffusa* is sometimes prominent. *Vahlodea (Deschampsia) atropurpurea* is often present. If *Festuca viridula* is present, it not abundant.

USFWS Wetland System: Not applicable.

Comments: Stands with prominent *Festuca viridula* (over 10% cover) will better fit the *Abies lasiocarpa-(Tsuga mertensiana)/Festuca viridula* associations. This association is not represented in the current plot data.

Conservation Rank: S2

Rank Justification: This association is described from Oregon. Few sites are known in Washington and it is not represented in the current plot data for Mount Rainier.

Synonyms:
Tsuga mertensiana-Abies lasiocarpa/Aster ledophyllus Association; Diaz et al. 1997
Tsuga mertensiana-Abies lasiocarpa/Eucephalus ledophyllus-PNW; McCain and Diaz 2002b, Diaz et al. 1997
Tsuga mertensiana-Abies lasiocarpa/Eucephalus ledophyllus-Lupinus arcticus ssp. *subalpinus* Woodland; Chappell 2005

Abies lasiocarpa-(Tsuga mertensiana)/Festuca viridula Woodland

Subalpine Fir-(Mountain Hemlock)/Green Fescue



Acronym: ABILAS-(TSUMER)/FESVIR

NatureServe Code: PNWCOAST_035

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa- Cupressus nootkatensis* Tree Island

Classification Confidence Level: 3

Range: This association occurs on northeastern slopes of Mount Rainier and possibly in the eastern North Cascades.

Plots: 4, MORA (1), NOCA (0), OLYM (0), Other (3)

Environmental Description: This association occurs at high elevations. Sites are near the upper limit of tree growth.

Vegetation Description: This type occurs as tree islands or ribbons in subalpine parkland. The tree canopy is co-dominated by *Abies lasiocarpa* and sometimes*Tsuga mertensiana.* There is no shrub layer. The well-developed herb layer is usually co-dominated by *Festuca viridula*, *Luzula glabrata* var. *hitchcockii*, and *Lupinus (arcticus ssp. subalpinus, latifolius)*. *Festuca viridula* has over 10% cover. *Eucephalus (=Aster) ledophyllus* and *Polemonium pulcherrimum* are usually prominent.

USFWS Wetland System: Not applicable.

Comments: This type equates to *Abies lasiocarpa-Tsuga mertensiana/Festuca viridula* in the coastal correlation project.

Conservation Rank: S2S3

Rank Justification: This association appears within a restricted range although with few threats. Climate change will affect this vegetation.

Synonyms:
Abies lasiocarpa-Tsuga mertensiana/*Festuca viridula* Woodland; Chappell 2005 NPK
Tsuga mertensiana-Abies lasiocarpa/*Festuca viridula* Association; Diaz et al. 1997
Tsuga mertensiana-Abies lasiocarpa/*Festuca viridula*-PNW; Diaz et al. 1997

Abies lasiocarpa/Polemonium pulcherrimum-Pedicularis racemosa Woodland

Subalpine Fir/Jacob's-ladder-Sickletop Lousewort Woodland



Acronym: ABILAS/POLPUL-PEDRAC

NatureServe Code: Preliminary

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa-Cupressus nootkatensis* Tree Island

Classification Confidence Level: 2

Range: This association occurs in the Olympic and the Cascade Mountains.

Plots: 6, MORA (0), NOCA (1), OLYM (5), Other (0)

Environmental Description: This association occurs at high elevations as tree islands in the subalpine parkland.

Vegetation Description: The tree canopy is dominated by *Abies lasiocarpa*. *Cupressus (=Chamaecyparis) nootkatensis* can be co-dominant. There are few to no shrubs and if present they typically have less than 5% cover. The herb layer usually includes *Polemonium pulcherrimum*, *Pedicularis racemosa*, *Polygonum bistortoides*, and/or *Luzula glabrata* var. *hitchcockii*.

USFWS Wetland System: Not applicable.

Comments: *Abies lasiocarpa* parklands with a sparse understory of *Valeriana sitchensis* and/or *Arnica latifolia* may best fit this concept. This differs from the *Abies lasiocarpa-Picea engelmannii*/*Polemonium pulcherrimum* (CEGL000373) by presence to prominence of more Cascadian species such as *Cupressus nootkatensis* and *Luzula glabrata* var. *hitchcockii* and low abundance or absence of *Picea engelmannii*.

Conservation Rank: S3

Rank Justification: This association occurs within a limited ecological range but with few threats. Climate change will likely effect this vegetation.

Synonyms:
Abies lasiocarpa/*Polemonium pulcherrimum-Pedicularis racemosa* Woodland; Chappell 2005 NPK
Abies lasiocarpa-Tsuga mertensiana/*Pedicularis racemosa-Polemonium pulcherrimum* Community Type; Henderson et al. 1979

Abies lasiocarpa/Vaccinium deliciosum Woodland

Subalpine Fir/Blueleaf Huckleberry Woodland

Acronym: ABILAS/VACDEL

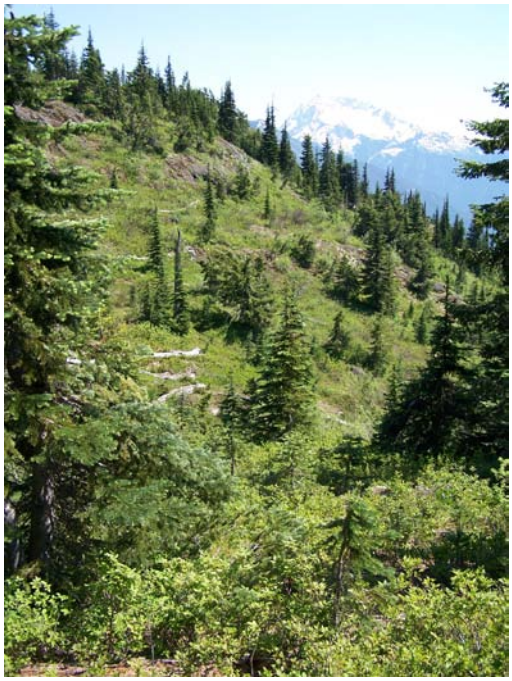
NatureServe Code: PNWCOAST_031

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa-Cupressus nootkatensis* Tree Island

Classification Confidence Level: 2



Range: This association occurs in the Cascade and the Olympic Mountains.

Plots: 12, MORA (3), NOCA (3), OLYM (0), Other (6)

Environmental Description: This association occurs at high elevations. It is found at the ecotone between forest and subalpine parkland or as tree islands within the subalpine parkland.

Vegetation Description: The open canopy is always dominated by *Abies lasiocarpa*. *Tsuga mertensiana* is occasionally present but never prominent. *Cupressus (=Chamaecyparis) nootkatensis* or *Picea engelmannii* can be prominent. The well-developed dwarf-shrub layer is dominated or co-dominated by *Vaccinium deliciosum*. *Paxistima (=Pachistima) myrsinites*, *Phyllodoce empetriformis*,*Vaccinium membranaceum* or *Vaccinium scoparium* are usually present or occassionaly prominent in the dwarf-shrub layer. The herb layer is usually low to moderate in cover. *Arnica latifolia, Luzula glabrata* var. *hitchcockii, Valeriana sitchensis*, *Luetkea pectinata*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Pedicularis racemosa* or *Rubus lasiococcus* are usually present.

USFWS Wetland System: Not applicable.

Comments:

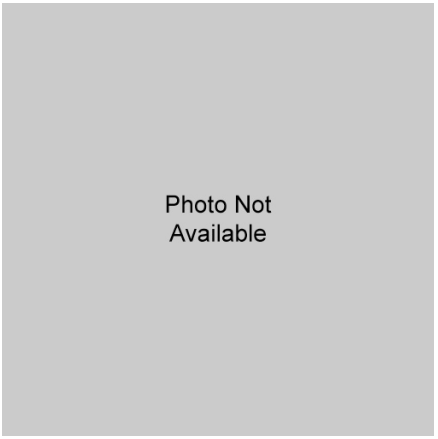
Conservation Rank: S3S4

Rank Justification: Natural-origin stands occur on protected lands within a restricted ecological range. Climate change will likely affect this vegetation.

Synonyms:
Abies lasiocarpa/*Vaccinium deliciosum* Association; Lillybridge et al. 1995
Abies lasiocarpa/*Vaccinium deliciosum* Community; Wooten and Morrison 1995
Abies lasiocarpa/*Vaccinium deliciosum* Woodland; Chappell 2005 NPK
Abies lasiocarpa/*Vaccinium deliciosum*-PNW; Lillybridge et al. 1995

Cupressus nootkatensis/Vaccinium deliciosum Woodland

Alaska yellow-cedar/Blueleaf Huckleberry Woodland



Acronym: CUPNOO/VACDEL

NatureServe Code: Provisional

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa-Cupressus nootkatensis* Tree Island

Classification Confidence Level: 3

Range: This associaton is described from one plot in the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The plot defining this type is at 1740 m (5700 ft) elevation on a east-facing, 50% slope.

Vegetation Description: This is a small open stand dominated by *Cupressus (=Chamaecyparis) nootkatensis* trees in a subalpine parkland setting. *Vaccinium deliciosum* dominates the understory with *Ribes acerifolium* and *Phyllodoce empetriformis* present in lesser amounts. The herbaceous layer contains species common to subalpine environments such as *Valeriana sitchensis*, *Polygonum bistortoides*, *Erythronium montanum*, and *Carex spectabilis*.

USFWS Wetland System: Not applicable.

Comments: This association is very similar to the *Tsuga mertensiana*/*Phyllodoce empetriformis*-*Vaccinium deliciosum* association (PNWCOAST_286) and might best be described as a variant of that association but with a different tree component. This association could be included within the *Cupressus nootkatensis* Subalpine Parkland Woodland (CEGL000350; Stand Group 9; Antos and Zobel 1986) association.

Conservation Rank: S2S4

Rank Justification: This provisional association may represent a narrowly defined type. Climate change will likely affect this vegetation.

Synonyms:

Tsuga mertensiana/Phyllodoce empetriformis-Vaccinium deliciosum Woodland

Mountain Hemlock/Pink Mountain-heather-Blueleaf Huckleberry Woodland



Acronym: TSUMER/PHYEMP-VACDEL

NatureServe Code: PNWCOAST_286

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa-Cupressus nootkatensis* Tree Island

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and Olympic Mountains.

Plots: 11, MORA (1), NOCA (5), OLYM (4), Other (1)

Environmental Description: This subalpine parkland or woodland association is found at high elevations. It is absent from dry climatic areas including the northeastern Olympics and northeastern Mount Rainier.

Vegetation Description: This association typically forms a mosaic of tree clumps or small patches of forest or woodland with dwarf-shrub openings. It also occurs as an upper montane woodland just below the subalpine parkland. *Tsuga mertensiana* dominates the tree layer and *Abies amabilis* is usually present to prominent. *Abies lasiocarpa* is usually absent or, if present, is relatively minor in comparison to other trees. The shrubs *Vaccinium alaskaense*, *Rhododendron albiflorum* or *V. membranaceum* are usually present and often have substantial cover around the bases of trees. The dominant understory vegetation is dwarf-shrubs, primarily *Phyllodoce empetriformis* and *Vaccinium deliciosum*, and secondarily *Cassiope mertensiana* and *Luetkea pectinata*.

USFWS Wetland System: Not applicable.

Comments: One related plot from Olympic National Park is tentatively assigned to the provisional *Cupressus nootkatensis* /*Vaccinium deliciosum* type (CUPNOO/ VACDEL). If additional sampling is conducted, it may be necessary to expand this association's concept or distinguish a new type.

Conservation Rank: S3S4

Rank Justification: This association occurs within a narrow environmental range with few threats. Climate change will likely affect this vegetation.

Synonyms:
MH mmp1 /01; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga mertensiana/ *Phyllodoce empetriformis*-*Vaccinium deliciosum*-NWO-PNW; McCain and Diaz 2002b, Diaz et al. 1997
Tsuga mertensiana/ *Phyllodoce empetriformis*-*Vaccinium deliciosum*-NWW; Henderson et al. 1989, Henderson et al. 1992
Tsuga mertensiana/*Phyllodoce empetriformis*-*Vaccinium deliciosum* Association; Henderson et al. 1989, Henderson et al. 1992
Tsuga mertensiana/*Phyllodoce empetriformis*-*Vaccinium deliciosum* Woodland; Chappell 2005 NPK
Tsuga mertensiana-Abies amabilis (Immature Phase) Community; Douglas 1972
Tsuga mertensiana-Abies amabilis (Mature Phase-Open Group) Community; Douglas 1972
Tsuga mertensiana-Abies amabilis/*Vaccinium deliciosum-Phyllodoce empetriformis* Community Type; del Moral et al. 1976

Tsuga mertensiana-Abies lasiocarpa/Vaccinium deliciosum-Phyllodoce empetriformis Woodland

Mountain Hemlock-Subalpine Fir/Blueleaf Huckleberry-Pink Mountain-heather Woodland



Acronym: TSUMER-ABILAS/VACDEL-PHYEMP

NatureServe Code: CEGL000914

Macrogroup: Vancouverian Subalpine Forest

Group: North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group

Alliance: *Tsuga mertensiana-Abies lasiocarpa-Cupressus nootkatensis* Tree Island

Classification Confidence Level: 2

Range: This association occurs in the Cascades and Olympic Mountains.

Plots: 40, MORA (9), NOCA (1), OLYM (17), Other (13)

Environmental Description: This subalpine parkland association occurs above continuous forest and below upper treeline. It is absent from the driest climatic areas such as the northeast Olympics and northeastern Mount Rainier. Its typical form is a mosaic of tree clumps, small patches of forest or woodland, and dwarf-shrub openings.

Vegetation Description: The tree canopy is usually dominated by *Abies lasiocarpa* with *Tsuga mertensiana* ranging from dominant to present. *Abies amabilis* is often present. *Cupressus (=Chamaecyparis) nootkatensis* can be present to prominent typically as a tall shrub. The shrubs *Vaccinium membranaceum* and *Rhododendron albiflorum* often occur directly under the trees. The well-developed dwarf-shrub layer is co-dominated by *Vaccinium deliciosum* and *Phyllodoce empetriformis*. The herb layer can include *Luzula glabrata var. hitchcockii*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Arnica latifolia*, and *Valeriana sitchensis.*

USFWS Wetland System: Not applicable.

Comments: One Mount Rainier plot is included here in which *Cupressus nootkatensis* is the dominant tree with *Abies lasiocarpa* and *Tsuga mertensiana* each with over 10% cover in the shrub layer. This is transitional with the provisional *Cupressus nootkatensis/Vaccinium deliciosum* association.

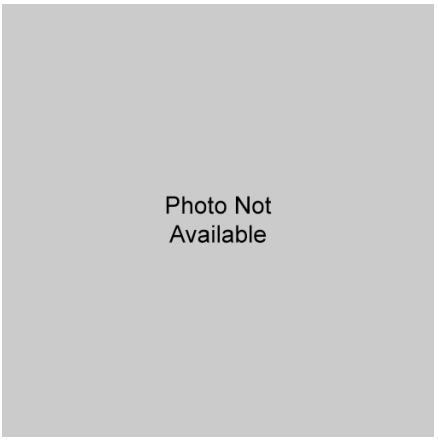
Conservation Rank: S3S4

Rank Justification: This association occurs throughout the high elevations in western Washington.

Synonyms:
Abies lasiocarpa-Tsuga mertensiana/*Phyllodoce empetriformis-Vaccinium deliciosum* Community Type; Henderson et al. 1979
Abies lasiocarpa-Tsuga mertensiana/*Vaccinium membranaceum* Community Type (Hoh); Henderson et al. 1979
MH mmp2 /01; Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga mertensiana(-*Abies lasiocarpa*)/*Phyllodoce empetriformis-Cassiope mertensiana* Dwarf Shrubland With Trees;
Tsuga mertensiana/ *Phyllodoce empetriformis-Vaccinium deliciosum*-EWA; Lillybridge et al. 1995
Tsuga mertensiana/ *Phyllodoce empetriformis-Vaccinium deliciosum*-GP; Diaz et al. 1997
Tsuga mertensiana/*Phyllodoce empetriformis-Cassiope mertensiana* Association;
Tsuga mertensiana/*Phyllodoce empetriformis-Vaccinium deliciosum* Association; Diaz et al. 1997,Kovalchik 2001,Lillybridge et al. 1995
Tsuga mertensiana/*Vaccinium membranaceum*/*Phyllodoce empetriformis* Community Type; del Moral et al. 1976
Tsuga mertensiana-Abies lasiocarpa/*Vaccinium deliciosum-Phyllodoce empetriformis* Woodland; Chappell 2005 NPK

Picea engelmannii/Equisetum arvense Forest

Engelmann Spruce/Field Horsetail Forest



Acronym: PICENG/EQUARV

NatureServe Code: CEGL005927

Macrogroup: Rocky Mountain and Great Basin Flooded & Swamp Forest

Group: Rocky Mountain Subalpine-Montane Riparian Woodland

Alliance: *Picea engelmannii*-(*Abies lasiocarpa*) Riparian Forest

Classification Confidence Level: 2

Range: This association occurs in the east Cascades and Northern Rockies.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This riparian association tends to occur on low gradient, typically meandering streams. It is located on stream terraces or associated with forested or shrub wetlands along mountain streams between 760-1500m (2500-4900ft) elevation. Soils can be mineral (e.g. loam with deep A horizons) or organic.

Vegetation Description: The forest or woodland canopy is usually dominated by *Picea engelmannii* often with *Abies lasiocarpa*. The shrub layer is poorly-developed with occasional patches of *Alnus incana*, *Ribes lacustre* or a wide variety of other riparian shrubs. *Equisetum arvense* is the dominant (over 10% cover) understory species, often growing abundantly with little other forb cover. *Carex disperma* can occasionally be abundant. The variable herb layer usually has one or more of the following: *Maianthemum (=Smilacina) stellatum*, *Streptopus amplexifolius*, *Galium triflorum*, or *Cornus canadensis*.

USFWS Wetland System: Palustrine.

Comments: This type is not represented in the current dataset of vegetation plots for national parks in Washington. It may occur in the headwaters of Lake Chelan.

Conservation Rank: S3

Rank Justification: This association occurs at numerous sites in Washington but is poorly represented on protected areas. Direct and indirect hydrologic changes, such as road construction, can negatively affect occurrences.

Synonyms:
Picea engelmannii/*Equisetum* spp. Association; Williams et al. 1995, Kovalchik 2001, Lillybridge et al. 1995, Williams and Lillybridge 1983

Abies amabilis-Tsuga mertensiana/Oplopanax horridus Forest

Pacific Silver Fir-Mountain Hemlock/Devil's-club Forest

Acronym: ABIAMA-TSUMER/OPLHOR

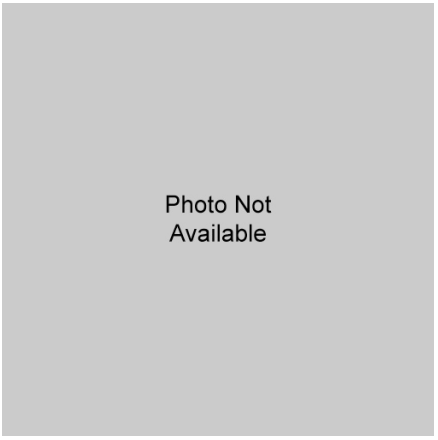
NatureServe Code: CEGL000507

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Tsuga - Abies - Picea) / (Rubus - Oplopanax)* Swamp Forest Alliance

Classification Confidence Level: 1



Range: This association occurs in the Cascade Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at middle elevations. Sites include mid to toe slopes, benches, and bottoms, with poorly-drained soils that are subirrigated or associated with springs, seeps, or small streams.

Vegetation Description: The canopy is co-dominated by *Tsuga mertensiana* and *Abies amabilis*. The former has over 10% total cover and the latter usually dominates tree regeneration. The well-developed shrub layer is dominated or co-dominated by *Vaccinium alaskaense*. *Oplopanax horridus* is always prominent to co-dominant. *Rubus spectabilis* is usually prominent to co-dominant. *Alnus viridis* ssp. *sinuata* is occasionally co-dominant. The herb layer is usually relatively rich. The most abundant species include *Rubus pedatus*, *Clintonia uniflora*, *Tiarella trifoliata* var. *unifoliata*, *Athyrium filix-femina*, and *Gymnocarpium dryopteris*.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S3S4

Rank Justification: Natural-origin stands occur on protected lands and some non-protected stands are subject to logging and development.

Synonyms:
Abies amabilis-Tsuga mertensiana/*Oplopanax horridus* Forest; Chappell 2005 NPK
Tsuga mertensiana/*Oplopanax horridum-Vaccinium alaskaense* Association; Henderson et al. 1992, Kovalchik 2001
Tsuga mertensiana/*Oplopanax horridus-Vaccinium alaskaense*-NWW; Henderson et al. 1992

Picea sitchensis/Rubus spectabilis/Carex obnupta-Lysichiton americanus Forest

Sitka Spruce/Salmonberry/Slough Sedge-Skunkcabbage Forest



Acronym: PICSIT/RUBSPE/CAROBN-LYSAME

NatureServe Code: CEGL000400

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Tsuga heterophylla - Picea sitchensis-Thuja plicata- Abies) / Lysichiton americanus* Coniferous Swamp Woodland

Classification Confidence Level: 2

Range: This association occurs on the western Olympic Peninsula.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This forested wetland association occurs at low elevations. Sites are flat or nearly so and usually occur on riverine terraces or floodplains of low-gradient streams. Soils are poorly drained and typically seasonally flooded.

Vegetation Description: The forest or woodland canopy is always dominated or co-dominated by *Picea sitchensis*. *Alnus rubra* is sometimes co-dominant and *Tsuga heterophylla* can be prominent. The shrub layer ranges from sparse to moderately dense and is characterized by consistent presence of *Rubus spectabilis*, with *Gaultheria shallon* sometimes present. The well-developed herb layer is dominated by *Carex obnupta* and/or *Lysichiton americanus*. *Carex obnupta* is always at least present and usually co-dominant.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S2

Rank Justification: This floodplain community is uncommon and occurs within a limited geographic and ecological range.

Synonyms:
Picea sitchensis/*Carex obnupta* Community; Kratz 1975
Picea sitchensis/*Carex obnupta-Lysichiton americanus*-WArip; Chappell 1999
Picea sitchensis/*Rubus spectabilis*/*Carex obnupta-Lysichiton americanus* Forest; Chappell 2005 NPK
Picea sitchensis-Alnus rubra/*Lysichitum americanum* community type; Kunze 1994
Picea sitchensis-Alnus rubra/*Rubus spectabilis*/*Carex obnupta* community type-in part; Kunze 1994

Tsuga heterophylla-(Thuja plicata-Alnus rubra)/Lysichiton americanus-Athyrium filix-femina Forest

Western Hemlock-(Western Redcedar-Red Alder)/Skunkcabbage-Lady Fern Forest



Acronym: TSUHET-(THUPLI-ALNRUB)/LYSAME-ATHFIL

NatureServe Code: CEGL002670

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Tsuga heterophylla - Picea sitchensis-Thuja plicata- Abies) / Lysichiton americanus* Coniferous Swamp Woodland

Classification Confidence Level:

Range: This forested wetland association occurs in the lowlands throughout western Washington, except perhaps on the outer coastal plain of the Olympic Peninsula.

Plots: 3, MORA (3), NOCA (0), OLYM (0), Other (0)

Environmental Description: This type occurs exclusively on poorly drained sites that are saturated or seasonally flooded. Soils are saturated throughout the growing season and are often organic (muck or woody peat), but may also be mineral.

Vegetation Description: The semi-open to dense forest canopy is dominated by *Tsuga heterophylla*, *Thuja plicata*, and/or *Alnus rubra*. Either *Tsuga heterophylla* or *Thuja plicata* are always at least co-dominant. *Picea sitchensis*, *Pseudotsuga menziesii* or *Abies amabilis* are sometimes present in lesser abundance. Tree regeneration is generally dominated by *Tsuga heterophylla*. The shrub layer varies from sparse to well-developed. *Rubus spectabilis* is usually the most abundant species. *Acer circinatum* is sometimes prominent. The herb layer is well-developed and dominated or co-dominated by *Lysichiton americanus*. *Athyrium filix-femina* is usually present to prominent. The understory is characterized by at least 5% cover of *Lysichiton americanus*, relatively low abundance of *Gaultheria shallon*, and the presence to prominence of *Rubus spectabilis* or *Athyrium filix-femina*.

USFWS Wetland System: Palustrine.

Comments:

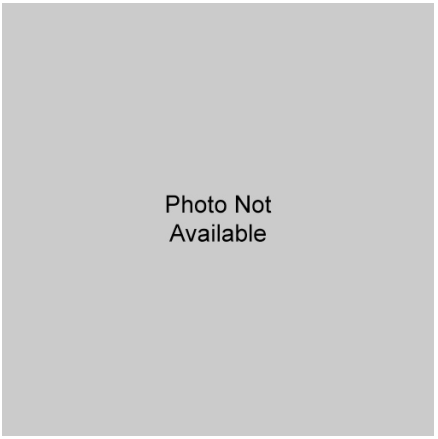
Conservation Rank: S2S3

Rank Justification: This association occurs only in wetlands. It is sensitive to changes in hydrology or water quality and to logging disturbance.

Synonyms:
CWH dm /12; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 1 /12; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 2 /12; Green and Klinka 1994, BC Ministry of Forests 2003
Thuja plicata/*Athyrium filix-femina* Association; Murray 2000
Thuja plicata-*Tsuga heterophylla*/*Lysichitum americanum* community type; Kunze 1994, p34,94
Tsuga heterophylla-(*Thuja plicata-Alnus rubra*)/*Lysichiton americanus-Athyrium filix-femina* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Lysichiton americanus*-NWW; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/*Lysichiton americanus*-PNW; McCain and Diaz 2002b, Topik et al. 1986, Halverson et al. 1986
Tsuga heterophylla/*Lysichitum americanum* Association; Henderson et al. 1992, Topik et al. 1986

Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Lysichiton americanus Forest

Western Hemlock-Pacific Silver Fir/Alaska Blueberry/Skunkcabbage Forest



Acronym: TSUHET-ABIAMA/VACALA/LYSAME

NatureServe Code: CEGL000223

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *Alnus rubra*/*Lysichiton americanus* Swamp Woodland

Classification Confidence Level: 1

Range: This association occurs in the Olympic Mountains and northwestern Cascade Range.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This forested wetland association occurs at middle elevations (250-900 m (820-2950 ft)). Site are small patches where soils are saturated and typically organic (especially muck).

Vegetation Description: The canopy is dominated by *Tsuga heterophylla*, and usually co-dominated by *Abies amabilis* and *Thuja plicata*. *Abies amabilis* occupies over 10% total cover (understory and canopy). The understory has a moderately dense to open shrub layer, with *Vaccinium alaskaense*, *Oplopanax horridus*, and *Rubus spectabilis* being the major species (only the first is always present). The herb layer is well-developed and *Lysichiton americanus* typically a co-dominant (always over 5% cover). Many other forbs and ferns may occur, especially *Clintonia uniflora*, *Blechnum spicant*, *Rubus pedatus*, *Streptopus lanceolatus (=roseus) var. curvipes*, *Maianthemum dilatatum*, *Athyrium filix-femina*, and *Cornus unalaschkensis (=canadensis)*.

USFWS Wetland System: Palustrine.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S3

Rank Justification: This association occurs in small patches associated with a very specific environment. It is moderately threatened by logging and associated impacts and due to its saturated, organic soils, which are susceptible to physical disturbance and difficult to restore once impacted.

Synonyms:
Abies amabilis/*Lysichiton americanus*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis/*Lysichitum americanum* Association; Henderson et al. 1989, Henderson et al. 1992
CWH ms 1 /11; Green and Klinka 1994, BC Ministry of Forests 2003
CWH ms 2 /11; Green and Klinka 1994, BC Ministry of Forests 2003
Thuja plicata/(*Lysichiton americanus*) Association; Murray 2000
Tsuga heterophylla/*Lysichitum americanum* Association; Lillybridge et al. 1995
Tsuga heterophylla-Abies amabilis/*Vaccinium alaskaensis*/*Lysichiton americanus* Forest; Chappell 2005 NPK

Tsuga heterophylla-Thuja plicata/Gaultheria shallon/Lysichiton americanus Forest

Western Hemlock-Western Redcedar/Salal/Skunkcabbage Forest



Acronym: TSUHET-THUPLI/GAUSHA/LYSAME

NatureServe Code: CEGL003226

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Tsuga heterophylla - Picea sitchensis-Thuja plicata- Abies) / Lysichiton americanus* Coniferous Swamp Woodland

Classification Confidence Level: 2

Range: This association occurs on the western coastal plain of the Olympic Peninsula and on Mount Rainier.

Plots: 5, MORA (3), NOCA (0), OLYM (2), Other (0)

Environmental Description: This forested wetland association (can be a woodland) occurs on organic soils that are poorly drained and composed primarily of muck, with admixture of woody debris and/or woody peat. Topography is flat or gently sloping. Microtopography is typified by raised areas of large woody debris and lower areas that are wetter and seasonally flooded to saturated.

Vegetation Description: The canopy is dominated by *Thuja plicata* and *Tsuga heterophylla*, with the latter usually dominating the tree understory. *Abies amabilis* and *Picea sitchensis* sometimes occur in the understory (typically the former) or canopy (more the latter) with under 25% cover. *Gaultheria shallon* dominates or co-dominates the shrub layer and is rooted in woody debris. *Vaccinium alaskaense* is usually prominent to co-dominant. Other frequently occuring shrubs are *Vaccinium parvifolium* and *Menziesia ferruginea*. *Vaccinium ovatum* can be locally abundant (particularly adjacent to the outer coast) but is usually absent. The herb layer is characterized by at least 5% cover of *Lysichiton americanus*, growing in the wettest microsites. *Blechnum spicant* is typically prominent to co-dominant. *Cornus unalaschkensis (=canadensis)* and *Rubus pedatus* are usually present.

USFWS Wetland System: Palustrine.

Comments: One plot, the only Mount Rainier location with *Picea sitchensis,* is tentatively included in this type. It is a sub-irrigated site at a higher elevation and with lower cover of *Lysichiton americanus* that is otherwise similar to this association.

Conservation Rank: S2

Rank Justification: This association occurs in small patches associated with a very specific environment. It is moderately threatened by logging and associated impacts and is fragile due to its saturated, organic soils, which are susceptible to physical disturbance and difficult to restore once impacted, and sensitivity to hydrological alterations.

Synonyms:
Abies amabilis/*Gaultheria shallon*/*Lysichiton americanus*-Olympics; Bigley and Hull 1995
Abies amabilis/*Gaultheria shallon-Lysichitum americanum* Association; Bigley and Hull 1995
CWH mm 1 /12; Green and Klinka 1994
CWH vh 1 /13; Green and Klinka 1994
CWH vm 1 /14; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
MXD-CON/*Gaultheria shallon*/*Lysichiton americanus*-AKS; Pawuk and Kissinger 1989
Picea sitchensis/*Gaultheria shallon*/*Lysichiton americanus*-Olympics; Bigley and Hull 1995
Picea sitchensis/*Gaultheria shallon-Lysichitum americanum* Association; Bigley and Hull 1995
Tsuga heterophylla/*Gaultheria shallon*/*Lysichiton americanus*-Olympics; Bigley and Hull 1995
Tsuga heterophylla/*Gaultheria shallon-Lysichitum americanum* Association; Bigley and Hull 1995
Tsuga heterophylla/*Lysichitum americanum* Association; Henderson et al. 1989
Tsuga heterophylla-Thuja plicata/*Gaultheria shallon*/*Lysichiton americanus* Forest; Chappell 2005 NPK
Tsuga heterophylla-Thuja plicata/*VAcer circinatum-Gaultheria shallon*/*Lysichiton americanus*-AKK; DeMeo et al. 1992

Alnus rubra/Athyrium filix-femina-Lysichiton americanus Forest

Red Alder/Lady Fern-Skunkcabbage Forest



Acronym: ALNRUB/ATHFIL-LYSAME

NatureServe Code: CEGL003388

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Alnus - Fraxinus - Populus) / Lysichiton americanus* Deciduous Swamp Woodland

Classification Confidence Level: 2

Range: This association occurs in western Washington.

Plots: 2, MORA (2), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association has poorly drained wetland soils and occurs on typically flat sites. It is often associated with lakes, ponds, or depressional wetlands but not with active riverine flooding.

Vegetation Description: The canopy is dominated by *Alnus rubra*. The understory is characterized by over 5% cover of *Lysichiton americanus*, the presence of *Athyrium filix-femina*, and absence or low cover of *Carex obnupta*. *Rubus spectabilis* often occurs as a prominent to dominant shrub, depending on disturbance history.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs in a narrow range and environment.

Synonyms:
Alnus ruba/*Athyrium filix-femina-Lysichiton americanus* Forest; Chappell 2005 NPK
Alnus rubra/(*Athyrium filix-femina-Lysichiton americanus*) Association; Murray 2000
Alnus rubra/*Lysichitum americanum* community type; Kunze 1994

Alnus rubra/Glyceria striata Forest

Red Alder/Fowl Mannagrass Forest



Acronym: ALNRUB/GLYSTR

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Alnus - Fraxinus - Populus) / Lysichiton americanus* Deciduous Swamp Woodland

Classification Confidence Level: 3

Range: This association is described from one plot in the Olympic Mountains and may be elsewhere in western Washington.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The plot defining this type is located in a depressional wetland at 595 m (1950 ft) elevation.

Vegetation Description: This broadleaf wetland forest is dominated by *Alnus rubra* with some *Tsuga heterophylla*. A sparse shrub layer of *Rubus spectabilis* occurs with a dense, diverse herb layer dominated by *Glyceria striata (=elata)*, along with *Athyrium filix-femina*, *Tiarella trifoliata*, *Tolmiea menziesii* and *Viola glabella*.

USFWS Wetland System: Palustrine

Comments: This preliminary association is recognized from a single plot and a citation in Oregon (Murray 2000). Data from focused riparian sampling are needed.

Conservation Rank: S2S4Q

Rank Justification: Insufficient information exists to provide more specificity than a range rank for this preliminary association.

Synonyms:
Alnus rubra/*Glyceria elata* Association; Murray 2000

Alnus rubra/Rubus spectabilis/Chrysosplenium glechomifolium Forest

Red Alder/Salmonberry/Golden Saxifrage Forest



Acronym: ALNRUB/RUBSPE/CHRGLE

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Hardwood-Conifer Swamp

Alliance: *(Alnus - Fraxinus - Populus) / Lysichiton americanus* Deciduous Swamp Woodland

Classification Confidence Level: 2

Range: This association occurs on the western Olympic Peninsula.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This forested wetland association occupies riparian terraces, toeslopes, or landslide deposits with poorly drained soils at low elevations. Most soils are fine-grained. It occurs in the wettest climatic area in the lowlands of western Washington.

Vegetation Description: The forest canopy is dominated by *Alnus rubra* and is occasionally co-dominated by *Picea sitchensis*. The understory is characterized by over 10% cover of the herb *Chrysosplenium glechomifolium*. *Rubus spectabilis* is always present and often forms a well-developed shrub layer. *Lysichiton americanus* is often present in small amounts and is sometimes heavily browsed by mountain beaver (*Aplodontia*).

USFWS Wetland System: Palustrine.

Comments: This type is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S3S4

Rank Justification: This association occurs within a limited range and environment with few threats.

Synonyms:
Alnus rubra/*Rubus spectabilis*/*Chrysosplenium glechomifolium* Forest; Chappell 2005 NPK
Alnus rubra/*Rubus spectabilis*/*Chrysosplenium glechomifolium* Forest Community; Chappell 1999

Acer macrophyllum/Maianthemum stellatum Forest

Bigleaf Maple/Starry False Solomon's Seal Forest



Acronym: ACEMAC/MAISTE

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 3

Range: This association is described from one plot in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The plot representing this riparian vegetation occurs on a 25% slope.

Vegetation Description: *Acer macrophyllum* dominates the closed broadleaf forest canopy. The shrub layer is sparse with *Rubus parviflorus*, *Oplopanax horridus* and *Sambucus racemosa* present. *Maianthemum (=Smilacina) stellatum*, *Prosartes (=Disporum) hookeri* and a *Poa* species dominate the herbaceous understory.

USFWS Wetland System: Palustrine

Comments: This provisional association may represent a new type or fit within one of several currently recognized associations. Data from focused riparian sampling are needed.

Conservation Rank: S2S4Q

Rank Justification: This association has a provisional classification status and is represented on one site in a protected area.

Synonyms:

Acer macrophyllum/Oxalis oregana Forest

Bigleaf Maple/Oregon Oxalis Forest



Acronym: ACEMAC/OXAORE

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra*) Riparian Forest Alliance

Classification Confidence Level: 2

Range: This type occurs on the Olympic Peninsula.

Plots: 9, MORA (0), NOCA (0), OLYM (9), Other (0)

Environmental Description: This association occurs at elevations generally below 450 m (1500 ft) on flat to low gradient slopes. Sites are moist and located primarily on riparian terraces. It is also found on alluvial fans, toe slopes, and adjacent to wetlands.

Vegetation Description: This broadleaf forest is dominated by *Acer macrophyllum* with conifers present, most frequently *Picea sitchensis*. A tall shrub layer is usually present and is dominated by *Acer circinatum* with *Rubus spectabilis* often present. The lush, species-rich herbaceous understory is dominated by *Oxalis oregana* with *Polystichum munitum* often co-dominant. *Tolmiea menziesii*, *Claytonia (=Montia) sibirica*, *Circaea alpina* and *Galium aparine* are frequently present to prominent.

USFWS Wetland System: Not applicable.

Comments: This association may be a variant of the *Populus balsamifera* ssp. *trichocarpa* - *Picea sitchensis* - (*Acer macrophyllum*) / *Oxalis oregana* association (CEGL003418). The stands with abundant *Acer circinatum* and *Oxalis oregana* included in this type were formerly considered part of the *Acer macrophyllum/Acer circinatum* association (CEGL000560).

Conservation Rank: S3S4

Rank Justification: There are few sites of this association within a limited geographic extent on the western Olympic Peninsula. Exotic species are present in most stands to varying degrees and will probably spread over time.

Synonyms:

Acer macrophyllum/Polystichum munitum-Tolmiea menziesii Forest

Bigleaf Maple/Swordfern-Youth-on-age Forest

Acronym: ACEMAC/POLMUN-TOLMEN

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 3



Range: This association occurs on the Olympic Peninsula and is likely found in the Cascade Mountain foothills.

Plots: 6, MORA (0), NOCA (0), OLYM (6), Other (0)

Environmental Description: This broadleaf forest association occurs on riparian terraces at relatively low elevations (less than 610 m (2000 ft) in plot data).

Vegetation Description: In this association, the overstory canopy is partially to completely closed. *Acer macrophyllum* dominates the overstory, sometimes with *Alnus rubra* which is always less prominent. The conifers *Abies grandis* and *Pseudotsuga menziesii* can be present and are always less abundant than deciduous trees. *Symphoricarpos albus* is the most frequent shrub with *Acer circinatum*, *Rosa gymnocarpa* or *Rubus spectabilis* less commonly present, typically in patches. *Polystichum munitum* characteristically dominates the understory. *Tolmiea menziesii*, *Carex deweyana*, *Circaea alpina*, *Bromus vulgaris*, *Melica subulata*, *Viola glabella*, or *Galium aparine* are usually present and can be prominent. *Polypodium glycyrrhiza* is usually present as an epiphyte on the *Acer* trees.

USFWS Wetland System: Palustrine.

Comments: There is possible confusion or overlap between this association and the *Acer macrophyllum/Rubus spectabilis* (CEGL000561) association. However, the latter has much greater abundance of *Rubus spectabilis* and/or *Ribes bracteosum.* The *Acer macrophyllum-(Pseudotsuga menziesii)/Polystichum munitum* association (Preliminary) appears on disturbed sites such as debris slides and previously logged upland sites.

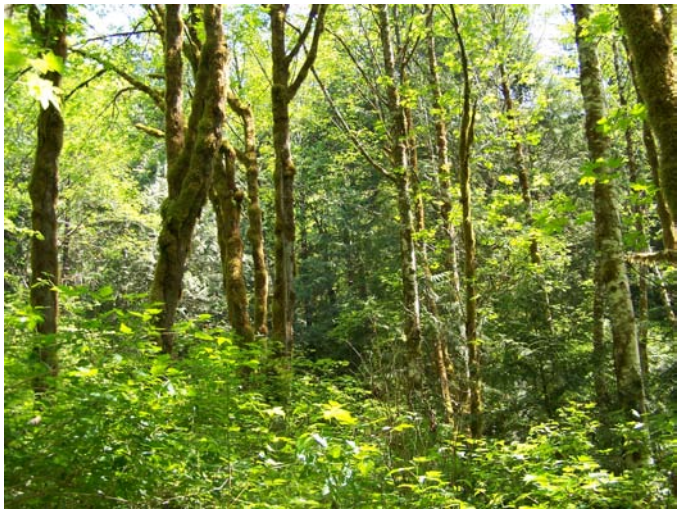
Conservation Rank: S3S4

Rank Justification: This preliminary association occurs within a narrow geographic and ecologic range. It is currently recognized as a natural vegetation unit that may be altered by logging.

Synonyms:

Acer macrophyllum/Rubus spectabilis Forest

Bigleaf Maple/Salmonberry Forest



Acronym: ACEMAC/RUBSPE

NatureServe Code: CEGL000561

Macrogroup: Vancouverian Flooded & Swamp Forest Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 3

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 5, MORA (0), NOCA (1), OLYM (4), Other (0)

Environmental Description: This low elevation to foothill association appears mostly on riparian floodplains, terraces or moist soils (seeps). It can occur on moist upland sites as early seral vegetation.

Vegetation Description: This closed broadleaf forest is dominated by *Acer macrophyllum* with occasional *Alnus rubra*. *Picea sitchensis*, *Tsuga heterophylla* and *Thuja plicata* can be present to prominent but in aggregate never exceeds broadleaf tree cover. *Rubus spectabilis* and/or *Ribes bracteosum* dominates the shrub understory with few other shrub species present. However, *Acer circinatum* can form an upper tall-shrub layer. *Polystichum munitum* and *Tolmiea menziesii* can be prominent to dominant in the herb layer. *Claytonia (=Montia) sibirica*, *Circaea alpina*, *Carex deweyana*, and *Melica subulata* are other frequent herbs.

USFWS Wetland System: Palustrine.

Comments: There is possible confusion or overlap between this association and *Acer macrophyllum /Polystichum munitum-Tolmiea menziesii* (Preliminary) which is characterized by low abundance of *Rubus spectabilis* and other shrubs.

Conservation Rank: S4

Rank Justification: This preliminary association occurs within a narrow geographic and ecologic range. It is currently recognized as a natural vegetation type that may be altered by logging.

Synonyms:
Acer macrophyllum/*Rubus spectabilis* Community Type; Douglas 1971
Acer macrophyllum/*Rubus spectabilis* Forest; Chappell 2005 NPK

Alnus rubra/Acer circinatum/Claytonia sibirica Forest

Red Alder/Vine Maple/Western Springbeauty Forest



Acronym: ALNRUB/ACECIR/CLASIB

NatureServe Code: CEGL003298

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This type is found in western Washington.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at lower elevations on riparian floodplains, streambanks, or terraces. Soils are somewhat well-drained.

Vegetation Description: The canopy is dominated by *Alnus rubra*. *Acer circinatum* dominates a tall shrub layer though *Rubus spectalilis* and other shrubs may be present. *Athyrium filix-femina*, *Claytonia (=Montia) sibirica*, *Stachys chamissonis* var. *cooleyae*, *Polystichum munitum* and *Tolmiea menziesii* are often present and, collectively, usually have over 10% cover.

USFWS Wetland System: Palustrine.

Comments: The one plot recorded at MORA is transitional to *Alnus rubra/Oplopanax horridus-Rubus spectabilis* (CEGL003399).

Conservation Rank: S4

Rank Justification: This association is, geographically, relatively widespread although limited to riparian and valley bottom habitats.

Synonyms:
Alnus rubra/*Acer circinatum* community; Diaz & Mellon 1996
Alnus rubra/*Acer circinatum*/*Claytonia sibirica* Forest; Chappell 2005 NPK
Alnus rubra/*Acer circinatum*/*Polystichum munitum* Community Type; Mycek 1994

Alnus rubra/Elymus glaucus Forest

Red Alder/Blue Wildrye



Acronym: ALNRUB/ELYGLA

NatureServe Code: CEGL003398

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This type is found in western Washington.

Plots: 14, MORA (0), NOCA (0), OLYM (14), Other (0)

Environmental Description: This association occurs at low elevations on riparian floodplains and flat, lower terraces. Soils are well-drained due to coarse texture. Cobbles can be common on the soil surface of these sites although often obscured by litter.

Vegetation Description: The canopy is dominated by *Alnus rubra.* In the western Olympics, *Picea sitchensis* is typically in the canopy or sub-canopy. Grasses dominate the understory, and can co-dominate with the trailing dwarf-shrub *Rubus ursinus* (latter situation not found in the parks). *Acer circinatum* occasionally forms a tall-shrub layer. *Elymus glaucus* or *Elymus hirsutus* has over 1% cover and often well over 10%. *Polystichum munitum* is usually present but under 5% cover. *Oxalis oregana*, *Claytonia (=Montia) sibirica*, *Galium aparine*, *Circaea alpina* and *Tolmiea menziesii* occur frequently. *Agrostis* spp. and *Ranunculus repens* are often abundant. Sites heavily used by elk may lack the full suite of native indicator species but are still dominated by grasses, such as *Poa trivialis*, *Agrostis exarata*, *Poa pratensis*, or *Bromus sitchensis.*

USFWS Wetland System: Palustrine.

Comments: This association is broadly defined to include all grass dominated *Alnus rubra* stands with *Elymus glaucus* or *Elymus hirsutus*. It is related to the *Alnus rubra*/*Oxalis (oregana, trilliifolia)* Forest (CEGL003400). The plots with *Acer circinatum* are related to the *Alnus rubra/Acer circinatum/Claytonia siberica* Forest (CEGL003298).

Conservation Rank: S3S4

Rank Justification: This association receives some protection and occurs in a restricted range and environment.

Synonyms:
Alnus rubra (Shrub) community; Diaz & Mellon 1996
Alnus rubra community; Fonda 1974
Alnus rubra/*Elymus glaucus* community; Diaz & Mellon 1996
Alnus rubra/*Elymus glaucus* Forest; Chappell 2005 NPK
Alnus rubra/Grass Community Type; Henderson et al. 1979
Alnus rubra/*Rubus ursinus*/*Elymus glaucus* Community Type; Chappell 1999
Alnus rubra-Salix scouleriana/Grass Community Type; Henderson et al. 1979

Alnus rubra/Oplopanax horridus-Rubus spectabilis Forest

Red Alder/Devil's-club-Salmonberry Forest

Acronym: ALNRUB/OPLHOR-RUBSPE

NatureServe Code: CEGL003399

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2



Range: This association occurs in western Washington.

Plots: 2, MORA (2), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at lower elevations on riparian floodplains, terraces, and toe slopes. Sites are somewhat poorly drained, usually due to restrictive soil layers perching moving water to create subirrigation.

Vegetation Description: The canopy is dominated by *Alnus rubra*. The understory is dominated or co-dominated by *Oplopanax horridus,* which always occupies over 10% cover. *Rubus spectabilis* and/or *Ribes bracteosum* often co-dominate in the shrub layer. A diverse and often abundant herbaceous layer is typical. *Athyrium filix-femina*, *Gymnocarpium dryopteris*, *Oxalis oregana*, and *Tolmiea menziesii* are among the many herbaceous species that are frequently abundant in the understory.

USFWS Wetland System: Palustrine.

Comments:

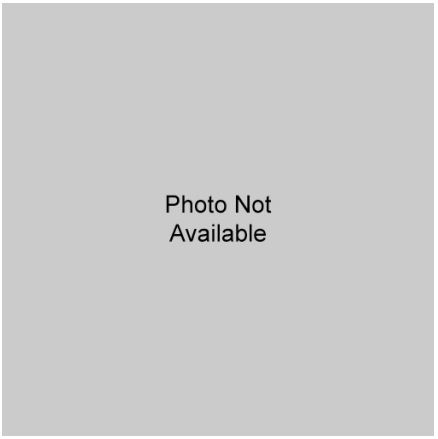
Conservation Rank: S4

Rank Justification: This association receives some protection and occurs within a restricted range and environment.

Synonyms:
Alnus rubra/*Oplopanax horridum* community; Diaz & Mellon 1996
Alnus rubra/*Oplopanax horridum*/*Corydalis scouleri* Community Type; Mycek 1994
Alnus rubra/*Oplopanax horridum-Rubus spectabilis* Forest; Chappell 2005 NPK
Alnus rubra/*Oplopanax horridus* Community; Peter 2000
Alnus rubra/*Oplopanax horridus*/*Athyrium filix-femina* Community; Peter 2000
Alnus rubra/*Oplopanax horridus*/*Oxalis oregana* Association; Murray 2000
Alnus rubra/*Rubus spectabilis* community type; Franklin et al. 1988

Alnus rubra/Petasites frigidus Forest

Red Alder/Sweet Coltsfoot Forest



Acronym: ALNRUB/PETFRI

NatureServe Code: CEGL003401

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This type is found in western Washington.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs on well-drained soils at lower to middle elevations on riparian floodplains, bars, or low-lying streambanks. These sites are frequently flooded and/or occurs as an early successional vegetation type.

Vegetation Description: The canopy is dominated by *Alnus rubra* which is sometimes only at shrub height due to its early successional status. The understory is dominated by *Petasites frigidus* although other forbs are typically present. Shrubs (other than shrub-height alder) are under 20% cover if present.

USFWS Wetland System: Palustrine.

Comments: This association is not represented in the current data set of vegetation plots for the national parks in Washington. Sites co-dominated at by *Salix sitchensis* and *Alnus rubra* as tall shrubs are included in *Salix sitchensis/Equisetum arvense-Petasites frigidus* shrubland (CEGL003296).

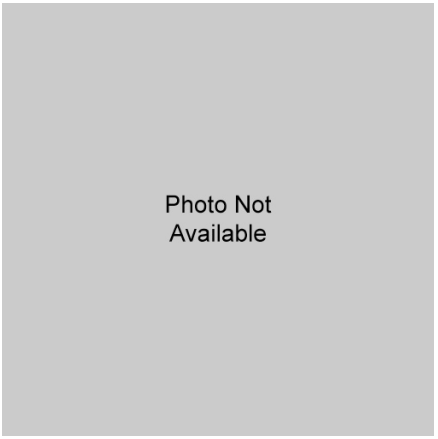
Conservation Rank: S4

Rank Justification: This association occurs in limited range and environment with few threats.

Synonyms:
Alnus rubra/*Petasites frigidus* community; Diaz & Mellon 1996
Alnus rubra/*Petasites frigidus* Forest; Chappell 2005 NPK
Alnus rubra/*Polystichum munitum*/*Oxalis trillifolia* Community Type; Mycek 1994
Alnus rubra/*Rubus parviflorus*/*Petasites frigidus* Community Type; Mycek 1994

Alnus rubra/Rubus parviflorus Forest

Red Alder/Thimbleberry Forest



Acronym: ALNRUB/RUBPAR

NatureServe Code: CEGL003402

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association is described from the west Cascades but may occur elsewhere in lowland western Washington.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at low elevations on riparian floodplains, terraces, streambanks, and toe slopes. This association initiates following high flow events and represents vegetation development without subsequent disturbance.

Vegetation Description: The canopy is dominated by *Alnus rubra* which is sometimes only at shrub height due to early successional status. *Rubus parviflorus* dominates the understory often with low cover of *Rubus spectabilis*. *Stachys chamissonis* var. *cooleyae* is most constant and prominent of the numerous herbaceous species which may occur in this association. The ground is typically covered by mosses and exposed soil.

USFWS Wetland System: Palustrine.

Comments: This type is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S3

Rank Justification: This association occurs within a limited range and environment with few known occurrences. There are few threats to this association.

Synonyms:
Alnus rubra/*Rubus parviflorus* community; Diaz & Mellon 1996
Alnus rubra/*Rubus parviflorus* Forest; Chappell 2005 NPK

Alnus rubra/Rubus spectabilis Forest

Red Alder/Salmonberry Forest



Acronym: ALNRUB/RUBSPE

NatureServe Code: CEGL000639

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 1

Range: This association occurs throughout western Washington.

Plots: 11, MORA (1), NOCA (3), OLYM (7), Other (0)

Environmental Description: This low to mid-elevation, forested riparian/wetland association occupies riparian terraces, streambanks, floodplains, moist toe slopes, as well as the transitional edges of depressional wetlands.

Vegetation Description: *Alnus rubra* dominates the tree canopy. The well-developed shrub layer is dominated by *Rubus spectabilis* and/or co-dominated by *Ribes bracteosum*. *Acer circinatum* can be abundant. Herbs are usually present and can be diverse. *Athyrium filix-femina*, *Circaea alpina*, *Claytonia (=Montia) sibirica, Tiarella trifoliata*, *Tolmiea menziesii*, *Polystichum munitum*, *Carex deweyana*, and *Oxalis oregana* are some of the most common forbs and ferns.

USFWS Wetland System: Palustrine.

Comments: Stands on steep unstable slopes or in upland disturbed areas are included in the *Alnus rubra*/*Polystichum munitum* association (CEGL000638).

Conservation Rank: S4S5

Rank Justification: This association occurs within a limited range and environment with few threats.

Synonyms:
Alnus rubra/*Rubus spectabilis* Association; Murray 2000
Alnus rubra/*Rubus spectabilis* community type; Kunze 1994
Alnus rubra/*Rubus spectabilis* Forest; Chappell 2005 NPK, Chappell 1999
Alnus rubra/*Rubus spectabilis*/*Athyrium filix-femina* Community; Peter 2000
Alnus rubra/*Rubus spectabilis*/*Oxalis* spp. community; Diaz & Mellon 1996
Alnus rubra/*Rubus spectabilis*/*Tolmiea menziesii* community; Diaz & Mellon 1996
Alnus rubra-Populus *trichocarpa*/*Polystichum munitum* Community Type; Mycek 1994
Alnus rubra-Populus *trichocarpa*/*Rubus spectabilis* Community; Agee 1987

Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichiton americanus Woodland

Red Alder/Salmonberry/Slough Sedge-Skunkcabbage Woodland



Acronym: ALNRUB/RUBSPE/CAROBN-LYSAME

NatureServe Code: CEGL003389

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in western Washington, especially on the western Olympic Peninsula.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This low to mid-elevation, forested wetland association occupies poorly to very poorly drained soils. Most often it occurs on riparian terraces or floodplains, but may also occur in depressional or headwater wetlands.

Vegetation Description: The canopy is dominated by *Alnus rubra*. The understory is characterized by over 5% cover of *Lysichiton americanus* or *Carex obnupta*, the consistent presence of *Carex obnupta*, and the absence or relative paucity of *Athyrium filix-femina*. *Rubus spectabilis* is always present and often dominates a well-developed shrub layer.

USFWS Wetland System: Palustrine.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington.

Conservation Rank: S3

Rank Justification: This association occurs within a limited environmental and geographic range.

Synonyms:
Alnus rubra/*Rubus spectabilis*/*Carex obnupta-Lysichiton americanus* Forest Community; Chappell 1999
Alnus rubra/*Rubus spectabilis*/*Carex obnupta-Lysichiton americanus* Woodland; Chappell 2005 NPK
Alnus rubra/*Rubus spectabilis*/*Carex obnupta-Lysichitum americanum* community type; Kunze 1994

Alnus rubra/Stachys chamissonis var. cooleyae-Tolmiea menziesii Forest

Red Alder/Great Hedgenettle-Youth-on-age Forest



Acronym: ALNRUB/STACHA-TOLMEN

NatureServe Code: CEGL003403

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Acer macrophyllum, Alnus rubra)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the Olympic Mountains, Mount Rainier and likely elsewhere in western Washington.

Plots: 4, MORA (2), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs at lower elevations on moist, well-drained soils that are located on riparian floodplains, streambanks or lower terraces. Sites are periodically flooded but with trees and other vegetation surviving. Most sites display evidence of recent flooding, such as mineral soil deposits and flood debris.

Vegetation Description: The canopy is dominated by *Alnus rubra*. The understory is dominated by a diverse array of forbs such as *Tolmiea menziesii*, which can be dominant, *Stachys chamissonis* var. *cooleyae*, *Tiarella trifoliata*, and/or *Claytonia (=Montia) sibirica*. *Athyrium filix-femina* is usually present but rarely more than prominent. *Urtica dioica* can be very abundant. The shrubs *Acer circinatum*, *Oplopanax horridus*, or *Rubus spectabilis* are frequently encountered and typically sparse.

USFWS Wetland System: Palustrine.

Comments: Plots with substantial cover of *Elymus glaucus* may be transitional to or better clustered with *Alnus rubra/Elymus glaucus* Forest (CEGL003398).

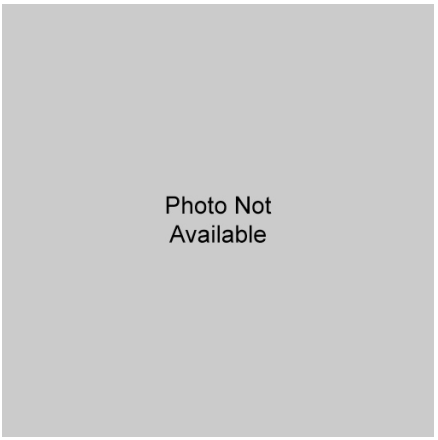
Conservation Rank: S3S4

Rank Justification: This association occurs within a limited range and environment with few threats.

Synonyms:
Alnus rubra/*Claytonia siberica* var. *siberica* Association; Murray 2000
Alnus rubra/*Oemleria cerasiformis*/*Tolmiea menziesii* Community Type; Mycek 1994
Alnus rubra/*Stachys chamissonis* var. *cooleyae-Tolmiea menziesii* Forest; Chappell 2005 NPK
Alnus rubra/*Stachys cooleyae* community; Diaz & Mellon 1996
Alnus rubra/*Tolmiea menziesii-Montia sibirica* community; Diaz & Mellon 1996

Abies grandis/Bromus vulgaris-Polystichum munitum Forest

Grand Fir/Columbia brome-Swordfern



Acronym: ABIGRA/BROVUL-POLMUN

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the Olympic Mountains.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association is characterized from sites on the east side of the Olympic Mountains.at 470 m (1550 ft) elevation on low gradient slopes in riparian settings.

Vegetation Description: These are likely seral stands with a mixed canopy dominated or co-dominated by *Abies grandis* with *Acer macrophyllum* and/or *Alnus rubra*. The grasses *Bromus vulgaris* and *Elymus glaucus* dominate the undergrowth. *Poa trivialis* and *P. pratensis* are prominent. *Polystichum munitum*, *Tolmiea menziesii*, *Heracleum maximum (=lanatum), Galium aparine, Ranunculus repens*, and *Adenocaulon bicolor* are present in both plots with substantial cover. Shrub cover is sparse with *Acer circinatum*, *Rubus spectabilis,* and *Ribes lacustre* in trace amounts.

USFWS Wetland System: Palustrine.

Comments: More intensive sampling and survey is needed to verify the extent and characteristics of this type. This is not the *Abies grandis/Bromus vulgaris* (CEGL002601) described from the Blue Mountains in Oregon.

Conservation Rank: S2S3Q

Rank Justification: This apparently has a restricted range and ecological amplitude although its classification is tentative.

Synonyms:
Abies grandis/Grass Community Type; Henderson et al. 1979

Alnus rubra/Oxalis (oregana, trilliifolia) Forest

Red Alder/Oregon, Great Oxalis Forest



Acronym: ALNRUB/OXAORE

NatureServe Code: CEGL003400

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the southern Cascade foothills of Washington including Mount Rainier and on the Olympic Peninsula.

Plots: 7, MORA (1), NOCA (0), OLYM (6), Other (0)

Environmental Description: This association occurs on relatively well-drained soils at lower elevations on riparian terraces, streambanks or floodplains.

Vegetation Description: The canopy is dominated by *Alnus rubra*. *Picea sitchensis* or *Tsuga heterophylla* are frequently in the overstory but with low cover. When present, the tall shrub layer is dominated by *Acer circinatum*. *Rubus spectabilis* or *Ribes bracteosum* may be present but under 20% cover in aggregate. The understory is dominated by *Oxalis oregana* or *Oxalis trilliifolia*. *Polystichum munitum* can be co-dominant or dominant in the herb layer. Many other forbs and ferns, including *Athyrium filix-femina*, *Luzula (fastigiata, parviflora)*, *Tiarella trifoliata*, *Circaea alpina* and *Tolmiea menziesii,* are frequently present to prominent. Grasses, such as *Elymus glaucus* and *Elymus hirsutus*, are present to co-dominant but never dominant or more abundant in aggregate than *Oxalis* spp.

USFWS Wetland System: Palustrine.

Comments: This association concept has been expanded to include subassociations with a *Acer circinatum*-dominated shrub layer.

Conservation Rank: S3S4

Rank Justification: This association receives some protection and occurs in restricted range and environment.

Synonyms:
Alnus rubra / Oxalis spp.; Diaz & Mellon 1996

Picea sitchensis-(Alnus rubra)/Rubus spectabilis/Polystichum munitum Forest

Sitka Spruce-(Red Alder)/Salmonberry/Swordfern Forest



Acronym: PICSIT-(ALNRUB)/RUBSPE/POLMUN

NatureServe Code: CEGL000060

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs on the outer coastal strip of the Olympic Peninsula.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: Sites are usually on slopes facing the Pacific Ocean or, less frequently, within one mile of the ocean. Soils are somewhat poorly drained and/or subirrigated.

Vegetation Description: The canopy is dominated or co-dominated by *Picea sitchensis* and/or *Alnus rubra. Picea sitchensis* is always at least prominent and can be confined to the understory below *Alnus* canopy. *Tsuga heterophylla* is sometimes present to prominent. The dense shrub layer is dominated by *Rubus spectabilis*. *Sambucus racemosa* is frequent and can be prominent. The well-developed herb layer is dominated by *Polystichum munitum*. *Athyrium filix-femina* is sometimes prominent.

USFWS Wetland System: Not applicable.

Comments: This type is similar to *Alnus rubra/Polystichum munitum* (CEGL000638) although the latter lacks prominence of *Picea sitchensis* or other conifers. One atypical plot lacked *Polystichum munitum* and had high cover of *Maianthemum dilatatum*. However, its cover of *Rubus spectabilis* and other floristic affinities places it here rather than with the *Picea sitchensis*/*Maianthemum dilatatum* association (CEGL003266).

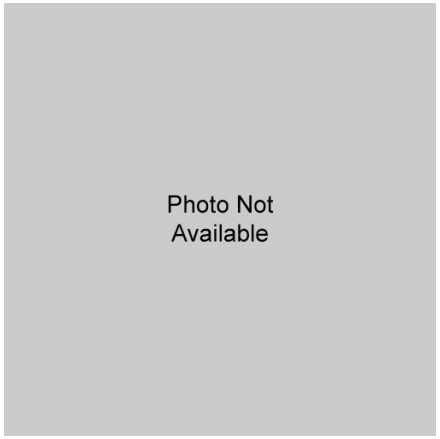
Conservation Rank: S3

Rank Justification: This association is restricted to narrow habitats, in a limited geographic range and currently has few threats.

Synonyms:
Picea sitchensis-(*Alnus rubra*)/*Rubus spectabilis*/*Polystichum munitum* Forest; Chappell 2005 NPK
Picea sitchensis/*Rubus spectabilis* Forest; Hemstrom and Logan 1986
Picea sitchensis/*Rubus spectabilis*-PNW; McCain and Diaz 2002a, Hemstrom and Logan 1986
Picea sitchensis-Alnus rubra/*Rubus spectabilis*; Kratz 1975
Picea sitchensis-Alnus rubra/*Rubus spectabilis* Community; Kratz 1975

Picea sitchensis/Scirpus microcarpus Woodland

Sitka Spruce/Small-fruited Bulrush Woodland



Acronym: PICSIT/SCIMIC

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer)* Riparian Forest Alliance

Classification Confidence Level: 3

Range: This association is described from one plot in the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The single plot defining this type is located along a stream near a small gravel bar.

Vegetation Description: This association has an open canopy of *Picea sitchensis.*. The understory is co-dominated by *Scirpus microcarpus* and *Glyceria striata (=elata)*. *Lysichiton americanus* is also present along with several other wetland species.

USFWS Wetland System: Palustrine.

Comments: This type is described from a legacy plot. Wetland and riparian sampling is incomplete and more information is needed to confirm that this plot represents a distinct vegetation type. The site may alternatively be interpreted as a *Scirpus microcarpus* or *Glyceria striata* herbaceous community with trees.

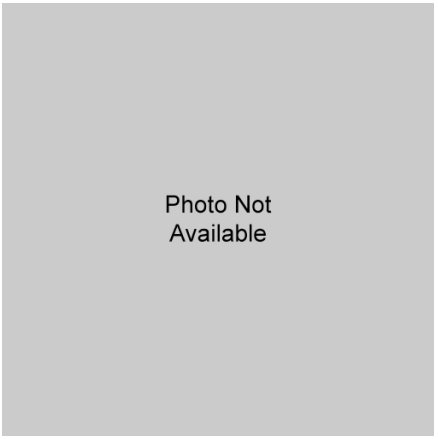
Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Picea sitchensis-Tsuga heterophylla-(Alnus rubra)/Oplopanax horridus/Polystichum munitum Forest

Sitka Spruce-Western Hemlock-(Red Alder)/Devil's-club/Swordfern Forest



Acronym: PICSIT-TSUHET-(ALNRUB)/OPLHOR/POLMUN

NatureServe Code: PNWCOAST_073

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer)* Riparian Forest Alliance

Classification Confidence Level: 3

Range: This association occurs on the western Olympic Peninsula at low elevations.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs on toe slopes or upper riparian terraces, usually near smaller streams. Soils are somewhat poorly drained and are probably seasonally to permanently subirrigated by flowing groundwater.

Vegetation Description: The canopy is co-dominated by *Picea sitchensis* and *Tsuga heterophylla*. *Alnus rubra* is usually present and sometimes co-dominant. The well-developed shrub layer is dominated or co-dominated by *Oplopanax horridus*. *Rubus spectabilis*, *Acer circinatum*, and *Ribes bracteosum* are usually present and often prominent to co-dominant. The rich herb layer is usually co-dominated by *Polystichum munitum* and *Oxalis oregana*. Many other herbs are common, the most abundant being *Tiarella trifoliata*.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S2S3

Rank Justification: This riparian community occurs within a limited geographic and ecological range.

Synonyms:
Picea sitchensis/*Oplopanax horridus* Association; Chappell 1999
Picea sitchensis/*Oplopanax horridus*-NWW; unpubl data Olympic NF
Picea sitchensis-Tsuga heterophylla-(*Alnus rubra*)/*Oplopanax horridus*/*Polystichum munitum* Forest; Chappell 2005 NPK

Tsuga heterophylla-(Pseudotsuga menziesii-Thuja plicata)/Polystichum munitum-Athyrium filix-femina Forest

Western Hemlock-(Douglas-fir-Western Redcedar)/ Swordfern-Lady fern Forest



Acronym: TSUHET-(PSEMEN-THUPLI)/POLMUN-ATHFIL

NatureServe Code: CEGL002627

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the western Cascades and the Olympic Peninsula except in the wettest part of the western Olympics and on the outer coastal strip.

Plots: 15, MORA (7), NOCA (2), OLYM (6), Other (0)

Environmental Description: This association occurs at low elevations. Sites are usually on lower or toe slopes or riverine terraces. Soils are moist and often deep.

Vegetation Description: The canopy is dominated by a variable mixture of *Tsuga heterophylla*, *Pseudotsuga menziesii*, and/or *Thuja plicata*. *Tsuga heterophylla* or *Thuja plicata* always occupy at least 10% total cover and dominate tree regeneration. *Acer macrophyllum* or *Alnus rubra* are sometimes prominent. A well-developed tall-shrub layer dominated by *Acer circinatum* is often present. Shorter shrubs are usually sparse but often include *Rubus spectabilis* (an important indicator for the type) and *Vaccinium parvifolium*. The herb layer is dominated by *Polystichum munitum*, usually growing taller and more densely than it does in other settings. Frequent herbs which are indicative of the association are *Athyrium filix-femina*, *Tiarella trifoliata*, *Blechnum spicant*, *Gymnocarpium dryopteris* and *Dryopteris expansa* (=*austriaca*), one or more of which is sometimes prominent. Other frequent herbs include *Achyls triphylla* and *Clintonia uniflora*.

USFWS Wetland System: Not applicable.

Comments: This association is distinguished by the relative abundance of the wet to moist-site indicator herbs, the presence of *Rubus spectabilis*, or the high percent cover of *Polystichum munitum*.

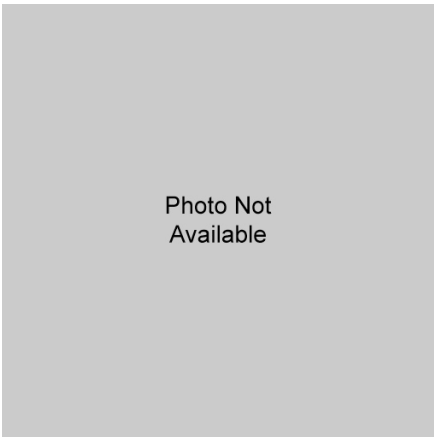
Conservation Rank: S3

Rank Justification: This association occurs within a narrow environmental range in the mountains of western Washington and has been impacted by logging.

Synonyms:
Abies grandis-Tsuga heterophylla/*Polystichum munitum* Forest; ORNHP
CWH dm /07; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 1 /07; Green and Klinka 1994, BC Ministry of Forests 2003
CWH xm 2 /07; Green and Klinka 1994, BC Ministry of Forests 2003
Pseudotsuga menziesii-Tsuga heterophylla/*Polystichum munitum-DREX-WA; Chappell 2004*
Pseudotsuga menziesii-Tsuga heterophylla/Polystichum munitum-Dryopteris expansa Forest; Chappell 2001
Tsuga heterophylla-(*Pseudotsuga menziesii*)/*Polystichum munitum-Dryopteris expansa*; Chappell 2006 Puget
Tsuga heterophylla-(*Pseudotsuga menziesii-Thuja plicata*)/*Polystichum munitum-Athyrium filix-femina* Forest; Chappell 2005 NPK
Tsuga heterophylla/*Athyrium filix-femina* Association; Topik et al. 1986
Tsuga heterophylla/*Athyrium filix-femina*-GP; Topik et al. 1986
Tsuga heterophylla/*Polystichum munitum*/*Tiarella trifoliata* Community Type; Mycek 1994
Tsuga heterophylla/*Polystichum munitum-Athyrium filix-femina* Association; Chappell 1997
Tsuga heterophylla/*Polystichum munitum*-Coast-PNW; McCain and Diaz 2002a
Tsuga heterophylla/*Polystichum munitum-Tiarella trifoliata* Association; Henderson et al. 1989, Henderson et al. 1992
Tsuga heterophylla/*Polystichum munitum-Tiarella trifoliata*-NWW; Henderson et al. 1992, Henderson et al. 1989
Tsuga heterophylla-Pseudotsuga menziesii/*Gymnocarpium dryopteris* Community Type; Henderson et al. 1979

Populus balsamifera ssp. *trichocarpa/Alnus incana* Forest

Black Cottonwood/Mountain Alder Forest



Acronym: POPBAL/ALNINC

NatureServe Code: CEGL000667

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *Populus balsamifera ssp. trichocarpa – (Acer, Alnus)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the east Cascades and Northern Rockies.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This riparian forest association appears where valley gradient tends to be gentle in low to mid-elevation, relatively broad valleys usually with meandering streams. This type is located on stream banks, lower stream terraces and wetter surfaces in the floodplain. Soils are sandy to loamy often over gravels.

Vegetation Description: The canopy is usually dominated by *Populus balsamifera* ssp. *trichocarpa*. *Alnus incana* dominates a diverse and well-developed tall-shrub layer. A shorter shrub layer often appears with *Symphoricarpos albus* providing the most cover. *Equisetum arvense* and *Elymus glaucus* are frequent associates in the herb layer.

USFWS Wetland System: Palustrine.

Comments: This is an east Cascades type in the literature and is not represented in the current dataset of vegetation plot data for national parks in Washington. North Cascades Park may have riparian forest similar to this association.

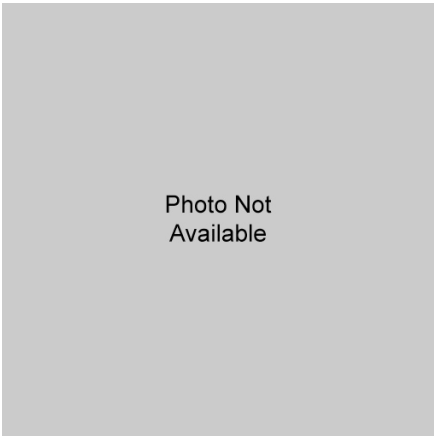
Conservation Rank: S3

Rank Justification: This association is susceptible to grazing, and many stands have been converted to understories dominated by introduced grasses. Dams and diversions have altered annual flooding and scouring events, thereby decreasing depositional floodplain features required for the establishment of *Populus balsamifera* ssp. *trichocarpa*.

Synonyms:
Populus balsamifera ssp. *trichocarpa*/*Alnus incana* Forest; Chappell 2005 NPK
Populus trichocarpa/*Alnus incana* Association; Kovalchik 2001
Populus trichocarpa-Populus tremuloides/*Symphoricarpos albus*/*Pyrola asarifolia*; Wooten and Morrison 1995

Populus balsamifera ssp. *trichocarpa/Cornus sericea* Forest

Black Cottonwood/Red-osier Dogwood Forest



Acronym: POPBAL/CORSER

NatureServe Code: CEGL000672

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *Populus balsamifera ssp. trichocarpa – (Acer, Alnus)* Riparian Forest Alliance

Classification Confidence Level: 2

Range: This association occurs in the east Cascades and Northern Rockies.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs on stream terraces at low to mid -elevations in relatively broad valleys usually with meandering streams. Soils are deep loams often over gravels.

Vegetation Description: The canopy is dominated by *Populus balsamifera* ssp. *trichocarpa*. *Cornus sericea* (=*stolonifera*) dominates a well developed tall-shrub layer. *Maianthemum (=Smilacina) stellatum* and *Elymus glaucus* are frequent associates in the ground cover.

USFWS Wetland System: Palustrine.

Comments: Lower terraces and overflow channels are co-dominated by *Alnus incana* and represent a transition to the wetter *Populus balsamifera* ssp. *trichocarpa*/*Alnus incana* association (CEGL000667). This is an east Cascades type in literature and is not represented in the current data for national parks in Washington. North Cascades Park may have riparian forest similar to this association.

Conservation Rank: S2S3

Rank Justification: Dams and diversions have altered annual flooding and scouring events, thereby decreasing depositional floodplain features required for the establishment of *Populus balsamifera* ssp. *trichocarpa*.

Synonyms:
Populus balsamifera ssp. *trichocarpa*/*Cornus sericea* Forest; Chappell 2005 NPK, Crawford 2003
Populus trichocarpa/Cornus stolonifera Forest; Evans 1989, Kovalchik 2001

Populus balsamifera ssp. trichocarpa-Alnus rubra/Carex obnupta Forest

Black Cottonwood-Red Alder/Slough Sedge Forest



Acronym: POPBAL-ALNRUB/CAROBN

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *Populus balsamifera ssp. trichocarpa – (Pseudotsuga, Picea, Tsuga)* Riparian Forest Allliance

Classification Confidence Level: 3

Range: This association occurs primarily on the Olympic Peninsula and in the Puget Lowlands.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This low elevation forested wetland association occurs on floodplains and terraces. Soils are rich, wet and have strongly fluctuating water table.

Vegetation Description: *Populus balsamifera* ssp. *trichocarpa* and *Alnus rubra* dominate or co-dominate this broadleaf forest association. *Thuja plicata* is occasionally prominent and *Picea sitchensis* is common but has low cover. *Carex obnupta* is dominant to prominent. *Symphoricarpos albus* is often prominent. Other herbs include *Elymus glaucus* (which may be co-dominant)*, Carex deweyana, Stachys chamissonis* var. *cooleyae*, and *Polystichum munitum*. .

USFWS Wetland System: Palustrine.

Comments: This association is similar to the depressional wetland *Populus balsamifera* spp. *trichocarpa*/*Cornus sericea*/*Carex obnupta* (PNWCOAST_113). Inclusion of these western Olympic plots within that Georgia Basin/Puget Lowland type would expand its concept to include riverine associated wetlands, a much wetter climate, and differing associated species. *Cornus sericea (=stolonifera)* and *Oemleria cerasiformis* are common in the Puget Lowland/British Columbia type.

Conservation Rank: S2Q

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Populus balsamifera ssp. trichocarpa-Picea sitchensis-(Acer macrophyllum)/Oxalis oregana Forest

Black Cottonwood-Sitka Spruce-(Bigleaf Maple)/Redwood Sorrel Forest



Acronym: POPBAL-PICSIT-(ACEMAC)/OXAORE

NatureServe Code: CEGL003418

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *Populus balsamifera ssp. trichocarpa – (Pseudotsuga, Picea, Tsuga)* Riparian Forest Allliance

Classification Confidence Level: 2

Range: This association occurs on the western Olympic Peninsula.

Plots: 6, MORA (0), NOCA (0), OLYM (6), Other (0)

Environmental Description: This association occurs at low elevations along major rivers on middle to high fluvial terraces, typically where seasonal flooding is infrequent.

Vegetation Description: The mixed-forest canopy is typically co-dominated by *Populus balsamifera* ssp. *trichocarpa*, *Picea sitchensis* and often *Acer macrophyllum* or *Alnus rubra*. *Populus balsamifera* ssp. *trichocarpa* is usually the tallest tree and may emerge above the main canopy. *Picea sitchensis* and/or *Acer macrophyllum* typically dominate a mid or subcanopy layer. The understory is variably dense but often includes substantial *Rubus spectabilis* or *Acer circinatum*. *Polystichum munitum* and *Oxalis oregana* are present and often co-dominant in the herb layer. Stands with *Tsuga heterophylla* present may represent later development stages of this association. *Poa trivialis* may be common in stands indicating heavy ungulate use.

USFWS Wetland System: Not applicable.

Comments: These appear to be mid-seral stands that without a flooding/depositional event slowly increase in conifer dominance.

Conservation Rank: S2

Rank Justification: There are few occurrences of this association and it covers a limited areal extent. It appears to be limited to a small geographic range, the western Olympic Peninsula, where it is highly dependent on riverine flooding and channel migration and, possibly, on freedom from excessive ungulate browsing. Most occurrences do not appear to be viable in the long term and are probably declining in extent because of lack of regeneration of cottonwood stands (the latter is hypothesized to be related to heavy elk browsing in the area). Exotic species are present in most stands to varying degrees and are probably spreading over time.

Synonyms:
Picea sitchensis-Acer macrophyllum-Populus trichocarpa community; Fonda 1974
Populus balsamifera ssp. *trichocarpa-Acer macrophyllum-Picea sitchensis*/*Rubus spectabilis* Forest; Chappell 1999
Populus balsamifera ssp. *trichocarpa-Picea sitchensis*-(*Acer macrophyllum*)/*Oxalis oregana* Forest; Chappell 2005 NPK

Pseudotsuga menziesii-Pinus ponderosa-Populus balsamifera/Acer circinatum Forest

Douglas-fir-Ponderosa Pine-Black Cottonwood/Vine Maple Forest



Acronym: PSEMEN-PINPON-POPBAL/ACECIR

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland Riparian Forest and Woodland

Alliance: *Populus balsamifera ssp. trichocarpa – (Pseudotsuga, Picea, Tsuga)* Riparian Forest Allliance

Classification Confidence Level: 3

Range: The sample defining the type is located in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The plot representing this riparian type was located on a floodplain at 380 m (1252 ft) elevation.

Vegetation Description: A mixture of conifers, *Pseudotsuga menziesii* and *Pinus ponderosa,* and deciduous trees, *Populus balsamifera* and *Acer macrophyllum,* form the tree canopy. A tall shrub layer is dominated by *Acer circinatum*. *Cornus nuttallii*, *Mahonia aquifolium*, and *Symphoricarpos albus can also be prominent in a well-devoped shrub layer.* A forb layer is not well developed.

USFWS Wetland System: Not applicable.

Comments: This provisional type shares some similarities to the provisional *Pseudotsuga menziesii-(Pinus ponderosa)*/*Symphoricarpos albus* floodplain type but differs significantly due to the dominance of *Acer circinatum*.

Conservation Rank: SQ

Rank Justification: There is insufficient information to rank this association.

Synonyms:

Acer circinatum Shrubland

Vine Maple Shrubland

Acronym: ACECIR

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Acer circinatum Shrubland*

Classification Confidence Level: 2

Range: This association occurs in the Cascades and Olympic Mountains.

Plots: 14, MORA (7), NOCA (6), OLYM (1), Other (0)

Environmental Description: This association occurs at low to middle elevations 350-1100 m (1200-3600 ft). Sites include dry talus, rock slides or relatively dry streambanks on small streams. Fire scars or charcoal can be associated with stands that resulted from extensive high-severity fires and that persisted due to repeated fire or other tree-removing disturbances.



Vegetation Description: A well-developed tall shrub layer is dominated by *Acer circinatum*. However, many other shrub species can occur. *Rubus spectabilis* or *Oplopanax horridus* occur only in trace amounts or are absent. Other shrubs such as *Paxistima (=Pachistima) myrsinites, Corylus cornuta* and *Rubus parviflorus* can be prominent. The herbaceous layer is typically sparse and lacks moist-site species (e.g.*Athyrium filix-femina*) except in very small amounts. When *Polystichum munitum* is present its cover is usually low. *Pteridium aquilinum* can be abundant. *Trillium ovatum* and *Galium triflorum* are the most common understory species.

USFWS Wetland System: Not applicable

Comments: This is similar to the *Acer circinatum-Pachistima myrsinites* seral vegetation described in the northern Oregon Cascades (White et al. 1996).

Conservation Rank: S4

Rank Justification: This association occurs within a wide geographic range with few threats.

Synonyms:
Acer circinatum community; Diaz & Mellon 1996
Acer circinatum Cover Type;
Acer circinatum Shrubland; Chappell 2005 NPK
Acer circinatum-Rubus parviflorus; Wooten and Morrison 1997

Acer circinatum/Athyrium filix-femina-Tolmiea menziesii Shrubland

Vine Maple/Lady Fern-Youth-On-Age Shrubland

Acronym: ACECIR/ATHFIL-TOLMEN

NatureServe Code: CEGL003291

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Acer circinatum* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 18, MORA (12), NOCA (1), OLYM (5), Other (0)

Environmental Description: This association occurs at low to middle elevations, typically on steep slopes, although it can occur on gentle slopes or flat sites. Sites include moist talus, lower ends of avalanche chutes, and streambanks on smaller streams. Exposed rock is uncommon.



Vegetation Description: A well-developed tall shrub layer is dominated by *Acer circinatum*. Shorter shrubs, including *Rubus spectabilis*, *Oplopanax horridus* and *Sambucus racemosa* are often present in sparse to dense amounts. The well-developed herbaceous layer is characterized by the presence to prominence of *Athyrium filix-femina* or *Tolmiea menziesii.* Other common herbaceous species include *Claytonia (=Montia) sibirica*, *Polystichum munitum*, *Maianthemum (=Smilacina) stellatum*, *Galium triflorum* and *Stachys chamissonis* var. *cooleyae*.

USFWS Wetland System: Palustrine.

Comments: Non-riparian sites with substantial *Polystichum munitum*, but without *Athyrium filix-femina, Tolmiea menziesii* or other wet site species are included in the preliminary *Acer circinatum* association rather than here.

Conservation Rank: S4

Rank Justification: Many natural-origin stands occur on protected lands.

Synonyms:
Acer circinatum/*Athyrium filix-femina*-*Tolmiea menziesii* Shrubland; Chappell 2005 NPK
Acer circinatum/*Corydalis scouleri* Community Type; Mycek 1994
Acer circinatum/Forb association; Henderson and Peter 1982
Acer circinatum/*Oemleria cerasiformis*/*Athyrium filix-femina* Community Type; Mycek 1994
Acer circinatum/*Oplopanax horridum-Rubus spectabilis* Association; Kovalchik 2001
Acer circinatum/*Rubus spectabilis*-*Oplopanax horridum* association; WANHP files
Acer circinatum/*Stachys cooleyae* association; Diaz & Mellon 1996

Alnus viridis ssp. sinuata Shrubland

Sitka Alder Shrubland

Acronym: ALNVIR

NatureServe Code: CEGL001154

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Alnus viridis* ssp. *sinuata* Shrubland

Classification Confidence Level: 3

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 8, MORA (0), NOCA (4), OLYM (4), Other (0)

Environmental Description: This association occurs at middle to high elevations on a variety of sites that are often steep. Such areas occurs above glacier meadows, near large lateral moraines, near small dry subalpine streambeds, on talus and on debris cones. Site are topographically moist but well-drained.



Vegetation Description: The well-developed tall shrub layer is dominated by *Alnus viridis* ssp.*sinuata.* Few other shrubs are present with the exception *of Sambucus racemosa.* The associated understory species are diverse although no single species appears in all plots. *Heracleum maximum (=lanatum)*, *Hydrophyllum fendleri* and *Thalictrum occidentale* are the most constant and are often prominent. *Claytonia (=Montia) sibirica*, *Maianthemum (=Smilacina) stellatum*, *Valeriana sitchensis*, *Veratrum viride,* and *Pteridium aquilinum* are infrequent but are prominent to co-dominant when they do occur.

USFWS Wetland System: Not applicable.

Comments: More plots or a broader regional analysis may be needed to better describe and distinguish this assocation from related types. This is association is very similar to the *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland association (CEGL002633). An additional Olympic plot, which appears in the table as SORSIT-ALNVIR, could be included here.

Conservation Rank: S4S5

Rank Justification: This association is relatively widespread and has few threats.

Synonyms:
Alnus sinuata Community; Johnson & Clausnitzer 1992, p148
Alnus sinuata thickets; Titus et al. 1999

Alnus viridis ssp. sinuata-Acer circinatum Shrubland

Sitka Alder-Vine Maple Shrubland



Acronym: ALNVIR-ACECIR

NatureServe Code: CEGL001155

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Alnus viridis* ssp. *sinuata* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 6, MORA (3), NOCA (1), OLYM (2), Other (0)

Environmental Description: This association occurs at middle elevations. Sites are usually moderate to steep slopes (34-85%) on talus or avalanche chutes.

Vegetation Description: The well-developed, tall shrub layer is co-dominated by *Alnus viridis* ssp. *sinuata* and *Acer circinatum*. The understory layer frequently includes *Maianthemum (=Smilacina) stellatum* and *Cryptogramma acrostichoides (=crispa)*. The shrubs *Paxistima (=Pachistima) myrsinites* and *Rubus parviflorus* and the forb *Maianthemum (=Smilacina) racemosum* are infrequent but prominent. Moss and lichen ground cover may be prominent.

USFWS Wetland System: Not applicable.

Comments: This Cascadian association is similar to the *Alnus viridis* ssp. *sinuata* / Mesic Forbs Shrubland association (CEGL002633) except for the co-dominance of *Acer circinatum*. The most current (NatureServe 2008) description overgeneralized the latter association to include *Acer circinatum* co-dominated stands and fails to recognize biogeographic variation.

Conservation Rank: S4Q

Rank Justification: This association is relatively widespread and has few threats. Its classification status in the NVC is under review.

Synonyms:
Alnus sinuata-Acer circinatum Community Type;
Alnus viridis ssp. *sinuata-Acer circinatum* Shrubland; Chappell 2005 NPK

Alnus viridis ssp. sinuata-Oplopanax horridus Shrubland

Sitka Alder/Devil's-club Shrubland



Acronym: ALNVIR-OPLHOR

NatureServe Code: CEGL001157

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Alnus viridis* ssp. *sinuata* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 7, MORA (4), NOCA (1), OLYM (2), Other (0)

Environmental Description: This association occurs at middle elevations 1125-1410 m (3700-4600 ft). Sites are usually moderate to steep slopes, usually on talus, debris fields or avalanche chutes with subsurface irrigation.

Vegetation Description: The well-developed tall shrub layer is dominated by *Alnus viridis* ssp. *sinuata* with a slightly lower shrub layer characterized by >10% cover of *Oplopanax horridus*. Several other shrub species, especially *Rubus spectabilis* and *Sambucus racemosa*, can occur in abundance. Frequently occuring herbs include *Athyrium filix-femina*, *Achlys (californica, triphylla)*, *Claytonia (=Montia) sibirica*. *Streptopus lanceolatus (=roseus) var. curvipes*, *Maianthemum (=Smilacina) stellatum*, and *Viola glabella*. *Cupressus (=Chamaecyparis) nootkatensis* is the most constantly occuring tree species but it is never prominent.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S4

Rank Justification: This association is relatively widespread and has few threats.

Synonyms:
Alnus sinuata/Forb association; Henderson and Peter 1982, p73, WANHP
Alnus sinuata/*Oplopanax horridum* Association; Kovalchik 2001
Alnus viridis ssp. *sinuata*-*Oplopanax horridus* Shrubland; Chappell 2005 NPK

Alnus viridis ssp. sinuata-Rubus spectabilis/Athyrium filix-femina Shrubland

Sitka Alder/Salmonberry/Lady Fern Shrubland



Acronym: ALNVIR-RUBSPE/ATHFIL

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Alnus viridis* ssp. *sinuata* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 27, MORA (9), NOCA (6), OLYM (12), Other (0)

Environmental Description: This association occurs at middle to subalpine elevations. Sites include streambanks and cobble deposits on alluvial benches and toe slopes near small streams, as well as moist talus slopes or avalanche chutes.

Vegetation Description: The well-developed tall shrub layer is dominated by *Alnus viridis* ssp. *sinuata*. A slightly shorter shrub layer is often well-developed, and typically contains *Rubus spectabilis*. *Sambucus racemosa*, *Ribes bracteosum*, and *Vaccinium ovalifolium* are frequently present. The herbaceous layer is usually well-developed. Commonly occurring species include *Achlys (californica, triphylla)*, *Athyrium filix-femina*, *Cornus unalaschkensis (=canadensis)*, *Linnaea borealis*, *Valeriana sitchensis*, *Viola glabella* and *Tiarella trifoliata* var. *unifoliata*.

USFWS Wetland System: Palustrine.

Comments: This differs from *Alnus viridis* ssp. *sinuata-Oplopanax horridus* association (CEGL001157) primarily in the absence of O*plopanax.* This association is similar to the *Alnus viridis* ssp. *sinuata* / *Athyrium filix-femina - Cinna latifolia* association (CEGL001156) however, that association lacks *Rubus spectabilis* and is located geographically on the east slope of the Cascades and in the Northern Rockies.

Conservation Rank: S4

Rank Justification: This association is relatively widespread and has few threats.

Synonyms:
Alnus sinuata association; Diaz & Mellon 1996
Alnus sinuata/Forb Community Type; Henderson et al. 1979
Alnus sinuata/*Rubus spectabilis* Association; Kovalchik 2001
Alnus sinuata-Rubus spectabilis/*Athyrium filix-femina*; Wooten and Morrison 1997
Alnus viridis ssp. *sinuata*/*Rubus spectabilis*/*Athyrium filix-femina* Association; Murray 2000
Alnus viridis ssp. *sinuata-Rubus spectabilis* Association; Murray 2000
Alnus viridis ssp. *sinuata-Rubus spectabilis*/*Athyrium filix-femina* Shrubland; Chappell 2005 NPK
Rubus spectabilis/*Athyrium filix-femina-Pteridium aquilinum* Community; Wooten and Morrison 1997
Shrub Type; del Moral 1973

Cornus sericea Shrubland

Red-Osier Dogwood Shrubland



Acronym: CORSER

NatureServe Code: CEGL001165

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Cornus sericea* Shrubland

Classification Confidence Level: 3

Range: This type is based on a single plot in the North Cascades. It may occur infrequently in riparian areas of this or other parks, as it is a widespread though rather uncommon, riparian community in western Washington.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association occurs in riparian floodplains and wetlands. This NOCA plot appears on shallow sloping, stabilized talus at 700 m (2292 ft) elevation. Duff and litter cover the rocky soil surface on a moist topographic position.

Vegetation Description: *Cornus sericea (=stolonifera)* dominates, but otherwise the global type is variable in composition,. The sampled vegetation is a thick shrubland dominated by *Cornus sericea (=stolonifera)* and *Salix scouleriana*. *Rubus parviflorus* and *Hydrophyllum fendleri* form a dense ground cover.

USFWS Wetland System: Palustrine.

Comments: This is considered to be a provisional association that encompasses all *Cornus sericea*-dominated shrublands.

Conservation Rank: S3S4Q

Rank Justification: This provisional association occurs throughout Washington in somewhat localized sites. Direct or indirect alteration of hydrology resulting from road construction, timber harvest, and other land uses are threats.

Synonyms:
Cornus sericea ssp. sericea/*Lysichiton americanus* Association; Murray 2000
Cornus stolonifera; Wooten and Morrison 1995
Cornus stolonifera association; Diaz & Mellon 1996
Cornus stolonifera/Mesic Forb Association; Kovalchik 2001

Oplopanax horridus Shrubland

Devil's-club shrubland



Acronym: OPLHOR

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Oplopanax horridus* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 2, MORA (2), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at low to middle elevations. Sites include riparian floodplains, terraces, toeslopes, streambanks, and sloping seeps.

Vegetation Description: The vegetation is dominated or co-dominated by *Oplopanax horridus*. *Ribes bracteosum* and/or *Rubus spectabilis* are frequently co-dominant. A variety of forbs and ferns such as *Trautvetteria caroliniensis, Streptopus amplexifolius*, *Corydalis scouleri* and *Athyrium filix-femina* can be prominent to co-dominant in the well-developed herbaceous layer.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S4

Rank Justification: This association is restricted to a narrow range of habitats. It is well represented in protected areas and has few threats.

Synonyms:
Oplopanax horridum association; Diaz & Mellon 1996, Kovalchik 2001
Oplopanax horridum/*Corydalis scouleri* Community Type; Mycek 1994
Oplopanax horridum/Fern association; Henderson and Peter 1982
Oplopanax horridus Association; Chappell 1999
Oplopanax horridus Shrubland; Chappell 2005 NPK
Oplopanax horridus/*Athyrium filix-femina* Association; Peter 2000
Oplopanax horridus-Acer circinatum Association; Murray 2000

Rubus spectabilis-Ribes bracteosum Shrubland

Salmonberry-Stink Currant Shrubland



Acronym: RUBSPE-RIBBRA

NatureServe Code: Preliminary

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Rubus spectabilis-Ribes bracteosum* Shrubland

Classification Confidence Level: 1

Range: This association occurs in the Cascades, on the Olympic Peninsula, and elsewhere in western Washington.

Plots: 3, MORA (3), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at low to middle elevations (up to 1525+ m (5000+ ft)) on floodplains, landslide surfaces, and sites near streambanks.

Vegetation Description: The well-developed shrub layer is dominated by *Rubus spectabilis* and/or *Ribes bracteosum*. The rich herbaceous layer often includes substantial *Athyrium filix-femina*, *Corydalis scouleri*, *Oxalis* spp., *Polystichum munitum*, *Tolmiea menziesii*, *Petasites frigidus*, *Stachys chamissonis* var. *cooleyae*, *Circaea alpina*, or *Claytonia (=Montia) sibirica*.

USFWS Wetland System: Palustrine.

Comments:

Conservation Rank: S4S5

Rank Justification: This association occurs within a narrow environment but is widespread in the Olympic and Cascade Mountains in Washington. Sites are naturally disturbance driven.

Synonyms:
(*Rubus spectabilis*)/*Athyrium filix-femina* Association; Murray 2000
Ribes bracteosum/*Athyrium filix-femina* Association; Murray 2000
Ribes bracteosum/Forb association; Henderson and Peter 1982
Ribes bracteosum-Rubus spectabilis/*Oxalis* spp. association; Diaz & Mellon 1996
Ribes bracteosum-Rubus spectabilis/*Petasites frigidus* association; Diaz & Mellon 1996
Ribes bracteosum-Rubus spectabilis/*Tolmiea menziesii* association; Diaz & Mellon 1996
Rubus spectabilis-Ribes bracteosum Shrubland; Chappell 2005 NPK
Rubus spectabilis-Ribes hudsonianum Association; Kovalchik 2001

Salix sitchensis/Equisetum arvense-Petasites frigidus Shrubland

Sitka Willow/Common Horsetail-Sweet Coltsfoot Shrubland



Acronym: SALSIT/EQUARV-PETFRI

NatureServe Code: CEGL003296

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: Salix sitchensis Riparian Shrubland

Classification Confidence Level: 2

Range: This association occurs in western Washington.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This riparian association occurs at low to montane elevations on floodplains or low terraces. These sites are probably frequently flooded by overbank riverine flooding, and have coarse-textured soils (gravelly and/or sandy). It is most often found along larger streams or rivers with well-developed floodplains.

Vegetation Description: The well-developed, tall shrub layer is dominated by *Salix sitchensis*. Young *Alnus rubra* can be present to co-dominant or *Populus balsamifera* ssp. *trichocarpa* is often present. Small amounts of *Rubus spectabilis* are usually present. The herbaceous layer varies from rather sparse to moderately dense. *Equisetum arvense* or *Petasites frigidus* are usually present. A variety of other herbs may be present.

USFWS Wetland System: Palustrine.

Comments: This type is common along the Elwha River in OLYM often with *Alnus rubra* as a co-dominant in the tall shrub layer. The MORA plot is at a higher elevation than the previous concept and has numerous subalpine species prominent (*Valeriana sitchensis, Arnica latifolia)*. Riparian and wetland environments are undersampled for this project.

Conservation Rank: S4Q

Rank Justification: This provisional type occurs within a narrow environment that has few known threats in Washington.

Synonyms:
Salix sitchensis/Equisetum arvense Community; Chappell 1999
Salix sitchensis/Equisetum arvense-Petasites frigidus Shrubland; Chappell 2005 NPK;
Salix sitchensis community; Diaz and Mellon 1996
Salix sitchensis/Petasites frigidus community; Diaz and Mellon 1996
Salix sitchensis/(Equisetum arvense) Association; Murray 2000
Salix sitchensis-Rubus spectabilis Community Type; Mycek 1994
Salix sitchensis/Equisetum arvense Community Type; Mycek 1994
Alnus rubra/Salix sitchensis/Equisetum arvense Community Type; Mycek 1994
Salix sitchensis/Equisetum arvense vegetation types (4 variants); Titus et al. 1999

Symphoricarpos albus-Malus fusca Shrubland

Common Snowberry-Western Crabapple Shrubland



Acronym: SYMALB-MALFUS

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Lowland - Montane Riparian and Wet Slope Shrubland

Alliance: *Symphoricarpos albus* Shrubland

Classification Confidence Level: 3

Range: This association is described from the Olympic Mountains.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs in avalanche chutes at mid-elevations on gentle to moderate slopes. It appears both within the track and at the debris apron at the base of chutes.

Vegetation Description: This dense shrubland is dominated by *Symphoricarpos albus*. Other common shrubs include *Malus (=Pyrus) fusca*, *Alnus viridis* ssp. *sinuata*, *Holodiscus discolor, Prunus emarginata* and *Amelanchier alnifolia*. *Pseudotsuga menziesii* and *Abies lasiocarpa* dominate the surrounding forests.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S4Q

Rank Justification: This tentative association occurs within a narrow environmental range on sites that have few threats.

Synonyms:

Abies amabilis/Rubus spectabilis-Vaccinium alaskaense Forest

Pacific Silver Fir/Salmonberry-Alaska Blueberry Forest



Acronym: ABIAMA/RUBSPE-VACALA

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Montane Riparian Woodland

Alliance: *Abies amabilis-Tsuga heterophylla*-(*Pseudotsuga menziesii*) Riparian Forest

Classification Confidence Level: 3

Range: This is identified solely from data from Olympic National Park.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The single plot representing this type is located on a 5% slope on an old river terrace at 465 m (1520 ft) elevation.

Vegetation Description: An open canopy (60% cover) is dominated by *Tsuga heterophylla* and *Abies amabilis*. Tree regeneration is mainly *Tsuga heterophylla*. A dense shrub layer is dominated by *Rubus spectabilis*, with *Vaccinium alaskaense* and *Rubus parviflorus* present in small amounts. The herb layer is well developed with many species, most abundantly *Tolmiea menziesii*, *Viola glabella*, *Polystichum munitum*, *Tiarella trifoliata* and *Gymnocarpium dryopteris*.

USFWS Wetland System: Palustrine

Comments: More sampling is needed to determine if this valley bottom vegetation represents a new association or variation within existing riparian or other wet site types. This provisional *Abies amabilis* association is related to the *Pseudotsuga menziesii-(Alnus rubra-Tsuga heterophylla)/Rubus spectabilis* Forest (PNWCOAST_158).

Conservation Rank: S2S4Q

Rank Justification: Insufficient information exists to rank or adequately classify this tentative association

Synonyms:

Abies amabilis-Tsuga heterophylla/Oplopanax horridus Forest

Pacific Silver Fir-Western Hemlock/Devil's-club Forest



Acronym: ABIAMA-TSUHET/OPLHOR

NatureServe Code: CEGL000004

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Montane Riparian Woodland

Alliance: *Abies amabilis-Tsuga heterophylla*-(*Pseudotsuga menziesii*) Riparian Forest

Classification Confidence Level: 2

Range: This association occurs in the Cascades and the Olympic Mountains.

Plots: 34, MORA (26), NOCA (5), OLYM (2), Other (1)

Environmental Description: This association occurs at middle elevations on sites with shallowly subirrigated soils that are poorly drained, usually due to an underlying impermeable layer. Sites are often associated with springs, seeps or small streams.

Vegetation Description: The canopy is usually co-dominated by *Abies amabilis* and *Tsuga heterophylla,* with *Thuja plicata* often co-dominant as well. *Abies amabilis* usually dominates tree regeneration and always has at least 10% total cover. *Pseudotsuga menziesii* is occasionally prominent to co-dominant. The shrub layer always has at least 5% cover of *Oplopanax horridus*, which typically dominates or co-dominates the undergrowth. A variety of other shrubs may be prominent to co-dominant, especially *Vaccinium alaskaense* and *Rubus spectabilis*. A rich herb layer is rather variable in composition but almost always has considerable *Tiarella trifoliata* var. *unifoliata*, *Gymnocarpium dryopteris* and/or *Athyrium filix-femina*. Other frequent herbs are *Viola glabella, Clintonia uniflora, Trillium ovatum,* and *Streptopus lanceolatus (=roseus) var. curvipes.*

USFWS Wetland System: Palustrine.

Comments: One plot at North Cascades may be included in this association. In that plot, the canopy is co-dominated by *Abies amabilis* and *Populus balsamifera* spp. *trichocarpa,* with a rather sparse understory (28% total cover) with *Oplopanax horridus* most abundant at 3%. It is listed in the stand table as ABIAMA-POPBAL/OPLHOR.

Conservation Rank: S5

Rank Justification: Many natural-origin stands occur on protected lands with few threats from logging and development.

Synonyms:
Abies amabilis/*Oplopanax horridum* Association; Brockway et al. 1983, Franklin 1966, Franklin et al. 1988, Henderson et al. 1989, Kovalchik 200, Lillybridge et al. 1995
Abies amabilis/*Oplopanax horridum-Vaccinium alaskaense* Association; Henderson et al. 1992
Abies amabilis/*Oplopanax horridus*-EWA; Lillybridge et al. 1995, Wenachee NF, unpub Eastern WA data, no date
Abies amabilis/*Oplopanax horridus*-GPNW; McCain and Diaz 2002b, Brockway et al. 1983
Abies amabilis/*Oplopanax horridus*-opho-NWW; Henderson et al. 1989
Abies amabilis/*Oplopanax horridus*-*Vaccinium alaskaense*-NWW; Henderson et al. 1992, Henderson et al. 1989
Abies amabilis-Tsuga heterophylla/*Oplopanax horridus* Forest; Chappell 2005 NPK
CWH mm 1 /07; Green and Klinka 1994, BC Ministry of Forests 2003
CWH mm 2 /08; Green and Klinka 1994, BC Ministry of Forests 2003
CWH ms 1 /06; Green and Klinka 1994, BC Ministry of Forests 2003
CWH ms 2 /06; Green and Klinka 1994, BC Ministry of Forests 2003
CWH vm 2 /08; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH ws 1 /04; Banner et al. 1993, BC Ministry of Forests 2003
CWH ws 2 /04; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
CWH ws 2 /06; Banner et al. 1993, Green and Klinka 1994, BC Ministry of Forests 2003
Tsuga heterophylla/*Vaccinium alaskaense*/*Plagiomnium insigne* Community Type; del Moral and Long 1977
Tsuga heterophylla-Thuja plicata/*Vaccinium alaskaense*/*Blechnum spicant* Community Type; del Moral et al. 1976

Abies lasiocarpa/Rubus spectabilis Forest

Subalpine Fir/Salmonberry Forest



Acronym: ABILAS/RUBSPE

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: North Pacific Montane Riparian Woodland

Alliance: *Abies lasiocarpa*-(*Rubus spectabilis*) Riparian Forest and Woodland

Classification Confidence Level: 3

Range: This is described from the northeast Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This stand is located on a riparian terrace (1% slope) at 1020 m (3340 ft) elevation.

Vegetation Description: An open, tall- tree canopy (50%) is dominated by *Abies lasiocarpa* with some *Picea engelmannii*. A dense shrub layer is dominated by *Rubus spectabilis,* with *Lonicera involucrata* and *Ribes lacustre*. The herbaceous layer contains *Heracleum maximum (=lanatum)*, *Petasites frigidus*, *Stachys chamissonis* var. *cooleyae* and other species associated with riparian settings.

USFWS Wetland System: Palustrine.

Comments: This plot represents the only stand in OLYM with *Picea engelmannii*. More data is needed to verify the status of this association.

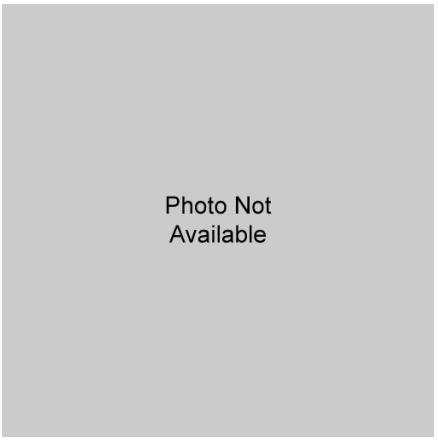
Conservation Rank: S2S4Q

Rank Justification: Insufficient information exists to rank or adequately classify this provisional association.

Synonyms:

Bromus sitchensis-Carex phaeocephala Herbaceous Vegetation

Alaska Brome-Dunhead Sedge Herbaceous Vegetation



Acronym: BROSIT-CARPHA

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: *Bromus sitchensis-Carex phaeocephala* Meadow

Classification Confidence Level: 3

Range: This type occurs in the Olympic Mountains and is possible in the Cascades.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs in dry avalanche chutes and debris slides between 1450 and 1700 m (4800-5500 ft) elevation. Gradient is steep (55 and 70%) on south to southwest aspects. The soil surface is typically covered with litter or mineral soil, with little to no rock exposed.

Vegetation Description: *Bromus sitchensis* dominates the dense vegetation with other graminoids, such as, *Carex phaeocephala*, *Carex spectabilis*, *Carex rossii* and *Trisetum spicatum* present in lesser amounts. Associated forbs include *Phacelia hastata*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Polygonum bistortoides*, and *Cirsium edule*.

USFWS Wetland System: Not applicable.

Comments:

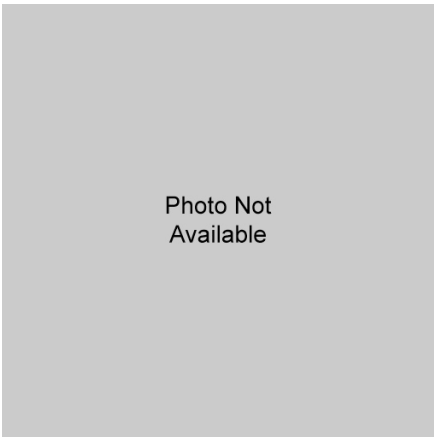
Conservation Rank: S2S4

Rank Justification: The provisional association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:

Hydrophyllum fendleri Herbaceous Vegetation

White Waterleaf Herbaceous Vegetation



Acronym: HYDFEN

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: *Hydrophyllum fendleri* Herbaceous Vegetation

Classification Confidence Level: 3

Range: This association is described from the Olympic Mountains although it is also likely found in the Cascades.

Plots: 8, MORA (0), NOCA (0), OLYM (8), Other (0)

Environmental Description: This association occurs between 1640-1920m (5400-6300 ft) elevation on moderately steep, southerly aspects.

Vegetation Description: The vegetation is dominated by *Hydrophyllum fendleri*, often co-dominated by *Thalictrum occidentale*. *Abies lasiocarpa* is present with <5% cover. Most plots include *Bromus sitchensis*, *Achillea millifolium*, *Epilobium anagallidifolium*, *Phacelia hastata*, *Packera flettii*, *Erysimum arenicola* and *Cirsium edule*.

USFWS Wetland System: Not applicable.

Comments: More environmental information is needed to better distinguish this provisional association. Schreiner (1994) included this type with the broadly defined *Phacelia hastata* community located on dry colluvial fans.

Conservation Rank: S3S5Q

Rank Justification: This provisional association occurs within a narrow range of environments with few threats on protected land.

Synonyms:

Artemisia ludoviciana-Lomatium martindalei Herbaceous Vegetation

White Sagebrush-Cascade Desert-parsley Herbaceous Vegetation



Acronym: ARTLUD-LOMMAR

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: *Phacelia hastata* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 15, MORA (0), NOCA (1), OLYM (14), Other (0)

Environmental Description: This association occurs between 1580 and 2010 m (5200 and 6600 ft) elevation on 25-70% slopes on scree, talus or other rocky sites. Aspects are generally southerly.

Vegetation Description: *Artemisia ludoviciana* is the most abundant plant (25% average cover) in a sparse to nearly closed vegetation. *Lomatium martindalei* and *Phacelia hastata* occur in most sites. *Delphinium glareosum*, *Erysimum arenicola*, *Epilobium anagallidifolium*, *Achillea millefolium*, *Poa secunda (=sandbergii)*, and *Phlox diffusa* are frequent associates, typically with low cover.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This preliminary association occurs within a restricted ecological range with few threats.

Synonyms:

Eucephalus paucicapitatus Herbaceous Vegetation

Olympic Mountain Aster Herbaceous Vegetation



Acronym: EUCPAU

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: *Phacelia hastata* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs only in the Olympic Mountains.

Plots: 13, MORA (0), NOCA (0), OLYM (13), Other (0)

Environmental Description: This association appears on open slopes at subalpine to low alpine elevations (5000-6400 ft) on moderately steep, south to easterly aspects. Sites can be on colluvial fans. Soils are often rocky.

Vegetation Description: This open to sparse vegetation is dominated by *Eucephalus (=Aster) paucicapitatus* with a few constant associates such as *Epilobium anagallidifolium*, *Lomatium martindalei*, *Polygonum bistortoides*, *Phlox diffusa*, and *Phacelia hastata*. Other subalpine meadow species, including *Carex spectabilis*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Valeriana sitchensis* are frequently present but rarely more than prominent.

USFWS Wetland System: Not applicable.

Comments: This community is included in the broadly defined *Phacelia hastata* vegetation of Schreiner (1994).

Conservation Rank: S2

Rank Justification: This association is endemic to the Olympic Mountains and Vancouver Island and occurs within a restricted ecological range on protected land with few threats.

Synonyms:

Phacelia hastata Lithomorphic Vegetation

Silverleaf Phacelia

Acronym: PHAHAS

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: *Phacelia hastata Herbaceous Vegetation*

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 24, MORA (0), NOCA (0), OLYM (23), Other (1)

Environmental Description: These scree and talus sites occur between 1490-1830 m (4900 and 6000 ft) elevation on moderate to steep southerly slopes. Mineral soil is more abundant than bedrock.

Photo Not Available

Vegetation Description: The moderately to sparsely developed herbaceous layer contains a wide array of species. *Phacelia hastata* is the most abundant species (average cover 20%). *Cirsium edule* and *Hydrophyllum fendleri* are often present and may be co-dominant. Other frequently encountered species are *Lomatium martindalei*, *Bromus sitchensis*, and *Epilobium anagallidifolium*.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S4

Rank Justification: This preliminary association occurs at many sites, is represented on protected areas, and has few threats.

Synonyms:
Phacelia community; Schreiner 1994

Polygonum davisiae Herbaceous Vegetation

Davis' Knotweed Herbaceous Vegetation

Acronym: POLDAV

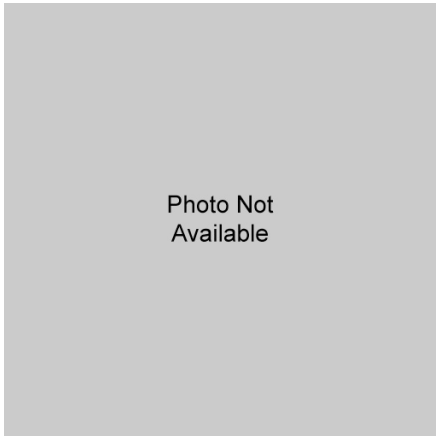
NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: *Phacelia hastata Herbaceous Vegetation*

Classification Confidence Level: 3



Range: This association occurs in the Olympic Mountains, Mount Rainier National Park and on other Cascadian volcanoes.

Plots: 4, MORA (2), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs at subalpine to alpine elevations. Sites occupy moderately steep, rocky, often pumice soils. Exposed mineral soil is common on unstable soils.

Vegetation Description: Vascular plant cover ranges from sparse to open in this type. *Polygonum davisiae* (=*newberryii*) is dominant or most abundant. Many other species such as, *Penstemon davidsonii*, *Lupinus (arcticus* ssp. *subalpinus, latifolius), Eucephalus (=Aster) paucicapitatus* and *Achillea millefolium* can be found, but always occur with low cover.

USFWS Wetland System: Not applicable.

Comments: This association is currently recognized as a dominance type. More plots are needed to clarify this preliminary type.

Conservation Rank: S2S3

Rank Justification: This preliminary association occurs within a narrow environmental range although with few threats.

Synonyms:
Polygonum newberryi Associes; Hamann 1972

Antennaria lanata Herbaceous Vegetation

Woolly Pussytoes Herbaceous Vegetation

Acronym: ANTLAN

NatureServe Code: CEGL001949

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Antennaria lanata -(Juncus parry)* Meadow

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 8, MORA (2), NOCA (0), OLYM (6), Other (0)

Environmental Description: This association occurs in subalpine meadows or in the alpine zone. Sites are usually gentle slopes or flats that have relatively late snow-melt and receive above average moisture. Soils are well-drained and often rocky.

Photo Not Available

Vegetation Description: The forb *Antennaria lanata* dominates this short, often open vegetation, usually with more cover than all other species. Dwarf-shrubs, e.g. *Salix cascadensis* or *Phyllodoce empetriformis*, can be present but subordinate in importance. *Carex nigricans*, *Carex spectabilis*, *Polygonum bistortoides*, *Oreostemma (Aster) alpigenum*, *Hieracium gracile* or *Juncus parryi* are often present. Although floristic diversity tends to be low, moss/lichen cover can be high.

USFWS Wetland System: Not applicable.

Comments: The *Juncus drummondii-Antennaria lanata* association (CEGL001904) in Montana appears in similar habitats as this association but is co-dominated by *Juncus* and other graminoid species.

Conservation Rank: S3S4

Rank Justification: This association occurs within a limited environmental range in Washington but currently has few threats. Climate change will likely affect this association.

Synonyms:
Antennaria lanata Association; Hamann 1972
Antennaria lanata Community; Douglas and Bliss 1977
Antennaria lanata Community Type; Henderson 1974
Antennaria lanata Herbaceous Vegetation; Chappell 2005

Juncus parryi-(Polygonum bistortoides) Herbaceous Vegetation

Parry's Rush-(American Bistort) Herbaceous Vegetation



Acronym: JUNPAR-(POLBIS)

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Antennaria lanata -(Juncus parry)* Meadow

Classification Confidence Level: 2

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 14, MORA (0), NOCA (4), OLYM (10), Other (0)

Environmental Description: This association occurs in subalpine parklands and on open ridges. Sites can be rocky on steep to gentle slopes.

Vegetation Description: The patchy to closed vegetation is dominated by *Juncus parryi*. *Antennaria lanata*, *Arenaria capillaris*, *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, *Polygonum bistortoides*, and *Carex spectabilis* are frequently present to occasionally prominent, but are never more abundant than*Juncus parryi*. Tree species such as *Cupressus (=Chamaecyparis) nootkatensis* and *Abies lasiocarpa* occur in transition areas adjacent to tree islands.

USFWS Wetland System: Not applicable.

Comments: This association is related to other *Juncus parryi* associations (Montana, Colorado, and California) in habitat but differing in floristics.

Conservation Rank: S3S4

Rank Justification: This association occurs within a narrow range of environments with few threats on protected land.

Synonyms:
Juncus parryi-Polygonum bistortoides Community Type; Henderson et al. 1979
Juncus parryi-Polygonum bistortoides Herbaceous Vegetation-new; Chappell 2005

Carex spectabilis-(Lupinus (arcticus, latifolius)-Polygonum bistortoides Herbaceous Vegetation

Showy Sedge-Subalpine Lupine-American Bistort Herbaceous Vegetation



Acronym: CARSPE-(LUPARC-POLBIS)

NatureServe Code: CEGL001828

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Carex spectabilis* Meadow

Classification Confidence Level: 1

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 64, MORA (1), NOCA (2), OLYM (52), Other (9)

Environmental Description: This subalpine meadow occurs between1030-2060 m (3400-6750 ft) elevation on well-drained, somewhat moist soils. It occasionally appears in avalanche chutes where trees and other woody species are periodically removed.

Vegetation Description: The vegetation is usually a lush meadow dominated or co-dominated by *Carex spectabilis*. *Polygonum bistortoides* and *Lupinus (arcticus* ssp. *subalpinus*,*latifolius*) are usually present to prominent. *Erigeron peregrinus*, *Luetkea pectinata*, and *Valeriana sitchensis* are often present but always less abundant than *Carex spectabilis*. Many other species can occur, but are rarely more than prominent.

USFWS Wetland System: Not applicable.

Comments: This is an expanded concept which now includes the part of the *Lupinus arcticus* ssp. *subalpinus* - *Polygonum bistortoides* - (*Carex spectabilis*) association (CEGL001973) that had a high cover of *Carex spectabilis*.

Conservation Rank: S3S4

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:
Carex spectabilis Community; Douglas 1972
Carex spectabilis-Polygonum bistortoides Herbaceous Vegetation; Chappell 2005
Carex spectabilis-Valeriana sitchensis-Polygonum bistortoides Community Type; Henderson et al. 1979
Tall Sedge Type; Kuramoto and Bliss 1970

Heracleum maximum Herbaceous Vegetation

Cow Parsnip Herbaceous Vegetation



Acronym: HERMAX

NatureServe Code: CEGL005857

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: Cascadian Mesic Tall Forb Meadow

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 7, MORA (0), NOCA (0), OLYM (6), Other (1)

Environmental Description: This diverse, forb-dominated meadow association appears in a variety of environments including avalanche tracks and meadows with evidence of fire or other disturbance. Site are rocky or with rocky soil. It appears at mid to high elevation on moderately steep to steep, often southerly slopes. Patches of *Alnus viridis* ssp. *sinuata* may dominate nearby sites.

Vegetation Description: *Heracleum maximum (=lanatum)* clearly dominates this association although it often is co-dominant with *Hydrophyllum fendleri* or *Thalictrum occidentale*. *Anaphalis margaritacea* or *Cirsium edule* are other herbaceous species frequently prominent to co-dominant.

USFWS Wetland System: Not applicable.

Comments: This is similar to and preliminarily clustered with the *Heracleum maximum* Herbaceous association (CEGL005857) in the Northern Rockies. This association has also been observed by one of the authors in a moist, relatively flat meadow within a larger riparian system at lower elevation in the northeast Olympics. The lack of cover of *Saussurea americana* is the major difference between this type and the *Saussurea americana - Heracleum maximum* Herbaceous association (CEGL001945).

Conservation Rank: S3S5

Rank Justification: This preliminary association occurs within a narrow range of environments with few threats on protected land.

Synonyms:

Lupinus (arcticus ssp. subalpinus, latifolius) Herbaceous Vegetation

Subalpine Lupine Herbaceous Vegetation

Acronym: LUPARC

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: Cascadian Mesic Tall Forb Meadow

Classification Confidence Level: 3

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 47, MORA (1), NOCA (0), OLYM (46), Other (0)

Environmental Description: This subalpine meadow occurs on gentle to steep slopes with well-drained and at least slightly moist soils. Aspects are typically southerly although it occurs on all aspects. Soils can be rocky especially on more sparsely vegetated sites.



Vegetation Description: The variable canopy is consistently dominated by *Lupinus (arcticus* ssp. *subalpinus, latifolius.)*. Many other species typically occur but have low cover. *Phlox diffusa* is the most frequently abundant associated species and sometimes is co-dominant with *Lupinus (arcticus* ssp. *subalpinus, latifolius)*. *Carex spectabilis*, *Polygonum bistortoides*, *Juncus parryi* are often present to prominent but with less cover than *Lupinus*. *Lomatium martindalei*, *Trisetum spicatum* and *Hieracium gracile* are frequently present with low cover.

USFWS Wetland System: Not applicable.

Comments: This association more narrowly defines the concept of the *Lupinus arcticus* ssp. *subalpinus* - *Polygonum bistortoides* - (*Carex spectabilis*) (CEGL001973) association. As defined here, samples with *Carex spectabilis* dominance/codominance are merged into *Carex spectabilis*-(*Lupinus arcticus* ssp. *subalpinus-Polygonum bistortoides*) Herbaceous Vegetation (CEGL001828). The former association may appear as sparse or lithomorphic vegetation on steep, more rocky sites where *Lupinus (arcticus ssp. subalpinus, latifolius)* is the most abundant vascular plant (LUPARC lithomorphic in table).

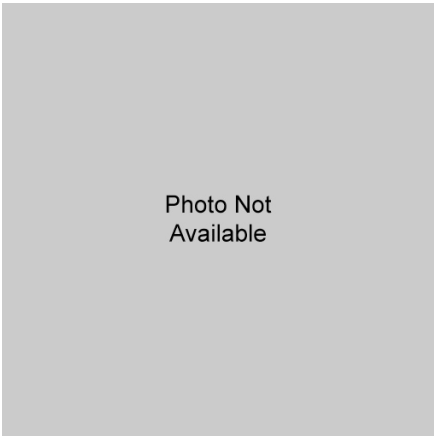
Conservation Rank: S3

Rank Justification: This association is geographically restricted and is represented on many protected areas that have few threats. Climate change will likely affect this vegetation.

Synonyms:
Lupinus arcticus ssp. *subalpinus-Polygonum bistortoides*-(*Carex spectabilis*) Herbaceous Vegetation-name change; Chappell 2005
Lupinus latifolius Community; Douglas and Bliss 1977
Lupinus/Polygonum Community Type; Henderson 1974
Polygonum bistortoides/*Potentilla flabellifolia* Association; Hamann 1972
Valeriana/Lupinus Community Type; Henderson 1974
Carex - Lupinus; Schreiner 1994

Pteridium aquilinum Herbaceous Vegetation

Bracken Fern Herbaceous Vegetation



Acronym: PTEAQU

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: Cascadian Mesic Tall Forb Meadow

Classification Confidence Level: 3

Range: This association occupies sites in the Olympic Mountains and likely occurs elsewhere in Washington.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs an middle elevations, on steep slopes that are rocky or may have relatively thick organic layer.

Vegetation Description: The well- developed herbaceous layer is dominated by *Pteridium aquilinum* (average 80% cover). *Lathyrus nevadensis*, *Melica subulata* var. *subulata*, and *Thalictrum occidentale* are frequent

USFWS Wetland System: Not applicable.

Comments: Due to limited sampling, this currently recognized as provisional dominance type with an undefined range of floristic and geographic variation.

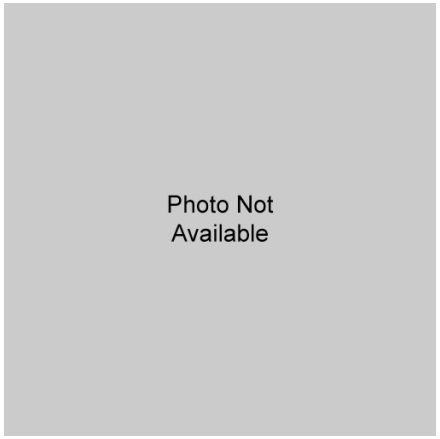
Conservation Rank: SUQ

Rank Justification: Insufficient information exists to fully characterize or rank this provisional type.

Synonyms:

Saussurea americana-(Heracleum maximum) Herbaceous Vegetation

American Sawwort-(Cow Parsnip) Herbaceous Vegetation



Acronym: SAUAME-(HERMAX)

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow

Alliance: Cascadian Mesic Tall Forb Meadow

Classification Confidence Level: 3

Range: This association occurs in the northeast Olympic Mountains and possibly elsewhere in western Washington.

Plots: 5, MORA (0), NOCA (0), OLYM (4), Other (1)

Environmental Description: This association occurs at middle to high elevations. Sites are moist, often linear, depressions in the lower portions of the subalpine parkland. It is often associated at toe-slopes below slide areas.

Vegetation Description: The herbaceous vegetation is usually relatively dense, and often rather tall. *Saussurea americana* is co-dominant. *Heracleum maximum (=lanatum)* is sometimes present and can be co-dominant. *Bromus sitchensis* is also frequent and sometimes co-dominant. Several other forbs and grasses occur commonly and can be prominent or even co-dominant.

USFWS Wetland System: Palustrine.

Comments:

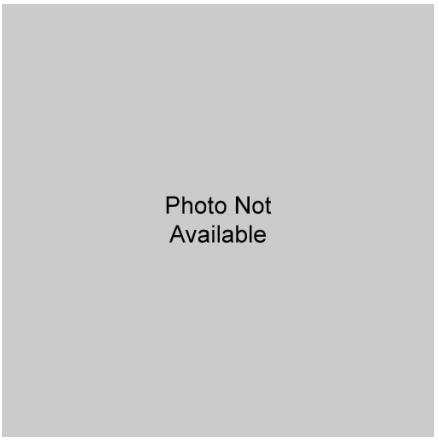
Conservation Rank: S2S3

Rank Justification: This association occurs within a limited environmental range in the Olympic and Cascade Mountains in Washington.

Synonyms:
Moist Saussurea Forb Type; Kuramoto and Bliss 1970
Saussurea americana-(*Heracleum maximum*) Herbaceous Vegetation; Chappell 2005
Saussurea americana-Forb Community Type; Henderson et al. 1979

Carex nardina Herbaceous Vegetation

Spike Sedge Herbaceous Vegetation



Acronym: CARNAR

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Festuca brachyphylla*-(*Carex breweri*, *Carex nardina*) Meadow

Classification Confidence Level: 3

Range: This association may occur in the eastern North Cascades.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at high elevations on dry upper slopes. It occurs on a variety of aspects above upper treeline (alpine zone).

Vegetation Description: The moderate herbaceous cover is dominated by *Carex nardina*. *Phlox hendersonii* is usually present to prominent. Other common species are *Festuca brachyphylla* (=*ovina* var. *rydbergii*), *Minuartia (=Arenaria) obtusiloba*, and *Smelowskia ovalis*.

USFWS Wetland System: Not applicable.

Comments: This is not represented in the current data for national parks in Washington.

Conservation Rank: S2S3

Rank Justification: This provisional association occurs within a limited geographic range.

Synonyms:
Carex nardina Community Type; Douglas and Bliss 1977
Carex nardina Herbaceous Vegetation; Chappell 2005

Carex scirpoidea ssp. *pseudoscirpoidea* Herbaceous Vegetation

Western Single-spike Sedge Herbaceous Vegetation



Acronym: CARPSE

NatureServe Code: CEGL001865

Macrogroup Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Festuca viridula* Meadow

Classification Confidence Level: 2

Range: This association occurs primarily in the eastern North Cascades and one plot was sampled at Mount Rainier.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This primarily alpine association occurs in the North Cascades at 2200-2600 m (7200-8500 ft) elevation on dry, well-drained slopes.

Vegetation Description: This densely vegetated association is dominated *Carex scirpoidea* ssp. *pseudoscirpoidea* with *Carex phaeocephala*, *Potentilla diversifolia*, *Minuartia (=Arenaria) obtusiloba* and *Festuca brachyphylla (=ovina* var. *rydbergii)* occuring in lesser amounts.

USFWS Wetland System: Not applicable.

Comments: A Mount Rainier plot (CARPSE in the synthesis table) is dominated by *Carex scirpoidea* ssp. *pseudoscirpoidea* and *Veratrum viride*. The single plot was located at the head of a southeast-facing draw at 1740 m (5700 ft) elevation and in a moist topographic position. This plot may represent a new association or variation of the *Valeriana sitchensis -Veratrum viride* association.

Conservation Rank: S2

Rank Justification: This association occurs within a restricted geographic range in Washington and environment. Known sites are in protected areas.

Synonyms:
Carex scirpoidea var. *pseudoscirpoidea* Community Type; Douglas and Bliss 1977

Festuca viridula-Eucephalus ledophyllus Herbaceous Vegetation

Green Fescue-Cascade Aster Herbaceous Vegetation



Acronym: FESVIR-EUCLED

NatureServe Code: CEGL001632

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Festuca viridula* Meadow

Classification Confidence Level: 2

Range: This association occurs in northern and eastern Mount Rainier National Park and in the North Cascades.

Plots: 19, MORA (10), NOCA (1), OLYM (0), Other (8)

Environmental Description: This dry subalpine meadow association occurs on moderate to steep, southerly slopes with well-drained soils. Bare ground is a common feature of this vegetation.

Vegetation Description: The vegetation is dominated or co-dominated by *Festuca viridula*. *Eucephalus (=Aster) ledophyllus* is always present to sometimes co-dominant. *Lupinus (arcticus* ssp*. subalpinus, latifolius)* or *Ligusticum grayi* is often prominent to co-dominant. *Arnica parryi*, *Nothocalais (=Microseris) alpestris*, and *Penstemon confertus* are somewhat frequent in higher elevation sites. *Xerophyllum tenax* is present to prominent in burned sites.

USFWS Wetland System: Not applicable.

Comments: This association and the *Festuca viridula- Lupinus (arcticus, latifolius)* association (CEGL001635) are similar with latter being a more mesic, often occurring at lower elevations, and primarily distinguished by the absence or low abundance of *Eucephalus ledophyllus*. One North Cascades plot included here is dominated by *Eucephalus ledophyllus* and *Carex spectabilis* with only a presence of *Festuca viridula* and 5-10% cover of *Vaccinium deliciosum*. It appears to be transitional to the type described here or the preliminary *Vaccinium deliciosum*/*Festuca viridula* association.

Conservation Rank: S3

Rank Justification: This association occurs within a restricted range of environments with few threats on protected land. Climate change will likely affect this vegetation.

Synonyms:
Festuca viridula/*Aster ledophyllus* Association; Hamann 1972
Festuca viridula-Eucephalus ledophyllus Herbaceous Vegetation; Chappell 2005
Festuca/ASTER Community Type; Henderson 1974

Festuca viridula-Lupinus (arcticus, latifolius) Herbaceous Vegetation

Green Fescue-Subalpine Lupine Herbaceous Vegetation

Acronym: FESVIR-LUPARC

NatureServe Code: CEGL001635



Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Festuca viridula* Meadow

Classification Confidence Level: 1

Range: This association occurs in northern and eastern Mount Rainier and in the eastern North Cascades.

Plots: 27, MORA (11), NOCA (4), OLYM (0), Other (12)

Environmental Description: This mesic to dry subalpine meadow and lower alpine association occurs on well-drained soils and southerly facing slopes.

Vegetation Description: The vegetation is dominated or co-dominated by *Festuca viridula*. *Lupinus (arcticus ssp. subalpinus, latifolius)* is usually present to co-dominant. *Carex spectabilis, Luetkea pectinata*, and *Polygonum bistortoides* are often present to prominent. Other common species include *Potentilla flabellifolia*, *Antennaria lanata*, *Hieracium gracile, Juncus parryi, Ligusticum grayi*, and *Oreostemma alpigenum*.

USFWS Wetland System: Not applicable.

Comments: This association and the *Festuca viridula-Eucephalus ledophyllus* association are similar with latter being a drier meadow that is often higher and distinguished by prominence to co-dominance of *Eucephalus ledophyllus*.

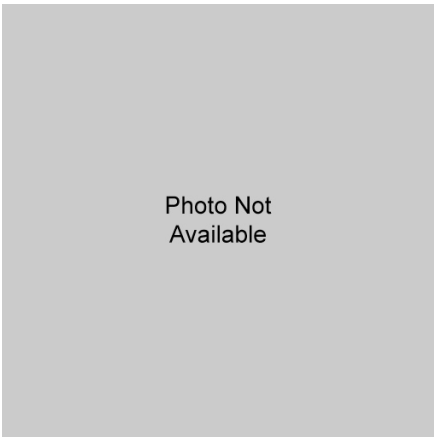
Conservation Rank: S3

Rank Justification: This association occurs within a restricted range of environments with few threats on protected land. Climate change will likely affect this vegetation.

Synonyms:
Festuca viridula Community; Douglas and Bliss 1977
Festuca viridula-Lupinus arcticus ssp. *subalpinus* Herbaceous Vegetation; Chappell 2005
Festuca viridula-Lupinus latifolius Association; Hamann 1972, Henderson and Peter 1982
Festuca viridula-Phlox diffusa Community; Wooten and Morrison 1995
Festuca/Lupinus Community Type; Henderson 1974
Festuca/Potentilla Community Type; Henderson 1974

Luetkea pectinata Herbaceous Vegetation

Partridgefoot Herbaceous Vegetation



Acronym: LUEPEC

NatureServe Code: CEGL001918

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Luetkea pectinata* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Cascade and the Olympic Mountains.

Plots: 71, MORA (0), NOCA (0), OLYM (60), Other (11)

Environmental Description: This association occurs in the subalpine parkland. Sites range from north- to west-facing moderate to steep slopes with well-drained soils to gentle slopes and flats with somewhat poorly soils. Rocks 11-70 cm (4.3-27.5 in) in size frequently compose the substrate in the Olympics.

Vegetation Description: This open to sparse, short vegetation, typically 6 inches (15 cm) tall, is dominated or co-dominated by the semi-shrub *Luetkea pectinata* (average cover 19%). *Luetkea* is always the most abundant species. Many herbaceous species can occur, all typically with low cover. *Luzula piperi*, *Hieracium gracile*, *Juncus parryi* and *Carex spectabilis* are most frequent species in Olympics. Schreiner (1994) notes that this vegetation appears to occur on recently colonized sites.

USFWS Wetland System: Not applicable.

Comments: This association is a name change of the *Luetkea pectinata - Saxifraga tolmiei* Herbaceous Vegetation (CEGL001918).

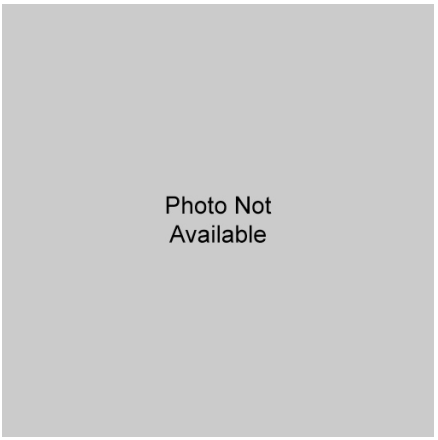
Conservation Rank: S4

Rank Justification: This association is restricted to high elevations in the more maritime climates of the Pacific Northwest and represented on many protected areas with few threats. Climate change will likely affect this vegetation.

Synonyms:
Luetkea pectinata (RAWMARK Phase) Community; Douglas 1972
Luetkea pectinata (Residual or Regosolic Phase) Community; Douglas 1972
Luetkea pectinata Community Type; Henderson 1974
Luetkea pectinata Herbaceous Vegetation; Chappell 2005
Luetkea -Saxifraga community; Schreiner 1994

Carex spectabilis-Phlox diffusa Herbaceous Vegetation

Showy Sedge-Spreading Phlox Herbaceous Vegetation



Acronym: CARSPE-PHLDIF

NatureServe Code: CEGL001979

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Phlox diffusa* Herbaceous Vegetation

Classification Confidence Level*:* 2

Range: This association occurs in the western North Cascades and in the Olympic Mountains.

Plots: 8, MORA (0), NOCA (0), OLYM (8), Other (0)

Environmental Description: This association occurs in the alpine and in the subalpine parklands in the Olympics on moderate to steep upper slopes (usually southerly aspects) with well-drained soils.

Vegetation Description: This moderately dense vegetation is dominated by *Carex spectabilis* and *Phlox diffusa*. *Solidago multiradiata* is usually prominent and may occur as a co-dominant in the North Cascade alpine plots. Sites in the Olympics often have *Antennaria microphylla*, *Arenaria capillaris*, *Erysimum arenicola*, *Lomatium martindalei*, *Luzula comosa (=campestris, congesta)*, *Poa cusickii* and *Polygonum bistortoides*. *Carex breweri*, *Danthonia intermedia*, *Cerastium arvense*, *Achillea millefolium*, *Polygonum bistortoides*, and *Sibbaldia procumbens* are regular in alpine sites of the Cascades.

USFWS Wetland System: Not applicable.

Comments: This association has expanded the concept of *Phlox diffusa* ssp. *longistylis-Carex spectabilis* (CEGL001979) as previously defined to include more subalpine species and environments present in the Olympics.

Conservation Rank: S3S4

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas. Climate change will likely affect this vegetation.

Synonyms:
Phlox diffusa ssp. *longistylis-Carex spectabilis* Association; NatureServe 2008

Phlox diffusa-(Lomatium martindalei- Carex phaeocephala) Herbaceous Vegetation

Spreading Phlox-(Cascade Desert-parsley-Dunhead Sedge) Herbaceous Vegetation



Acronym: PHLDIF-(LOMMAR-CARPHA)
NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Phlox diffusa* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Olympic Mountains, Mount Rainier and elsewhere in the Cascades.

Plots: 55, MORA (3), NOCA (1), OLYM (44), Other (7)

Environmental Description: This association occurs at middle elevations up to the lower alpine. Sites are moderate to steep, southerly slopes, with well-drained, very shallow or rocky soils.

Vegetation Description: Vascular plant cover ranges from sparse to moderate in this type. *Phlox diffusa* is always prominent to co-dominant. *Lomatium martindalei* is usually present to prominent. Other herbaceous species are present although few appear consistently. *Achillea millefolium, Arenaria capillaris, Carex phaeocephala, Erysimum arenicola,* and *Phacelia hastat*a are frequent associates.

USFWS Wetland System: Not applicable.

Comments: Schreiner (1994) states that this may represent an earlier sucessional or steep, wet site version of the preliminary *Dasiphora fruticosa* lithomorphic association. This association expands the concept of *Phlox diffusa*-(*Lomatium martindalei-Penstemon subserratus*) of Chappell (2006) to include subalpine sites. Alpine sites with *Phlox diffusa* are better recognized as the preliminary *Phlox diffusa-Lupinus sellulus* var. *lobbii*-(*Pedicularis contorta)* association.

Conservation Rank: S3S4

Rank Justification: The association occurs on many sites over a wide elevation range. Lower elevation sites are more subject to exotic species invasion and recreational activities than high elevation sites.

Synonyms:
Cushion Plant Type; Kuramoto and Bliss 1970
Phlox diffusa Community Type; Henderson et al. 1979
Phlox diffusa-(*Lomatium martindalei-Penstemon subserratus*); Chappell 2006a
Phlox diffusa-Lomatium martindalei Herbaceous Vegetation-new; Chappell 2005
Phlox-Carex phaeocephala community; Schreiner 1994

Danthonia intermedia-Racomitrium canescens Herbaceous Vegetation

Timber Oatgrass Herbaceous Vegetation



Acronym: DANINT

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Pseudoroegernia spicata - Danthonia intermeida* Herbaceous Vegetation (Providisional)

Classification Confidence Level: 3

Range: This association occurs in the Cascade Mountains.

Plots: 3, MORA (0), NOCA (3), OLYM (0), Other (0)

Environmental Description: This association occurs at 450 to 560 m (1480-1846 ft) on south-facing, dry sites on gentle to moderately steep sloes. Soils are rocky with little soil development.

Vegetation Description: This open to sparse vegetation is dominated by *Danthonia intermedia*. *Arctostaphylos uva-ursi*, *Achillea millifolium*, *Carex concinnoides* and *Zigadenus venenosus* are usually present. The moss *Racomitrium canescens* with *Selaginella wallacei* cover most of the rocky ground surface. *Pinus ponderosa*, *Pinus contorta*, and *Pseudotsuga menziesii* are usually in the surrounding forests and may occur as isolated individual trees.

USFWS Wetland System: Not applicable.

Comments: This is not the alpine/high subalpine *Danthonia intermedia* Herbaceous Vegetation (CEGL001794) association. This current type has more affinities with Northern Rocky Mountain or interior British Columbia vegetation.

Conservation Rank: S2

Rank Justification: This preliminary association occurs within a very narrow range of environments and is geographically restricted.

Synonyms:

Pseudoroegneria spicata/Selaginella wallacei Herbaceous Vegetation

Bluebunch Wheatgrass Herbaceous Vegetation



Acronym: PSESPI

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Pseudoroegernia spicata - Danthonia intermeida* Herbaceous Vegetation (Provisional)

Classification Confidence Level: 3

Range: This association occurs in the North Cascades; most commonly on the east side. The association also exists in the northern Rocky Mountains.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: This association occurs on dry balds within forests and woodlands. As sampled, it appears between 575-670 m (1990-2200 ft) elevation on steep southeasterly aspects.

Vegetation Description: The relatively open vegetation is dominated by *Pseudoroegneria (=Agropyron) spicata*. *Achillea millefolium, Collinsia parviflora* and *Polygonum douglasii* occurred in the two documented plots. *Bromus marginatus*, *Selaginella wallacei*, *Paxistima (=Pachistima) myrsinites* and *Philadelphus lewisii* appear prominently in one plot. Mosses, particularly *Racomitrium canescens,* are abundant on exposed rock in both sites. The forest surrounding this bald is dominated by *Pseudotsuga menziesii* and *Pinus contorta.*

USFWS Wetland System: Not applicable.

Comments: This provisional association may be represented in British Columbia, the eastern Cascades, or the central Columbia River gorge in Washington. Although floristically similar, this association is defined as different, primarily by its forest landscape setting, from the widespread *Pseudoroegneria spicata (*CEGL001660) grasslands in the non-forest zones of the interior Pacific Northwest. The Columbia Basin grassland have more “shrubsteppe” species, such as *Artemisia tridentata* and *Chrysothamnus* spp.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this tentative association.

Synonyms:

Luzula glabrata-(Lupinus (arcticus ssp. subalpinus, latifolius)) Herbaceous Vegetation

Hitchcock's smooth woodrush-(Lupine) Herbaceous Vegetation

Acronym: LUZGLA-(LUPARC)

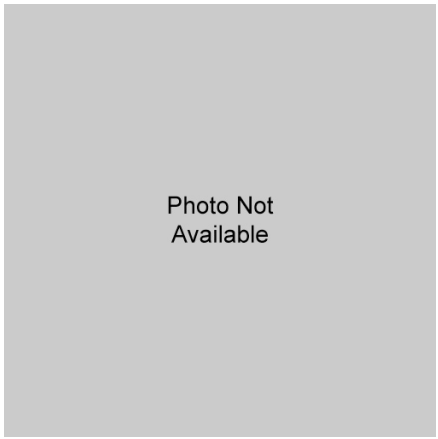
NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Valeriana sitchensis* Meadow

Classification Confidence Level: 3



Range: This association was sampled at Mount Rainier National Park and is found elsewhere in the Cascades.

Plots: 7, MORA (1), NOCA (0), OLYM (0), Other (6)

Environmental Description: This association is found in subalpine parklands. Surrounding tree islands and woodlands are primarily composed of *Abies lasiocarpa*.

Vegetation Description: The vegetation is dominated or co-dominated by *Luzula glabrata var. hitchcockii*. *Lupinus (arcticus* ssp. *subalpinus, latifolius)* and/or *Valeriana sitchensis* can be co-dominants. *Elymus glaucus* is co-dominant in one plot.

USFWS Wetland System: Not applicable.

Comments: This tentative association is represented by six legacy plots outside the national park boundaries with minimal environmental information. This association could be considered part of the variation of the open canopy *Abies lasiocarpa*/*Luzula glabrata* association.

Conservation Rank: S3Q

Rank Justification: This provisional association is restricted to a narrow habitat, represented on protected areas and has few threats.

Synonyms:

Valeriana sitchensis-Athyrium filix-femina Herbaceous Vegetation

Sitka Valerian-Lady Fern Herbaceous Vegetation



Acronym: VALSIT-ATHFIL

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Valeriana sitchensis* Meadow

Classification Confidence Level: 3

Range: This type is described from one plot in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: The sole plot was located on a mid-elevation, steep slope which likely receives snowmelt and is bordered by talus cliffs.

Vegetation Description: This association is co-dominated by *Athyrium filix-femina* and *Valeriana sitchensis*. *Epilobium anagallidifolium* and *Oxyria digyna* are prominent associates.

USFWS Wetland System: Not applicable.

Comments: This is related to the preliminary *Athyrium americanum-Cryptogramma acrostichoides (=crispa)* Lithomorphic Vegetation that occurs in a similar habitat. More sampling is needed to verify the classification of this type.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to assess the conservation rank of this preliminary association.

Synonyms:

Valeriana sitchensis-Carex spectabilis Herbaceous Vegetation

Sitka Valerian-Showy Sedge Herbaceous Vegetation



Acronym: VALSIT-CARSPE

NatureServe Code: CEGL001996

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Valeriana sitchensis* Meadow

Classification Confidence Level: 2

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 15, MORA (1), NOCA (1), OLYM (11), Other (2)

Environmental Description: This subalpine meadow association occurs within subalpine parklands between tree islands. Sites typically occur on slopes, slightly more frequently than those with a north aspect. Soils are well-drained. This type can be influenced by upslope debris and avalanche chutes.

Vegetation Description: This dense to open herbaceous vegetation is dominated or co-dominated by *Valeriana sitchensis*. *Carex spectabilis* is prominent to dominant. *Lupinus (arcticus* ssp*. subalpinus, latifolius)* or *Polygonum bistortoides* can be prominent but not co-dominant. This floristically diverse, often lush type has several species that occasionally can be prominent, including *Senecio triangularis*, *Claytonia cordifolia*, and *Thalictrum occidentale*.

USFWS Wetland System: Not applicable.

Comments: This association may also appear as a sparsely vegetated type on steep, more rocky sites where *Valeriana sitchensis* and *Carex spectabilis* are the most abundant vascular plants.

Conservation Rank: S3

Rank Justification: This association occurs in the Olympic and Cascade Mountains within a narrow environmental range. Climate change will likely affect this vegetation.

Synonyms:
Moist Valeriana Forb Type; Kuramoto and Bliss 1970
Valeriana sitchensis Community Type; Henderson 1974
Valeriana sitchensis-Carex spectabilis Herbaceous Vegetation; Chappell 2005
Carex – Valeriana community; Schreiner 1994

Valeriana sitchensis-Ligusticum grayi Herbaceous Vegetation

Sitka Valerian-Gray's Lovage Herbaceous Vegetation



Acronym: VALSIT-LIGGRA

NatureServe Code: CEGL001997

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Valeriana sitchensis* Meadow

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier National Park, the North Cascades and less commonly in the Olympic Mountains.

Plots: 11, MORA (6), NOCA (1), OLYM (1), Other (3)

Environmental Description: This subalpine meadow association is found on moderately steep, mostly northeast and east slopes with well-drained soils.

Vegetation Description: These variably dense herbaceous meadows often occur near *Abies lasiocarpa* tree islands. They are always co-dominated by *Valeriana sitchensis*, which is usually the most abundant species. *Festuca viridula*, *Ligusticum grayi*, and *Lupinus (arcticus ssp. subalpinus, latifolius)* are prominent to co-dominant. *Arnica latifolia*, *Castilleja parviflora*, *Carex nigricans*, *Erigeron peregrinus, Luzula glabrata var. hitchcockii*, *Polygonum bistortoides* or *Pulsatilla occidentalis* are other herbaceous species usually present in this diverse community.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Festuca viridula-Lupinus (arcticus, latifolius)* and *Festuca viridula-Eucephalus ledophyllus* associations. The later grassland associations lack high cover of *Valeriana* and generally appear on in drier locations.

Conservation Rank: S2S3

Rank Justification: This association occurs in the Olympic and Cascade Mountains in a narrow environmental range. Climate change will likely affect this vegetation.

Synonyms:
Valeriana sitchensis/*Ligusticum grayi* Association; Hamann 1972
Valeriana sitchensis-Ligusticum grayi Herbaceous Vegetation; Chappell 2005

Valeriana sitchensis-Veratrum viride Herbaceous Vegetation

Sitka Valerian-Green False Hellebore Herbaceous Vegetation



Acronym: VALSIT-VERVIR

NatureServe Code: CEGL001998

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance: *Valeriana sitchensis* Meadow

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 24, MORA (3), NOCA (4), OLYM (16), Other (1)

Environmental Description: This association occurs in subalpine meadows and seeps. Sites have very moist soils and are sometimes found on slopes. They are often located within small stream drainages, avalanche tracks, and remnants of stabilized rock slides or talus. Sites typically have shallow soils and seasonal moisture resulting from snow melt. Mineral soil maybe exposed reflecting site disturbance from adjacent windthrown trees or animal activity.

Vegetation Description: This dense, often tall herbaceous vegetation is dominated by *Veratrum viride*. *Valeriana sitchensis* is usually at least prominent and often co-dominates. Other frequently encountered species include *Lupinus (arcticus* ssp*. subalpinus, latifolius)*, *Polygonum bistortoides*, and *Carex spectabilis*. Adjacent tree islands or forests are composed of *Tsuga mertensiana*, *Abies amabilis*, *Abies lasiocarpa* or *Picea engelmannii*.

USFWS Wetland System: Palustrine.

Comments:

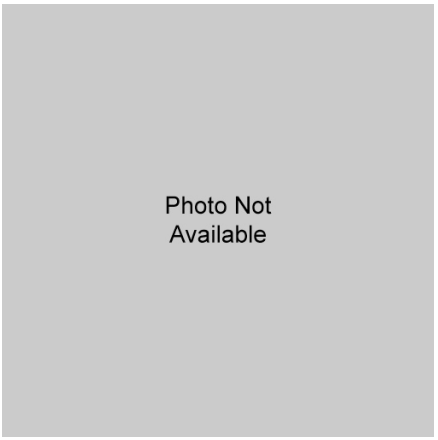
Conservation Rank: S3

Rank Justification: This association occurs in the Olympic and Cascade Mountains within a narrow environmental range.

Synonyms:
Moist Valeriana Forb Type; Kuramoto and Bliss 1970
Valeriana sitchensis Association; Henderson and Peter 1982
Valeriana sitchensis-Veratrum viride Herbaceous Vegetation; Chappell 2005
Valeriana sitchensis-Veratrum viride-Carex spectabilis Community; Wooten and Morrison 1995
Valeriana/*Veratrum* Community Type; Henderson 1974
Veratrum viride/*Valeriana sitchensis* Association; Hamann 1972
Veratrum viride-Forb Community Type; Henderson et al. 1979

Xerophyllum tenax Herbaceous Vegetation

Beargrass Herbaceous Vegetation



Acronym: XERTEN

NatureServe Code: CEGL005859

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow

Alliance*: Xerophyllum tenax* Meadow

Classification Confidence Level: 2

Range: This association may occur in the Cascade or Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association often occurs in areas that have experienced past fire. Although evidence is often old, the burns appear to have been intense and occurred in primarily closed forest conditions.

Vegetation Description: As paraphrased from NatureServe: "This association is a monoculture of *Xerophyllum tenax* (greater than 70% average cover) forming tall, dense tussocks rising to 0.3 m (1 foot). Over 90 vascular species occur within this association; about 20% of these are shrubs which never comprise more than 10% cover in the aggregate and of which only *Vaccinium membranaceum* attains greater than 50% constancy. Tree species, mostly *Abies lasiocarpa* in the tall-shrub layer, may occur sparsely scattered. The only graminoid of consequence is *Carex geyeri*, though its cover seldom exceeds 5%. Though diverse, the herbaceous component has only six species (exclusive of *Xerophyllum tenax*) with more than 50% constancy, including *Erigeron peregrinus*, *Valeriana sitchensis*, *Veratrum viride*, *Erythronium grandiflorum*, *Thalictrum occidentale*, and *Chamerion* (= *Epilobium*) *angustifolium*. Generally this forb component does not exhibit more than 10% cover, and should the first three named forbs exceed this cover, then another association is possibly indicated."

USFWS Wetland System: Not applicable.

Comments: This is not represented in the current data for national parks in Washington. As described in Glacier National Park, the *Xerophyllum tenax* association (CEGL005859) has less than 10% woody species cover. *Xerophyllum tenax*-dominated sites with over 10% woody cover are found in various *Vaccinium membranaceum*, *Vaccinium deliciosum*, *Vaccinium caespitosum*, and *Vaccinium scoparium* associations. See descriptions for each of those shrub or dwarf-shrub types.

Conservation Rank: SU

Rank Justification: Insufficient information exists to assess the conservation rank of this association.

Synonyms:

Amelanchier alnifolia/Calamagrostis rubescens Shrubland

Western Serviceberry/Pinegrass Shrubland



Acronym: AMEALN/CALRUB

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Amelanchier alnifolia* Shrubland

Classification Confidence Level: 3

Range: This association is described from a single location in the North Cascades.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association was sampled from an unforested bald at 1530 m (5020 ft) on a dry, steep, southeast aspect. The site is surrounded by a forest dominated by *Abies lasiocarpa* and *Cupressus nootkatensis*.

Vegetation Description: This site is a dense shrubland co-dominated by *Amelanchier alnifolia* and *Paxistima (=Pachistima) myrsinites.* The ground cover is dense and dominated by *Calamagrostis rubescens* and *Carex geyeri* with *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Phlox diffusa*, *Erythronium grandiflorum* and *Arctostaphylos uva-ursi* present.

USFWS Wetland System: Not applicable.

Comments: This provisional association is similar to the *Amelanchier alnifolia* / (Mixed Grass, Forb) association (CEGL005885) in the Northern Rockies of Montana and may represent its North Pacific floristic variant.

Conservation Rank: S2S4Q

Rank Justification: This tentative association is likely to be more widespread in the eastern Cascades and Okanogan Highlands. Fire suppression and tree invasion may be a threat in portions of the range.

Synonyms:

Juniperus communis-(Phlox diffusa) Dwarf-shrubland

Common Juniper-(Spreading Phlox) Dwarf-shrubland



Acronym: JUNCOM-(PHLDIF)

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Juniperus communis* Dwarf-shrubland

Classification Confidence Level: 3

Range: This association is broadly described from the Olympic and Cascade Mountains.

Plots: 40, MORA (1), NOCA (0), OLYM (35), Other (4)

Environmental Description: This preliminary association occurs from low montane elevations up to the lower alpine zone. It occurs on all aspects and moist slopes. Soils are usually rocky or shallow and may have exposed mineral soil and bedrock.

Vegetation Description: *Juniperus communis* is the most abundant species in this dwarf-shrubland. *Phlox diffusa* is its most frequent companion, generally with low cover. *Achillea millefolium*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, and *Trisetum spicatum* are other common associates. Associated species vary with elevation from species found in lowland balds to characteristically alpine species.

USFWS Wetland System: Not applicable.

Comments: This preliminary association has also been observed in the southern Cascades of Washington.

Conservation Rank: S3S4

Rank Justification: This association occurs within a broad range of environments with few threats on protected land. Tree invasion is a threat at some sites.

Synonyms:
Juniperus communis Community Type; Diaz 2001
Juniperus communis-(*Phlox diffusa*); Chappell 2006a
Juniperus communis/*Douglasia laevigata* Community Type; Henderson et al. 1979

Paxistima myrsinites-Phlox diffusa Dwarf-Shrubland

Oregon boxwood/Spreading Phlox Dwarf-shrubland



Acronym: PAXMYR-PHLDIF

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Paxistima myrsinites* Dwarf Shrubland

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 10, MORA (0), NOCA (3), OLYM (7), Other (0)

Environmental Description: This shrubland association occurs between 1370-1740 m (4500-5700 ft) elevation on steep to moderately steep slopes. These are dry openings within a forest or woodland landscape. Sites may have evidence of past disturbance; either old blowdown or fire scars.

Vegetation Description: The open or patchy vegetation is co-dominated by short *Paxistima (=Pachistima) myrsinites* and *Phlox diffusa* at 10-30% cover each. *Silene parryi* occurs in most plots of this forb-rich association. *Penstemon procerus, Lomatium martindalei*, *Erysimum arenicola*, and *Sedum divergens* frequently occur with *Cryptogramma acrostichoides (=crispa)* or other rocky site species. *Festuca viridula* is often present and may be prominent in the North Cascades.

USFWS Wetland System: Not applicable.

Comments: The OLYM plots are within the variation of Schreiner's (1994) *Pachistima – Sedum* community.
Conservation Rank: S3S4

Rank Justification: This preliminary association is restricted to narrow range of habitats, represented on many protected areas and has few threats.

Synonyms:

Rubus parviflorus/Chamerion angustifolium Shrubland

Thimbleberry/Fireweed Shrubland



Acronym: RUBPAR/CHAANG

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Rubus parviflorus* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and, possibly, in the Olympic Mountains.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: This association occurs at middle to subalpine elevations on sites that tend to be southerly aspects on steep slopes, avalanche tracks and dry streambeds.

Vegetation Description: The open, deciduous shrub layer is dominated by *Rubus parviflorus*. The herbaceous layer has abundant cover and diversity. The most abundant herbs are *Chamerion (=Epilobium) angustifolium*, *Pteridium aquilinum*, *Valeriana sitchensis* (mostly subalpine), *Veratrum viride* (mostly subalpine), and *Viola glabella*.

USFWS Wetland System: Not applicable.

Comments: The full variation of this association has not been sampled.

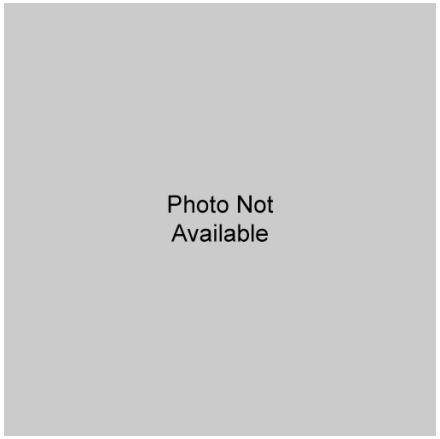
Conservation Rank: S3S4

Rank Justification: This association appears to be widespread and resilient to site disturbance.

Synonyms:
Rubus parviflorus/*Chamerion angustifolium* Shrubland; Chappell 2005
Rubus parviflorus/*Epilobium angustifolium* Community Type; Douglas 1972

Rubus parviflorus-Rubus spectabilis Shrubland

Thimbleberry-Salmonberry Shrubland



Acronym: RUBPAR-RUBSPE

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Rubus parviflorus* Shrubland

Classification Confidence Level: 3

Range: This association is sampled in the North Cascades and Mount Rainier National Park.

Plots: 2, MORA (1), NOCA (1), OLYM (0), Other (0)

Environmental Description: This type has been sampled on both a dry riparian terrace and a bald within a forest landscape.

Vegetation Description: *Rubus parviflorus* is the most abundant plant. It occurs with other shrubs, including *Rubus spectabilis*, *Symphoricarpos albus* and *Sorbus sitchensis*. The forbs *Angelica arguta*, *Maianthemum (=Smilacina) racemosum*, *Hydrophyllum fendleri*, and *Viola glabella* were found at both plots.

USFWS Wetland System: Not applicable.

Comments: This is a provisional *Rubus parviflorus* type.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to fully characterize or rank this provisional type although it appears to be widespread and resilient to site disturbance.

Synonyms:

Spiraea splendens Shrubland

Mountain Spiraea Shrubland



Acronym: SPISPL

NatureServe Code: Provisional

Macrogroup: 2. Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Spiraea splendens* Shrubland

Classification Confidence Level: 3

Range: This association was sampled in the Olympic and Cascade Mountains.

Plots: 5, MORA (0), NOCA (1), OLYM (4), Other (0)

Environmental Description: Sites vary between 1460 and 1770 m (4800 and 5800 ft) elevation and on steep slopes (55-70%). Sites are described as a rocky knoll, a bench, and a cirque wall.

Vegetation Description: *Spiraea splendens (=densiflora)* is the dominant shrub in this moderately dense to closed shrubland association. *Juniperus communis*, *Rubus spectabilis, Vaccinium membranaceum*, or *Vaccinium ovalifolium* can be prominent but always with much less cover than *Spiraea splendens*. Other frequently occurring species include *Carex spectabilis*, *Erigeron peregrinus*, *Polygonum bistortoides*, *Juncus parryi*, *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, and *Valeriana sitchensis*.

USFWS Wetland System: Not applicable.

Comments: This is a provisional association with a wide ecological range. *Spiraea splendens* is also associated with wetlands dominated by *Carex lenticularis.*

Conservation Rank: S3S4Q

Rank Justification: This provisional association occurs within a wide environmental range on sites that have few threats.

Synonyms:

Symphoricarpos albus-Malus fusca Shrubland

Common Snowberry-Western Crabapple Shrubland

Acronym: SYMALB-MALFUS

NatureServe Code: Provisional

Macrogroup: Vancouverian Flooded & Swamp Forest

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Symphoricarpos albus* Shrubland

Classification Confidence Level: 3



Range: This association is described from the Olympic Mountains.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs in avalanche chutes at mid-elevations on gentle to moderate slopes. It appears both within the track and at the debris apron at the base of chutes.

Vegetation Description: This dense shrubland is dominated by *Symphoricarpos albus*. Other common shrubs include *Malus (=Pyrus) fusca*, *Alnus viridis* ssp. *sinuata*, *Holodiscus discolor, Prunus emarginata* and *Amelanchier alnifolia*. *Pseudotsuga menziesii* and *Abies lasiocarpa* dominate the surrounding forests.

USFWS Wetland System: Not applicable.

Comments:

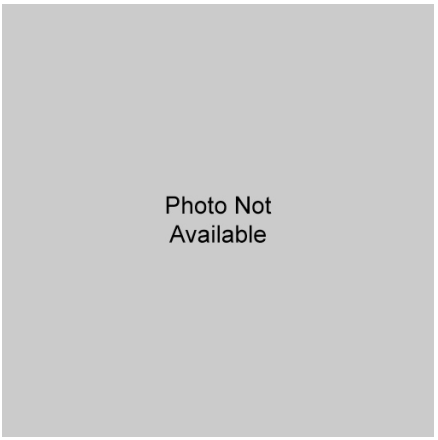
Conservation Rank: S2S4Q

Rank Justification: This tentative association occurs within a narrow environmental range on sites that have few threats.

Synonyms:

Symphoricarpos hesperius Dwarf-Shrubland

Trailing Snowberry Dwarf-shrubland



Acronym: SYMHES

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Symphoricarpos hesperius* Dwarf Shrubland

Classification Confidence Level: 3

Range: This association is described from the Olympic Mountains and may occur in the Cascades.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association was sampled at 1100 m (3600 ft) on a 22% slope near an avalanche track.

Vegetation Description: This dense shrubland is dominated by *Symphoricarpos hesperius (=mollis)*. Other shrubs include *Rosa nutkana* and *Alnus viridis* ssp. *sinuata*. *Hydrophyllum fendleri*, *Heracleum maximum (=lanatum)*, *Thalictrum occidentale* and *Carex hoodii* also occur with high percent cover. The tree species *Abies lasiocarpa* and *Cupressus (=Chamaecyparis) nootkatensis* also appear.

USFWS Wetland System: Not applicable.

Comments: This is a provisional type that needs more sampling.

Conservation Rank: S2S4Q

Rank Justification: Insufficient information exists to rank this tentative association.

Synonyms:

Vaccinium caespitosum/Festuca viridula Dwarf-shrubland

Dwarf Huckleberry-Green Fescue Dwarf-shrubland



Acronym: VACCAE/FESVIR

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium* (*caespitosum*, *membranaceum*, *scoparium*) Dwarf-shrubland

Classification Confidence Level: 3

Range: This association is described from the North Cascades and occurs elsewhere in the eastern Cascade Mountains.

Plots: 3, MORA (0), NOCA (3), OLYM (0), Other (0)

Environmental Description: This association occurs in the subalpine parkland at high elevations on gentle slopes that are well-drained. It can occur within tree islands. Fire plays a role in this association as evidenced by charred stumps and charcoal.

Vegetation Description: This dwarf-shrubland is dominated by *Vaccinium caespitosum.* The herb community is diverse and includes high cover of *Erigeron peregrinus*, *Festuca viridula, Arenaria capillaris*, *Antennaria lanata*, *Potentilla flabellifolia* and *Ligusticum grayi*. *Abies lasiocarpa*, *Picea engelmannii* and *Larix lyallii* seedlings are commonly encountered.

USFWS Wetland System: Not applicable.

Comments: Because this provisional association contains similar species to the *Vaccinium (caespitosum, scoparium)* Dwarf-shrubland (CEGL001140) in the Rocky Mountains it potentially could be generalized into that type.

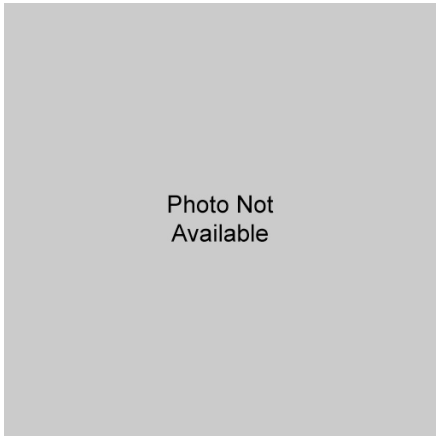
Conservation Rank: S2S3Q

Rank Justification: Little information exists for this provisional association to assess its conservation rank. The paucity of data and observations suggest that it is not common.

Synonyms:

Vaccinium caespitosum-Xerophyllum tenax Dwarf-shrubland

Dwarf Huckleberry-Beargrass Dwarf-shrubland



Acronym: VACCAE-XERTEN

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium* (*caespitosum*, *membranaceum*, *scoparium*) Dwarf-shrubland

Classification Confidence Level: 3

Range: This sample is described from the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This sample occurs on a gentle south aspect at 1490 m (4900 ft) elevation.

Vegetation Description: This dwarf-shrubland is dominated by *Vaccinium caespitosum* and the evergreen bunch-forb *Xerophyllum tenax*. Few other forbs are present. *Tsuga mertensiana* seedlings are present.

USFWS Wetland System: Not applicable.

Comments: This might be included in a generalized type consisting of *Xerophyllum tenax* herbland with shrubs. See comments in the *Vaccinium deliciosum* (CEGL001427) and *Vaccinium scoparium* (provisional) associations.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to assess this tentative association.

Synonyms:

Vaccinium deliciosum-Festuca viridula Dwarf-shrubland

Blueleaf Huckleberry-Green Fescue Dwarf-shrubland



Acronym: VACDEL-FESVIR

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium* (*caespitosum*, *membranaceum*, *scoparium*) Dwarf-shrubland

Classification Confidence Level: 3

Range: This association occurs in the Cascade Mountains.

Plots: 6, MORA (2), NOCA (1), OLYM (0), Other (3)

Environmental Description: This association occurs in subalpine grasslands and parklands that primarily have *Abies lasiocarpa* tree islands. Evidence of fire may be present. Sites can be rolling gentle slopes to exposed ridge tops.

Vegetation Description: The dwarf-shrub layer is dominated by *Vaccinium deliciosum* with a herbaceous layer dominated by *Festuca viridula*. When present, other shrubs, primarily *Phyllodoce empetriformis* and *Juniperus communis*, usually display less than 10% cover. Frequently occurring, sometimes prominent herbaceous species include *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, *Veratrum viride*, *Eucephalus (=Aster) ledophyllus*, *Valeriana sitchensis*, *Ligusticum grayi*, *Phlox diffusa*, *Arnica latifolia*, and *Luzula glabrata* var. *hitchcockii*. *Abies lasiocarpa* is usually present to prominent.

USFWS Wetland System: Not applicable.

Comments: This could be interpreted as a variant of either the *Vaccinium deliciosum* dwarf-shrub association, the *Festuca viridula* herbaceous association or an early developmental stage of an *Abies lasiocarpa* woodland association. Two plots with high percent cover of *Juniperus communis* are closely related to the preliminary *Juniperus communis-(Phlox diffusa)* association.

Conservation Rank: S2S3

Rank Justification: This preliminary association apparently occurs in the high Cascades in narrow environmental range between subalpine heather and drier subalpine grasslands. Climate change will likely affect this vegetation.

Synonyms:

Vaccinium scoparium Dwarf-shrubland

Red Huckleberry Dwarf-shrubland



Acronym: VACSCO

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium* (*caespitosum*, *membranaceum*, *scoparium*) Dwarf-shrubland

Classification Confidence Level: 3

Range: This association occurs in the Cascade Mountains and is likely in the Rocky Mountains.

Plots: 4, MORA (2), NOCA (0), OLYM (0), Other (2)

Environmental Description: This association occurs between 1735-2200 m (5700 and 7200 ft) elevations on generally steep, southwestern slopes that often have evidence of past burning.

Vegetation Description: This patchy, dwarf-shrub vegetation is dominated by *Vaccinium scoparium*. Other shrubs such as *Vaccinium deliciosum*, *Vaccinium membranaceum*, and *Paxistima (=Pachistima) myrsinites* are sometimes present but always in less abundance than *Vaccinium scoparium*. *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, *Arnica latifolia*, *Phlox diffusa* and *Festuca viridula* can be prominent to co-dominant. Scattered short trees are usually *Abies lasiocarpa*.

USFWS Wetland System: Not applicable.

Comments: Three additional plots, co-dominated by *Vaccinium scoparium* and *Festuca viridula,* are considered a variant of this generalized type. They appear in the table as VACSCO/FESVIR. One MORA plot is co-dominated by *Xerophyllum tenax* and with more extensive sampling may be recognized as a separate entity; see the provisional *Vacccinium caespitosum/Xerophyllum tenax* association. These could be generalized into the *Vaccinium (caespitosum, scoparium)* Dwarf-shrubland (CEGL001140) which is recognized in the Rocky Mountains.

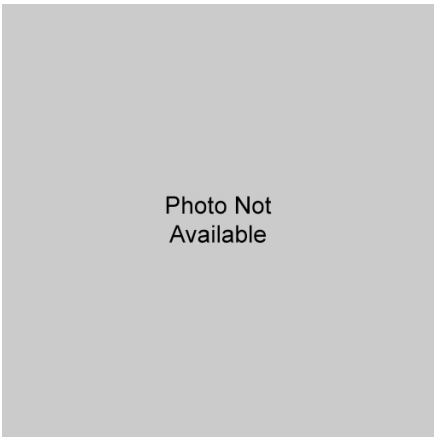
Conservation Rank: S2S4Q

Rank Justification: This provisional association occurs at Mount Rainier National Park although it likely occurs elsewhere in the east Cascades and northern Rockies.

Synonyms:

Vaccinium membranaceum/Phlox diffusa Dwarf-shrubland

Big Huckleberry/Spreading Phlox Dwarf-shrubland



Acronym: VACMEM/PHLDIF

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium membranaceum*/*Phlox diffusa* Dwarf-shrubland

Classification Confidence Level: 3

Range: This association occurs in the Olympic and possibly the Cascade Mountains.

Plots: 8, MORA (0), NOCA (0), OLYM (8), Other (0)

Environmental Description: This association is known to occur at 1520-1830 m (5000-6000 ft) elevation on moderately steep slopes with rocky substrates. The soil surface is often covered with litter and other organic material.

Vegetation Description: The shrubland is open or patchy and dominated by short-stature *Vaccinium membranaceum*. *Phlox diffusa* typically has similar cover to *Vaccinium membranaceum*. *Paxistima (=Pachistima) myrsinites* is occasionally abundant. *Silene parryi*, *Moehringia (=Arenaria) macrophylla*, *Poa cusickii*, *Lomatium martindalei*, *Sedum divergens* and other rocky site species can also occur.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3S4

Rank Justification: This preliminary association occurs in the Olympic Mountains in a specific habitat with few threats. It may occur in the Cascades.

Synonyms:

Vaccinium membranaceum Shrubland

Big Huckleberry Shrubland

Acronym: VACMEM

NatureServe Code: Preliminary

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium membranaceum* Shrubland

Classification Confidence Level: 3

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 25, MORA (8), NOCA (2), OLYM (15), Other (0)

Environmental Description: This association occurs at middle to high elevations typically on southerly to west aspects. Sites are topographically dry on gentle to steep slopes and often have evidence of past fires. Soils can be rocky with some exposed mineral soil.



Vegetation Description: This shrub association varies in both height and cover but is always is dominated by *Vaccinium membranaceum*. Other shrubs such as *Sorbus sitchensis*, *Vaccinium scoparium* and *Paxistima (=Pachistima) myrsinites* are less prominent. *Lupinus (arcticus* ssp. *subalpinus, latifolius)* is present to prominent along with a variety of other herbaceous species, such as *Arnica latifolia, Polygonum bistortoides*, or *Valerican sitchensis*. *Xerophyllum tenax* displays less than 10% cover or is absent. Several trees species can be present but *Abies lasiocarpa* is most frequent.

USFWS Wetland System: Not applicable.

Comments: Shrublands dominated by *Vaccinium membranaceum* were historically burned by native Americans to enhance berry production and retard tree invasion (Arnett and Crawford 2007).

Conservation Rank: S4

Rank Justification: This preliminary association is widespread in the mountains of western Washington. Fire suppression has allowed tree invasion into many occurrences.

Synonyms:
Vaccinium membranaceum Community Type; Henderson et al. 1979
Vaccinium/*Xerophyllum* Community Type; Henderson 1974

Vaccinium membranaceum/Calamagrostis rubescens Shrubland

Big Huckleberry/Pinegrass Shrubland



Acronym: VACMEM/CALRUB

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium membranaceum* Shrubland

Classification Confidence Level: 3

Range: This association occurs in the eastern Cascade Mountains and is likely to occur the Northern Rocky Mountains.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association occurs at middle to high elevations, typically on southerly to west aspects. Sites are topographically dry, gentle to steep slopes and often have evidence of past fires. Soils can be rocky with some exposed mineral soil. Evidence of browsing is common.

Vegetation Description: This variable height shrub association is dominated by *Vaccinium membranaceum*. Other shrubs, such as *Paxistima (=Pachistima) myrsinites*, *Spiraea betulifolia*, *Amelanchier alnifolia*, *Rosa gymnocarpa*, and *Sorbus sitchensis* are less prominent. *Calamagrostis rubescens* is present to co-dominant with a variety of other herbaceous species. *Carex geyeri* may be present.

USFWS Wetland System: Not applicable.

Comments: This association is tentatively recognized pending further sampling. This provisional association is represented by a single plot in the North Cascades. As conceptualized, this association includes all *Vaccinium membranaceum*-dominated shrublands in the east Cascades and northern Rocky Mountains without *Xerophyllum tenax*. Further sampling and comparison regionally is needed to verify this association or a variant of a regional shrubland. Fire suppression has allowed tree invasion into many occurrences.

Conservation Rank: S2S4Q

Rank Justification: Insufficient information exists to rank this provisional association.

Synonyms:

Vaccinium membranaceum/Xerophyllum tenax Shrubland

Big Huckleberry/Beargrass Shrubland



Acronym: VACMEM/XERTEN

NatureServe Code: CEGL005891

Macrogroup: Northern Rocky Mountain - Vancouverian Montane Shrubland

Group: Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland

Alliance: *Vaccinium membranaceum* Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade, Olympic and Northern Rocky Mountains.

Plots: 9, MORA (6), NOCA (0), OLYM (3), Other (0)

Environmental Description: This association occurs at 1300-1555 m (4300-5100ft) elevation on moderately steep slopes with southerly aspects. Evidence of past fire is present at many sites.

Vegetation Description: The vegetation is dense and dominated by the evergreen forb *Xerophyllum tenax* and the shrub *Vaccinium membranaceum*. Other shrubs, such as *Paxistima (=Pachistima) myrsinites* and *Sorbus sitchensis* may be present to prominent. *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, *Rubus lasiococcus*, and *Chamerion (= Epilobium) angustifolium* appear in most plots, generally with low cover. Scattered, short trees are common and typically include *Abies lasiocarpa*, *Cupressus (=Chamaecyparis) nootkatensis* or *Pseudotsuga menziesii*.

USFWS Wetland System: Not applicable.

Comments: This is also known from lower, montane elevations (e.g. *Abies amabilis* zone) in the southern Cascades.

Conservation Rank: S2S3

Rank Justification: This association occurs in the mountains of Washington. Fire suppression has allowed trees to invade into many occurrences.

Synonyms:
Vaccinium membranaceum/*Xerophyllum tenax* Community Type; Henderson et al. 1979

Arctostaphylos (nevadensis, uva-ursi)-Juniperus communis Dwarf-shrubland

Pinemat Manzanita or Kinnikinnick-Common Juniper Dwarf-shrubland



Acronym: ARC(NEV, UVA)-JUNCOM

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group North Pacific Herbaceous Bald and Bluff

Alliance: *Arctostaphylod uva-ursi* Dwarf-shrubland

Classification Confidence Level: 2

Range: This association has been recently described in the Washington Cascade and Olympic Mountains.

Plots: 2, MORA (1), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association occurs as patches in balds with very dry, shallow soils located at low to middle elevations.

Vegetation Description: This association is typically dominated by at least 25% cover of dwarf-shrubs. Either *Arctostaphylos nevadensis* or *A. uva-ursi* is co-dominant to dominant. *Juniperus communis* is usually prominent to co-dominant. Where *Juniperus* is absent, *Arctostaphylos nevadensis* is dominant. *Phlox diffusa* is usually present to occasionally co-dominant. *Calochortus subalpinus*, *Lomatium martindalei*, *Achillea millefolium*, *Eriophyllum lanatum*, *Xerophyllum tenax*, *Carex inops*, *Agrostis pallens (=diegoensis)*, and *Luzula (comosa, multiflora)* are usually present and are occasionally prominent.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs within a limited ecological range with few threats.

Synonyms:
Arctostaphylos (nevadensis, uva-ursi)-Juniperus communis; Chappell 2006a

Arctostaphylos (nevadensis, uva-ursi)-Paxistima myrsinites Dwarf-shrubland

Pinemat Manzanita or Kinnikinnick/Oregon boxwood Dwarf-shrubland



Acronym: ARC(NEV, UVA)/PAXMYR

NatureServe Code: Provisional

Macrogroup: Northern Rocky Mountain Lowland Grassland & Shrubland

Group: Northern Rocky Mountain Montane-Foothill Deciduous Shrubland

Alliance: *Arctostaphylos uva-ursi Dwarf-shrubland* Alliance

Classification Confidence Level: 3

Range: This association occurs in the North Cascades.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: This middle elevation association appears in rocky balds within a matrix woodland or open forest dominated by *Pinus ponderosa* and *Pseudotsuga menziesii*. Exposed bedrock is common in the balds.

Vegetation Description: This association is co-dominated by *Arctostaphylos uva-ursi* or *A. nevadensis,* and *Paxistima (=Pachistima) myrsinites.* The herbaceous component generally consists of *Arenaria capillaris*, *Pseudoroegneria (=Agropyron) spicatum, Calamagrostis rubescens* and/or *Balsamorhiza sagittata*.

USFWS Wetland System: Not applicable.

Comments: The two plots representing this provisional association may represent two different communities more common in the east Cascades and Rocky Mountains. Further samping and comparison is needed to clarify these relationships. The *Arctostaphylos uva-ursi* / *Pseudoroegneria spicatum* association (CEGL005831) is similar in dominance but varies in associated species and occurs at higher elevations.

Conservation Rank: S3Q

Rank Justification: This provisional association may have limited range and could be negatively impacted by exotic species (*Bromus tectorum*).

Synonyms:

Arctostaphylos uva-ursi-Fragaria virginiana-(Festuca roemeri) Dwarf-shrubland

Kinnikinnick-Virginia Strawberry-(Roemer's fescue) Dwarf-shrubland



Acronym: ARCUVA-FRAVIR-(FESROE)

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Herbaceous Bald and Bluff

Alliance: *Arctostaphylod uva-ursi* Dwarf-shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountain foothills and the Puget Lowland.

Plots: 1, MORA (0), NOCA (1), OLYM (0), Other (0)

Environmental Description: This association appears as patches within shallow-soiled, very dry balds located in forests at lower to middle elevations. It occurs mostly on moderately steep slopes (up to 75% slope) or on gentle benches. Topographic position is mostly upper slopes, but can be found ridgetops and mid-slopes.

Vegetation Description: This association is typically dominated by dwarf-shrubs, which always occupy at least 25% cover. *Arctostaphylos uva-ursi* is the dominant dwarf-shrub. *Juniperus communis* and *Arctostaphylos nevadensis* are absent. *Festuca roemeri (=idahoensis)* is usually present (Olympic Mountains and Puget Lowlands only) and sometimes co-dominant. *Fragaria virginiana* is usually present and prominent. *Eriophyllum lanatum*, *Luzula (comosa, multiflora)*, and *Zigadenus venenosus* are often present.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

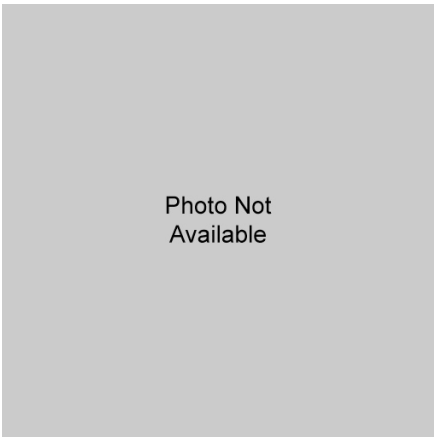
Rank Justification: This association seems to be common within the limited habitat of balds and rock outcrops in the Olympics and northern Cascades. There may be some long-term threat from tree invasion and non-native species.

Synonyms:

Arctostaphylos uva-ursi-Fragaria virginiana-(*Festuca roemeri*); Chappell 2006a

Bromus vulgaris-Festuca subulata Herbaceous Vegetation

Columbia brome-Bearded Fescue Herbaceous Vegetation



Acronym: BROVUL-FESSUB

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Herbaceous Bald and Bluff

Alliance: *Bromus vulgaris* Herbaceous Vegetation

Classification Confidence Level: 3

Range: This type is based on a single plot from the Olympic Mountains but it may occur in the Cascades.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: The plot is located on a debris slide at 990 m (3250 ft) elevation with a southwest aspect. Litter covers the unvegetated ground surface.

Vegetation Description: This early successional herbaceous community is dominated by *Bromus vulgaris* and *Festuca subulata*. *Fragaria vesca*, *Osmorhiza purpurea*, *Trifolium latifolium* and *Polystichum munitum* are other associates. Scattered shrubs with low percent cover include *Acer circinatum*, *Holodiscus discolor*, and *Rubus leucodermis*. Snags and scattered *Thuja plicata* and *Tsuga heterophylla* are prominent and indicate a trend in stand development. Moss dominates the ground cover.

USFWS Wetland System: Not applicable.

Comments: This may be early-seral vegetation that is not stable enough to represent an association.

Conservation Rank: S2S5Q

Rank Justification: The provisional association may occur within a limited geographic range and environment. The known site is in a protected area.

Synonyms:

Festuca roemeri-Cerastium arvense-Koeleria macrantha Herbaceous Vegetation

Roemer's Fescue-Field Chickweed-Prairie Junegrass Herbaceous Vegetation

Acronym: FESROE-CERARV-KOEMAC

NatureServe Code: CEGL003349

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Herbaceous Bald and Bluff

Alliance: *Festuca roemeri - Agrostis pallens - Koeleria macrantha* Herbaceous Vegetation

Classification Confidence Level: 1

Range: This association occurs in the Puget Lowlands, in the western Columbia River Gorge, and on the north-central to northeastern Olympic Peninsula.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs in herbaceous balds surrounded by *Pseudotsuga menziesii – Tsuga heterophylla* forests. Sites have shallow soils and are on sunny aspects and very dry sites.



Vegetation Description: This grassland is dominated or co-dominated by *Festuca roemeri*. *Mahonia aquifolium* occurs in about half the Puget Lowland plots with a maximum of 20% cover. *Arctostaphylos uva-ursi* is occasionally prominent. Frequent, native herbaceous species include *Koeleria macrantha (=cristata)*, *Luzula (comosa, multiflora*), *Achillea millefolium*, *Eriophyllum lanatum*, *Cerastium arvense*, *Zigadenus venenosus*, *Fritillaria lanceolata, Lotus micranthus*, and *Lomatium utriculatum*. *Selaginella wallacei* (habit similar to a moss) is usually present on small rock outcrops within the association. The native grasses *Danthonia californica*, *Bromus sitchensis*, and *Agrostis pallens* (=*diegoensis*) occasionally are prominent to even co-dominant.

USFWS Wetland System: Not applicable.

Comments: High elevation subalpine sites with similar vegetation but with *Oxytropis monticola* and *Phlox diffusa* are not included here, instead they are included in the *Festuca roemeri - Phlox diffusa* Herbaceous (CEGL001622).

Conservation Rank: S1

Rank Justification: There are few occurrences in Washington and many of them are threatened by invasion and increase of non-native species. Other threats include development, road-building, fire suppression effects, and recreational impacts.

Synonyms:
Festuca idahoensis var. roemeri-Aspidotis densa Herbaceous Vegetation; WANHP files
Festuca idahoensis var. roemeri-Camassia quamash-Cerastium arvense Herbaceous Vegetation; WANHP files
Festuca roemeri-(*Cerastium arvense-Koeleria macrantha*); Chappell 2006b; Chappell 2006a
Festuca roemeri-Cerastium arvense-Koeleria macrantha Herbaceous Vegetation; WANHP files

Festuca roemeri-Plectritis congesta Herbaceous Vegetation

Roemer's Fescue-Rosy Plectritis



Acronym: FESROE-PLECON

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Herbaceous Bald and Bluff

Alliance: *Festuca roemeri - Agrostis pallens - Koeleria macrantha* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Puget Lowlands and in the Elwha drainage of Olympic Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This low elevation herbaceous bald association occurs in microsite features that are moist in the spring but very dry later in the summer. They consist of the partially shaded portions or edges of balds or seasonally moist (but not the wettest) microsites within more extensive balds. These balds are found primarily on mid- to upper slopes, with southern to western aspects. Soils are shallow over sedimentary or volcanic bedrock. Rock outcrops (often covered with mosses) are typically present within or directly adjacent to the association. Soils are mostly loam in texture, but can be gravelly or sandy.

Vegetation Description: This association is dominated or co-dominated by the *Festuca roemeri*. *Plectritis congesta* is always prominent to co-dominant. *Collinsia grandiflora* is prominent to co-dominant in about half the plots, and *Prunella vulgaris* occurs in one-third of them. Mosses and lichens typically cover the space between grasses and forbs. Many other species occur.

USFWS Wetland System: Not applicable.

Comments: This type was sampled on OLYM in the Elwha drainage during the Chappell (2006) Balds project. The summary of this association's data on and off OLYM appears in the synthesis table.

Conservation Rank: S1

Rank Justification: This association occurs at very few sites and most sites are threatened by the invasion of and/or increase in non-native species. Other threats include tree invasion, development, and recreational impacts.

Synonyms:

Festuca roemeri-Plectritis congesta; Chappell 2006a; Chappell 2006b

Koeleria macrantha-(Agrostis pallens) Herbaceous Vegetation

June Grass-(Seashore Bentgrass) Herbaceous Vegetation



Acronym: KOLMAC-(AGRPAL)

NatureServe Code: Preliminary

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Herbaceous Bald and Bluff

Alliance: *Festuca roemeri - Agrostis pallens - Koeleria macrantha* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association is described from the southern Cascades of Washington and also occurs in the North Cascades.

Plots: 2, MORA (0), NOCA (2), OLYM (0), Other (0)

Environmental Description: This mid to low montane grassland association appears on slightly dry to moderately dry portions of balds within forest landscapes. These balds occur on moderate to very steep slopes, mostly facing east to west (rarely other aspects). Almost all sites are on upper slopes, with an occasional mid-slope or ridgetop site as well.

Vegetation Description: This relatively open vegetation is dominated by *Koeleria macrantha (=cristata). Vulpia (Festuca) myuros*, *Selaginella wallacei*, *Achillea millefolium*, *Eriophyllum lanatum*, *Cryptogramma acrostichoides (=crispa)* and *Zigadenus venenosus* occur in both plots. The moss, *Racomitrium canescens*, is dominant at the North Cascade locations. As described in the southern Cascades of Washington, *Agrostis pallens (=diegoensis)* can be co-dominant with the following species that are co-dominant to prominent: *Festuca rubra* (non-native), *Microseris laciniata, Zigadenus venenosus, Gilia capitata, Elymus glaucus, Bromus carinatus, Mahonia aquifolium, Allium cernuum, Lomatium dissectum,* and *Lomatium nudicaule*.

USFWS Wetland System: Not applicable.

Comments: This expands the concept of *Koeleria macrantha*-(*Agrostis pallens*) association Chappell (2006) to include sites farther north in the Cascades.

Conservation Rank: S1S2

Rank Justification: There are few occurrences in Washington. This association is threatened by invasion and increase of non-native species. Other possible threats include tree invasion due to fire suppression and recreational impacts.

Synonyms:

Koeleria macrantha-(*Agrostis pallens*); Chappell 2006a

Lomatium martindalei Lithomorphic Vegetation

Cascade Desert-parsley Lithomorphic Vegetation



Acronym: LOMMAR Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Cliff, Scree & Other Rock Vegetation

Group: North Pacific Montane Massive Bedrock, Cliff and Talus

Alliance: *Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is described from the Cascades and likely occurs in the Olympic Mountains.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs within herbaceous balds within forest landscapes at lower to middle elevations. The type occurs on dry microsites with very shallow soils.

Vegetation Description: This sparse to open vegetation is dominated or co-dominated by *Lomatium martindalei*. *Agrostis pallens (=diegoensis), Selaginella wallacei* (moss like), and *Phlox diffusa* usually are present to prominent. If present, *Phlox diffusa* is never co-dominant. *Eriophyllum lanatum*, *Polygonum douglasii*, and *Saxifraga ferruginea* are usually present.

USFWS Wetland System: Not applicable.

Comments: Co-dominance of *Phlox diffusa* indicates a different association.

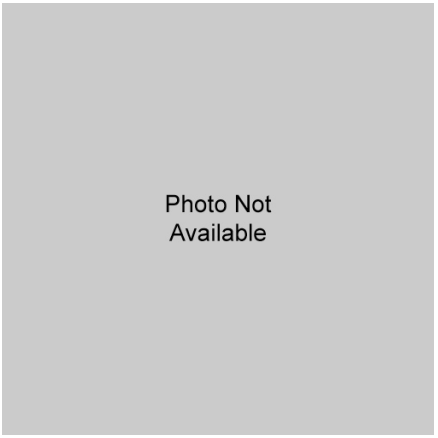
Conservation Rank: S2S3

Rank Justification: This preliminary association occurs within a narrow environmental range with few threats.

Synonyms:
Lomatium martindalei; Chappell 2006a

Blechnum spicant Herbaceous Vegetation

Deer Fern Herbaceous Vegetation



Acronym: BLESPI

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Hypermaritime Shrub and Herbaceous Headland

Alliance: *Blechnum spicant* Herbaceous Vegetation

Classification Confidence Level: 3

Range: This provisional type is based on a single plot from the Olympic Peninsula and is possible elsewhere in lowland western Washington.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: No environmental data exists to further define this plot.

Vegetation Description: This association is dominated by *Blechnum spicant* with no other species more abundant than present. Associated species are suggestive of a very wet climate (western Olympic Mountains).

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S5Q

Rank Justification: Insufficient information is available to provide a specific rank for this provisional association.

Synonyms:

Calamagrostis nutkaensis-Vicia nigra ssp. gigantea-(Equisetum telmateia) Herbaceous Vegetation

Pacific Reedgrass-Giant Vetch-(Giant Horsetail) Herbaceous Vegetation



Acronym: CALNUT-VICNIG-(EQUTEL)

NatureServe Code: CEGL001564

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Hypermaritime Shrub and Herbaceous Headland

Alliance: *Calamagrostis nutkaensis-Elymus glaucus* Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs on the Olympic Peninsula.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs on coastal bluffs and is always adjacent to saltwater. Slopes are moderate to very steep, and subject to erosion.

Vegetation Description: The vegetation is dominated by *Calamagrostis nutkaensis*. In Washington, *Vicia nigra* ssp. *gigantea* is present in all plots sampled and can be co-dominant. *Equisetum telmateia* can be abundant, and *Carex obnupta* is sometimes present where seeps are present in the bald. Other frequent species include *Gaultheria shallon*, *Anaphalis margaritacea*, *Fragaria chiloensis*, *Epilobium ciliatum*, *Polystichum munitum*, *Rubus spectabilis*, and *Solidago canadensis*.

USFWS Wetland System: Not applicable.

Comments: The global name (*Calamagrostis nutkaensis-Elymus glaucus* CEGL001564*)* comes from Oregon: in Washington, *Elymus glaucus* does not occur in this type. In addition, the Oregon vegetation has much less *Vicia nigra* ssp. *gigantea* and does not have wet-site indicators like *Equisetum telmateia.* This is not represented in the current plot data for national parks in Washington although WNHP has records of occurrences on the coastal strip of OLYM.

Conservation Rank: S1

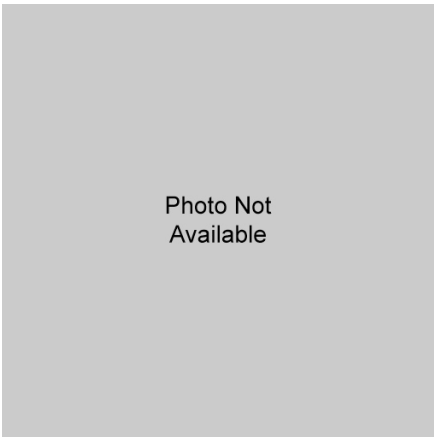
Rank Justification: This association is localized in distribution and environment, and has few occurrences. This association occurs on unstable substrates and is therefore susceptible to both natural and human-caused disturbances.

Synonyms:

Calamagrostis nutkaensis-Vicia nigra ssp. *gigantea*-(*Equisetum telmateia*); Chappell 2006a

Gaultheria shallon Shrubland

Salal Shrubland



Acronym: GAUSHA

NatureServe Code: Provisional

Macrogroup: Vancouverian Lowland Grassland & Shrubland

Group: North Pacific Hypermaritime Shrub and Herbaceous Headland

Alliance: *Gaultheria shallon* Shrubland

Classification Confidence Level: 3

Range: This association occurs on the Olympic Peninsula coastline, and potentially in the Olympic and the Cascade Mountains.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association is likely to occur at middle to lower elevations.

Vegetation Description: The dense vegetation is dominated by *Gaultheria shallon*. *Mahonia (=Berberis) nervosa*, *Chimaphila umbellata* and *Linnaea borealis* are likely associated species.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data for national parks in Washington. One of the authors (Chappell) has observed, but not sampled, *Gaultheria shallon*-dominated vegetation (often with *Vaccinium ovatum*) on coastal headlands and bluffs of Olympic National Park.

Conservation Rank: S2S4Q

Rank Justification: There is insufficient information to rank this provisional association.

Synonyms:

Arctostaphylos columbiana Shrubland

Hairy Manzanita Shrubland

Acronym: ARCCOL

NatureServe Code: Preliminary

Macrogroup: Cool Semi-Desert Chaparral

Group: Western Cordillerian Montane Sclerophyll Scrub

Alliance: *Arctostaphylos columbiana* Dwarf-shrubland

Classification Confidence Level: 2



Range: This association occurs on the northern and eastern side of the Olympic Mountains, in the Puget Lowland, and in the southern Cascades of Washington. It may also occur further north in the Cascades.

Plots: 4, MORA (0), NOCA (0), OLYM (4), Other (0)

Environmental Description: This association occurs at low to middle elevations on the slightly to moderately dry portions of open balds within a forest matrix. Slopes are moderate to steep, with south-southeast to west-southwest aspects. Topographic position is usually upper slope, although mid-slopes and ridgetops are also represented.

Vegetation Description: This association is typically dominated by at least 25% cover of shrubs that are taller than 0.5 m. *Arctostaphylos columbiana* is always the dominant shrub. The dwarf-shrub *Symphoricarpos hesperius (=mollis)* is usually prominent, and *Elymus glaucus* is usually present to prominent. *Carex inops* is occasionally prominent. *Arctostaphylos uva-ursi* or *Arctostaphylos nevadensis* (the latter only in the southern Cascades) are sometimes prominent. Small *Pseudotsuga menziesii* or *Juniperus scopulorum* are usually present (the latter only in the Olympics). Frequently occurring shrubs and dwarf-shrubs include *Amelanchier alnifolia*, *Mahonia aquifolium*, *Holodiscus discolor*, *Lonicera ciliosa*, *Paxistima (=Pachistima) myrsinites*, and *Rosa gymnocarpa*. *Festuca occidentalis*, *Castilleja hispida*, *Collomia heterophylla*, *Epilobium minutum*, *Fragaria virginiana*, *Achillea millefolium*, and *Eriophyllum lanatum* are the herbaceous species usually present.

USFWS Wetland System: Not applicable.

Comments: Recent taxonomic work has recognized *Juniperus scopulorum* west of the Cascades as J. *maritimum.*

Conservation Rank: S3

Rank Justification: This association occurs within a restricted ecological range and is threatened by tree encroachment.

Synonyms:
Arctostaphylos columbiana; Chappell 2006a

Ceanothus velutinus Shrubland

Snowbrush Shrubland



Acronym: CEAVEL

NatureServe Code: Provisional

Macrogroup: Cool Semi-Desert Chaparral

Group: Western Cordillerian Montane Sclerophyll Scrub

Alliance: Ceanothus velutinus Shrubland

Classification Confidence Level: 3

Range: This association occurs in the east and North Cascades.

Plots: 10, MORA (0), NOCA (10), OLYM (0), Other (0)

Environmental Description: This association occurs between 760-1310 m (2500 and 4300 ft) elevation on southerly aspects with 20-60% slopes. Sites are on drier topographic positions. The substrate is often comprised of rocky soils and associated with rock outcrops. Most sites have evidence of recent fire.

Vegetation Description: The vegetation is dominated by *Ceanothus velutinus* with several other tall shrubs: *Acer glabrum*, *Amelanchier alnifolia*, *Prunus emarginata*, *Salix scouleriana* and/or *Sorbus scopulina*. Shorter shrubs such as *Paxistima (=Pachistima) myrsinites*, *Spiraea betulifolia*, *Symphoricarpos albus* and/or *Rubus parviflorus* frequently occur. *Calamagrostis rubescens* is the most common herbaceous species along with *Chamerion (= Epilobium) angustifolium* and/or *Maianthemum (=Smilacina) racemosum*. The presence of *Pseudotsuga menziesii* or *Abies lasiocarpa* is likely.

USFWS Wetland System: Not applicable.

Comments: Additional plots may help describe geographic and environmental range variation of this preliminary type. The *Ceanothus velutinus - Prunus emarginata - Artemisia tridentata* association (CEGL003144) could serve as a placeholder for a regional type although it appears to be climatically drier.

Conservation Rank: S3S5Q

Rank Justification: This provisional association occurs within a wide geographic range with relatively narrow environmental conditions. Known sites are in protected areas.

Synonyms:

Ledum groenlanicum-Kalmia microphylla/Sphagnum spp. Shrubland

Bog-laurel/Sphagnum Shrubland

Acronym: LEDGRO-KALMIC/SPHAGN

NatureServe Code: CEGL003414

Macrogroup: North Pacific Bog & Fen

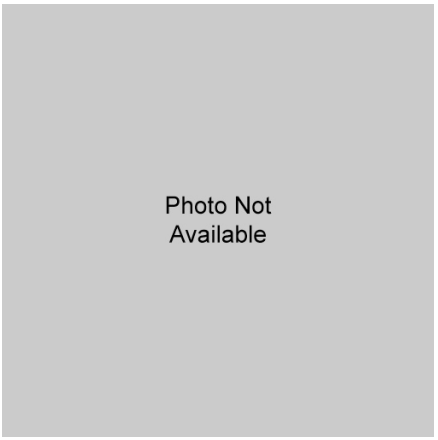
Group: North Pacific Lowland Bog & Poor Fen

Alliance: *Ledum groenlandicum-Kalmia microphylla* Shrubland

Classification Confidence Level: 1

Range: This association occurs on the Olympic Peninsula and the northern Puget Lowland.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)



Environmental Description: This association occurs at low elevations in depressions, on slopes, surrounding lakes or ponds, or associated with flat floodplains. Water tables are often at or near the surface for much of the growing season, and organic decomposition is slow. The substrate is moderately quaking to firm peat mats. Well-developed hummocks are common.

Vegetation Description: *Ledum groenlandicum* and/or *Kalmia microphylla* form a dense, short shrub layer. Other dwarf-shrubs frequently present are *Vaccinium oxycoccus* and *Gaultheria shallon*. A variety of herbaceous species may occur, the most frequent are usually *Drosera rotundifolia* and *Potentilla palustris*. *Sphagnum* spp. are the dominant feature in the spaces among vascular plants.

USFWS Wetland System: Palustrine.

Comments:

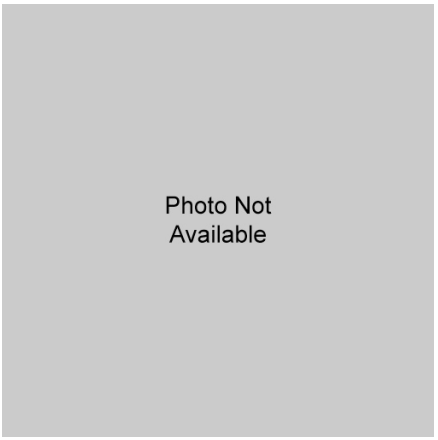
Conservation Rank: S3

Rank Justification: This bog/poor fen association occurs within a narrow ecological range with sites occurring on protected lands. Sites off protected areas are often threatened by hydrologic changes created by various land uses.

Synonyms:
Kalmia occidentalis-Ledum groenlandicum-Vaccinium oxycoccus/Sphagnum spp. variant; Kunze 1994
Kalmia occidentalis-Ledum groenlandicum/Carex rostrata variant; Kunze 1994
Ledum groenlandicum/Carex rostrata variant; Kunze 1994
Ledum groenlandicum/Sphagnum spp. variant; Kunze 1994
Ledum groenlandicum-Gaultheria shallon/Sphagnum spp. variant; Kunze 1994
Kalmia occidentalis/Sphagnum spp. variant; Kunze 1994
Kalmia occidentalis-Ledum groenlandicum-Gaultheria shallon/Pteridium aquilinum/Sphagnum spp. variant; Kunze 1994
Ledum groenlandicum-Kalmia microphylla/Sphagnum spp. Shrubland; Chappell 2005

Pinus contorta var. contorta/Ledum groenlandicum/Sphagnum spp. Woodland

Shore Pine/Bog Labrador-tea/*Sphagnum* spp. Woodland



Acronym: PINCON/LEDGRO/SPHAGN

NatureServe Code: CEGL003337

Macrogroup: North Pacific Bog & Fen

Group: North Pacific Lowland Bog & Poor Fen

Alliance: *Pinus contorta var. contorta*-Sphagnum spp. Woodland

Classification Confidence Level: 2

Range: This association occurs at low elevations in western Washington and may occur in the national parks, most likely being Olympic National Park.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: Sites are bogs or poor fens with saturated peat soils and acidic, nutrient-poor conditions. Topography is typically flat basins or depressions.

Vegetation Description: The open woodland tree canopy is dominated by *Pinus contorta* var. *contorta*. *Tsuga heterophylla* or *Thuja plicata* may also occur in smaller amounts. The well-developed shrub layer is dominated by *Ledum groenlandicum*, or co-dominated by that species and *Gaultheria shallon* or *Kalmia microphylla (=occidentalis*). The herb layer can be sparse to moderately dense and often has abundant *Pteridium aquilinum*. A well-developed moss layer is often dominated by *Sphagnum* spp. that is always at least present.

USFWS Wetland System: Palustrine.

Comments: This association is not represented in the current dataset of vegetation plots for national parks in Washington. The distinction between *Pinus contorta* varieties *contorta* and *latifolia* is rarely determined in field data. We assume that all *Pinus contorta* at low elevation (under 1970ft, 600 m) west of the Cascades is variety *contorta*.

Conservation Rank: S2

Rank Justification: This association is represented by few occurrences and only occurs within a limited geographic range.

Synonyms:

Pinus contorta var. *contorta*/*Ledum groenlandicum*/*Sphagnum* spp. Woodland; Chappell 2005

Pinus contorta/*Ledum groenlandicum*/*Sphagnum* spp. community type; Kunze 1994, p19,75

Thuja plicata-Tsuga heterophylla/Lysichiton americanus/Sphagnum spp. Woodland

Western Redcedar-Western Hemlock/Skunkcabbage/*Sphagnum* Spp.



Acronym: THUPLI-TSUHET/LYSAME/SPHAGN

NatureServe Code: CEGL001787

Macrogroup: North Pacific Bog & Fen

Group: North Pacific Lowland Bog & Poor Fen

Alliance: *Tsuga heterophylla*-(*Thuja plicata*)-*Sphagnum* spp. Woodland

Classification Confidence Level: 3

Range: This association occurs on the western coastal plain of the Olympic Peninsula.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This wooded wetland occurs in poor fens or bogs. Topographic setting can be basins or gentle slopes. Soils are generally saturated and composed of a mixture of fibrous *Sphagnum*, heath, and woody peat.

Vegetation Description: The open, relatively stunted tree canopy is dominated by *Thuja plicata* and *Tsuga heterophylla*. *Picea sitchensis* is also frequent. The shrub layer, rooted on woody debris, is dominated by *Gaultheria shallon*, with frequent *Menziesia ferruginea*, *Frangula (Rhamnus) purshiana*, and *Vaccinium alaskaense*. The well-developed herb layer is characterized by abundant *Lysichiton americanus* and *Blechnum spicant*. *Carex* spp. are often present to sometimes co-dominant. *Sphagnum* spp. usually dominate the moss layer and cover at least 15 % of the ground.

USFWS Wetland System: Palustrine.

Comments: This association is distinguished from *Tsuga heterophylla-Thuja plicata*/*Gaultheria shallon*/*Lysichiton americanus* Forest (CEGL003226), by the open, stunted tree canopy, abundance of *Sphagnum* spp., usually much more diverse herbaceous layer, and fibric peat soils. This association is not represented in the current dataset of vegetation plots for national parks in Washington. There is one known example of a coastal (Olympic NP) occurrence of *Thuja plicata-Tsuga heterophylla/Gaultheria shallon/Lysichiton americanus* forest association recorded by the Washington Natural Heritage Program.

Conservation Rank: S1S2

Rank Justification: This association occurs only in bogs or poor fens. It is sensitive to changes in hydrology or water quality and to logging disturbance.

Synonyms:
Thuja plicata-Tsuga heterophylla/*Gaultheria shallon*/*Lysichitum americanum*/*Sphagnum* spp. community type; Kunze 1994
Thuja plicata-Tsuga heterophylla/*Lysichiton americanus*/*Sphagnum* spp. Woodland; Chappell 2005

Tsuga heterophylla-(Thuja plicata)/Ledum groenlandicum/Sphagnum spp. Woodland

Western Hemlock-(Western Redcedar)/Bog Labrador-tea/Sphagnum spp. Woodland



Acronym: TSUHET-(THUPLI)/LEDGRO/SPHAGN

NatureServe Code: CEGL003339

Macrogroup: North Pacific Bog & Fen

Group: North Pacific Lowland Bog & Poor Fen

Alliance: *Tsuga heterophylla*-(*Thuja plicata*)-*Sphagnum* spp. Woodland

Classification Confidence Level: 1

Range: This association occurs in western Washington.

Plots: 5, MORA (0), NOCA (0), OLYM (5), Other (0)

Environmental Description: This association occurs at low elevations in bogs or poor fens with saturated peat soils and acidic nutrient poor conditions. Topography is typically flat basins or depressions.

Vegetation Description: The open woodland tree canopy is usually stunted and can be relatively short (under 5 m) or taller. The canopy is dominated by *Tsuga heterophylla* or *Thuja plicata*, with the former always at least present. The well-developed shrub layer is dominated by *Ledum groenlandicum*, or co-dominated by that species and *Gaultheria shallon or Kalmia microphylla (=occidentalis)*. The herb layer can be sparse to moderately dense and often has abundant *Pteridium aquilinum* or *Blechnum spicant*. *Sphagnum* spp. are always at least present and typically dominate a well-developed moss layer.

USFWS Wetland System: Palustrine.

Comments: *Carex obnupta* is abundant in the national parks sample.

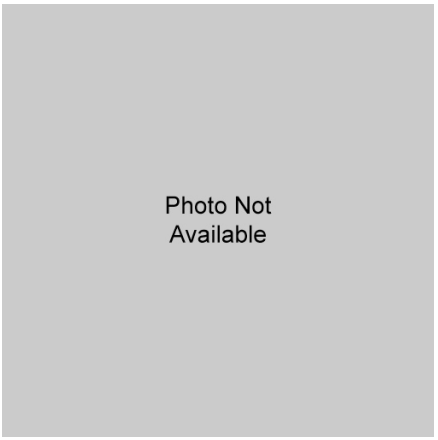
Conservation Rank: S2S3

Rank Justification: This association occurs only in bogs or poor fens. It is sensitive to changes in hydrology or water quality and to logging disturbance.

Synonyms:
Tsuga heterophylla-(*Thuja plicata*)/*Ledum groenlandicum*/Sphagnum spp. Woodland; Chappell 2005
Tsuga heterophylla/*Ledum groenlandicum*/Sphagnum spp. community type; Kunze 1994, p20,78

Kalmia microphylla-Carex nigricans Dwarf-shrubland

Bog-laurel/Black Alpine Sedge Dwarf-shrubland



Acronym: KALMIC-CARNIG

NatureServe Code: CEGL001402

Macrogroup: North Pacific Bog & Fen

Group: North Pacific Montane Rich Fen

Alliance: *Kalmia microphylla* Dwarf-shrubland

Classification Confidence Level: 1

Range: This association occurs at Mount Rainier and elsewhere in the Cascades.

Plots: 11, MORA (10), NOCA (0), OLYM (0), Other (1)

Environmental Description: This association occurs in the subalpine parkland in moist subalpine and alpine meadows, snowbeds, lake margins, and other low-gradient depressions. Sites are flat or gently sloping, have poorly drained soils, and are often adjacent to streams or lakes. These habitats are cold with late melting snowfields. Water tables are often at or near the surface for much of the growing season, organic decomposition is slow and soils are organic.

Vegetation Description: *Kalmia microphylla* appears consistently as the dominant dwarf-shrub but usually has less than 25% total cover. Other dwarf-shrubs frequently present to co-dominant are *Vaccinium deliciosum* and *Phyllodoce empetriformis*. A variety of herbaceous species may occur, the most abundant of which are usually *Oreostemma (Aster) alpigenum*, *Carex nigricans* and *Carex spectabilis*. Other important herbs include *Caltha leptosepala (=biflora, leptosepala)*, *Erigeron peregrinus,* and *Potentilla flabellifolia*.

USFWS Wetland System: Palustrine.

Comments: Dwarf-shrub cover is always present but typically less than 25% in this herbaceous-dominated community.

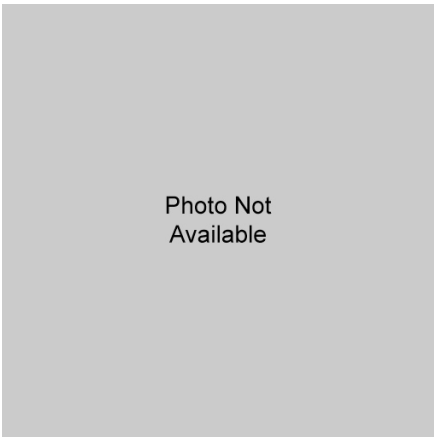
Conservation Rank: S3

Rank Justification: This association occurs within a narrow range of environments with few threats on protected land. Climate change will likely affect this vegetation.

Synonyms:
Carex/Kalmia Community Type; Henderson 1974
Kalmia microphylla/*Carex nigricans*; Wooten and Morrison 1995
Kalmia microphylla-Carex nigricans Herbaceous Vegetation-name change; Chappell 2005
Kalmia polifolia/*Aster alpigenus* Association; Hamann 1972

Tsuga mertensiana-Abies amabilis/Caltha leptosepala Woodland

Mountain Hemlock-Pacific Silver Fir/Two-flowered Marsh Marigold Woodland



Acronym: TSUMER-ABIAMA/CALLEP

NatureServe Code: CEGL000501

Macrogroup: North Pacific Bog & Fen

Group: North Pacific Montane Rich Fen

Alliance: *Tsuga mertensiana* Treed Fen

Classification Confidence Level: 2

Range: This association occurs in the North Cascades and possibly wetter parts of the Olympics.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This wooded wetland association occurs near the upper limits of continuous forest between the elevations of 760-1530 m (2500 to 5000 ft). It appears on very moist to wet, poorly-drained, concave sites. It is typically associated with springs or seeps and usually occurs as linear stringers. Soils are saturated year-round.

Vegetation Description: *Tsuga mertensiana* and *Abies amabilis* co-dominate the rather short tree canopy. *Cupressus (=Chamaecyparis) nootkatensis* is also sometimes prominent. The patchy shrub layer is usually dominated by *Vaccinium alaskaense*, and often co-dominated by *Vaccinium membranaceum* and/or *Menziesia ferruginea*. The shrubs are typically clumped near the bases of trees. A relatively lush, forb-dominated herb layer always has a least 10% cover of *Caltha leptosepala* (=*biflora, leptosepala).* Several other herbaceous species can be prominent, especially *Rubus pedatus*, *Streptopus lanceolatus (=roseus) var. curvipes* , *Athyrium filix-femina*, *Veratrum viride*, *Lysichiton americanus*, and *Valeriana sitchensis*. *Sphagnum* spp. are documented as abundant in British Columbia and probably also occur in Washington.

USFWS Wetland System: Palustrine.

Comments: The association name differs from NatureServe which uses *Caltha leptosepala* ssp. *howellii* . This association is not represented in the current dataset of vegetation plots for national parks in Washington although a OLYM legacy plot from Olympic National Park is associated with a seep and has scattered, short *Cupressus nootkatensis* with a herbaceous layer of *Saxifraga nelsonii* and *Caltha leptosepala*. It likely represents an early seral -stage of this association. It appears as CUPNOO-TSUMER/CALLEP in Appendix C.

Conservation Rank: S3

Rank Justification: This association occurs in small patches associated with a wetland environment. It is moderately threatened by logging and associated impacts and is fragile because of its saturated, organic soils

Synonyms:
Tsuga mertensiana/CABI-NWW; Henderson et al. 1992
Tsuga mertensiana/Caltha *biflora* Association; Henderson et al. 1992
Tsuga mertensiana/*Rubus spectabilis* Association; Henderson and Peter 1984
Tsuga mertensiana-Abies amabilis/*Caltha leptosepala* spp. *howellii* Woodland; Chappell 2005

Salix commutata Shrubland

Undergreen Willow Shrubland



Acronym: SALCOM

NatureServe Code: Provisional

Macrogroup: Western North America Wet Meadow & Low Shrub Carr

Group: North Pacific Montane Riparian Shrubland and Low Carr

Alliance: Low Stature *Salix* Wet Carr and Shrubland Alliance

Classification Confidence Level: 2

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 20, MORA (0), NOCA (2), OLYM (18), Other (0)

Environmental Description: This association occurs at middle to high elevations on topographically wet sites. It appears in seep/springs, wet depressions, large wet meadow complexes, bases of slide areas and stream sides. Sites are seasonally to semi-permanently flooded Hydric soil indicators, such as mottling, may be present.

Vegetation Description: This vegetation is open or patchy and dominated by *Salix commutata* shrubs less than 2 m (6 ft) tall. *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Leptarrhena pyrolifolia*, *Phleum alpinum* and *Cirsium edule* are the only species to occur somewhat frequently. One or more species of wetland-associated *Carex* are often co-dominant in the herb layer. Moss is often a dominant ground cover. Adjacent forests are dominated by *Abies lasiocarpa*, *Tsuga mertensiana* or *Abies amabilis*.

USFWS Wetland System: Palustrine.

Comments: This association is broadly described and is related to *Salix commutata* / Mesic Graminoid Shrubland (CEGL003497) and *Salix commutata* / *Carex scopulorum* (CEGL001189) that are both recognized in the North Rockies and eastern Cascades. Riparian and wetland environments are undersampled for this project.

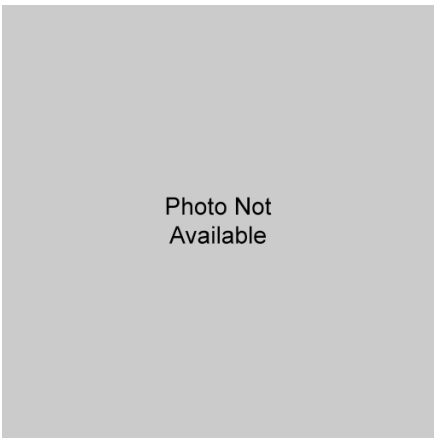
Conservation Rank: S4Q

Rank Justification: This provisional type occurs within narrow environments that have few known threats in Washington.

Synonyms:
Salix commutata Association; Murray 2000
Salix commutata Shrubland-new; Chappell 2005 NPK
Salix commutata/*Heracleum lanatum* Community Type; Henderson et al. 1979
Salix commutata/*Lupinus latifolius* Community Type; Henderson et al. 1979
Salix commutata/Mesic Forb Association; Kovalchik 2001

Carex mertensii Herbaceous Vegetation

Mertens' Sedge Herbaceous Vegetation



Acronym: CARMER

NatureServe Code: Provisional

Macrogroup: Western North America Wet Meadow & Low Shrub Carr

Group: Temperate Pacific Subalpine-Montane Wet Meadow

Alliance: *Carex* (spp.) Herbaceous Vegetation

Classification Confidence Level: 3

Range: This occurs in the Olympic and possibly in the Cascade Mountains.

Plots: 2, MORA (0), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association was sampled between 1250-3000 m (4100-4300 ft) elevation on sites with 5-15% slope. Both sites are subject to periodic disturbance, one by avalanche run-out and the other by flooding.

Vegetation Description: This dense and floristically diverse herbaceous association is dominated by *Carex mertensii*. *Polygonum bistortoides*, *Lupinus (arcticus ssp. subalpinus, latifolius)*, *Potentilla flabellifolia*, and *Phleum alpinum* occurred in both plots. *Agrostis oregonensis*, *Juncus drummondii*, *Carex nigricans*, and *Veratrum viride* occur with 10-20% cover.

USFWS Wetland System: Palustrine.

Comments: These legacy plots might represent variation in *Carex nigricans* (CEGL001816) and *Valeriana sitchensis-Veratrum viride* (CEGL001998) associations.

Conservation Rank: S3S4Q

Rank Justification: This provisional association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:

Carex nigricans Herbaceous Vegetation

Black Alpine Sedge Herbaceous Vegetation



Acronym: CARNIG

NatureServe Code: CEGL001816

Macrogroup: Western North America Wet Meadow & Low shrub carr

Group: Temperate Pacific Subalpine-Montane Wet Meadow

Alliance: *Carex* (spp.) Herbaceous Vegetation

Classification Confidence Level: 1

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 40, MORA (12), NOCA (0), OLYM (18), Other (10)

Environmental Description: This wet meadow occurs in the subalpine parkland and lower alpine zones. Sites occupied are flats, depressions, or gentle slopes with late snow-melt and poorly drained, seasonally wet soils. Bare ground is frequently present.

Vegetation Description: The vegetation is dominated by relatively dense *Carex nigricans*. Several other species may occur prominently, especially *Luetkea pectinata*, *Carex spectabilis and Juncus drummondii.* Other comon hrebaceous species include *Erythronium montanum*, *Poa fendleriana*, or *Carex illota*. Dwarf-shrubs *Phyllodoce empetriformis, Vaccinium deliciosum* and *Cassiope mertensiana* are frequently present but contribute less than 10% cover. Trees are absent and shrubs are confined to hummocks.

USFWS Wetland System: Palustrine

Comments: This association merges both the *Carex nigricans - Erythronium montanum* Herbaceous (CEGL001817) and the *Carex nigricans - Luetkea pectinata* Herbaceous (CEGL001819) associations into a single, coastal Pacific Northwest association. Co-dominance by *Caltha leptosepala* (=*biflora, leptosepala*) indicates the *Carex (aquatilis* var*. dives, nigricans) - Caltha leptosepala* ssp. *howellii* association (Henderson 1974) that tends to be wetter and occur at lower elevations (see Appendix B).

Conservation Rank: S4

Rank Justification: This association is widely distributed. Known sites are in protected areas.

Synonyms:
Carex nigricans Association; Hamann 1972, Henderson and Peter 1982, Kovalchik 2001
Carex nigricans Community; Douglas 1972
Carex nigricans Community Type; Henderson 1974, Henderson et al. 1979
Carex nigricans Herbaceous Vegetation; Chappell 2005
Carex nigricans/*Aster alpigenus* Community Type; Henderson 1974
Carex nigricans/*Carex spectabilis* Community Type; Henderson 1974
Carex nigricans-Luetkea pectinata Association; Douglas and Bliss 1977
Carex nigricans-Luetkea pectinata Community Type; Henderson et al. 1979
Carex nigricans-Lupinus polyphyllus-Vaccinium caespitosum Community; del Moral 1979
Carex spectabilis-Carex nigricans Community Type; Henderson et al. 1979
Dwarf Sedge Type; Kuramoto and Bliss 1970

Carex spectabilis-Carex nigricans-(Potentilla flabellifolia) Herbaceous Vegetation

Showy Sedge-Black Alpine Sedge-Fringe Leaf Cinquefoil Herbaceous Vegetation



Acronym: CARSPE-CARNIG-(POTFLA)

NatureServe Code: CEGL001829

Macrogroup: Western North America Wet Meadow & Low shrub carr

Group: Temperate Pacific Subalpine-Montane Wet Meadow

Alliance: *Carex* (spp.) Herbaceous Vegetation

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier National Park and in the Olympic Mountains.

Plots: 34, MORA (7), NOCA (0), OLYM (15), Other (12)

Environmental Description: This subalpine meadow occurs in moist basins between 1250 -2100 m (4110-6895 ft) elevation. Sites are typically flat to concave.

Vegetation Description: The vegetation is dominated by *Carex spectabilis* with *Carex nigricans* and/or *Potentilla flabellifolia* usually prominent to co-dominant. This is a species-rich association, however few species other than the dominants are rarely more than prominent. *Caltha leptosepala (=biflora, leptosepala)* and *Juncus drummondii* appear occasionally as prominent.

USFWS Wetland System: Not applicable.

Comments: This is a name change of the *Carex spectabilis-Potentilla flabellifolia* association (CEGL001829).

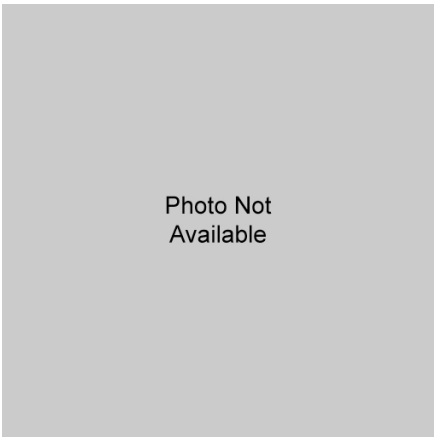
Conservation Rank: S3

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas. Climate change will likely affect this vegetation.

Synonyms:
Carex spectabilis Association; Kovalchik 2001
Carex spectabilis/*Potentilla flabellifolia* Association; Hamann 1972
Carex spectabilis-Potentilla flabellifolia Herbaceous Vegetation; Chappell 2005

Purshia tridentata/Pseudoroegneria spicata Shrubland

Bitterbrush/Bluebunch Wheatgrass Shrubland



Acronym: PURTRI/PSESPI

NatureServe Code: CEGL001495

Macrogroup: Northern Great Basin Shrub Steppe & Grassland

Group: Inter-Mountain Basins Big Sagebrush Steppe

Alliance: *Artemisia vaseyana-Purshia tridentata* Shrubland

Classification Confidence Level: 1

Range: This association occurs in the Lake Chelan National Recreational Area and, more generally, in the eastern Cascades in Washington and Oregon, the Blue Mountains, and the Bitterroot Valley in Montana.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs on steep, south facing, mid to upper slopes at 580-1675 m (1900-5500 ft) elevation. Soils are typically dry, shallow, and rocky. A high exposure of rock and surface soil is common.

Vegetation Description: Relatively open stands of the shrub *Purshia tridentata* occur with the bunchgrass *Pseudoroegneria (=Agropyron*) *spicata*. Forbs such as *Balsamorhiza sagittata. Poa secunda* (*=sandbergii)* and *Lomatium dissectum* are often present. Sites with co-dominance or dominance of *Festuca idahoensis* or *F. campestris (=scabrella)* indicate separate associations.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data for national parks in Washington. However, it may occur near Lake Chelan.

Conservation Rank: S2

Rank Justification: This relatively widespread association is known from the eastern Cascades into British Columbia, the Blue Mountains, and Bitterroot Valley in Montana. Very few high condition (i.e. having few exotic species), representative stands are known. Occurrences are declining due to exotic annual grass species and the loss of stands to fire disturbance events.

Synonyms:
Purshia tridentata/*Agropyron spicatum* Association; Daubenmire 1970

Arctostaphylos uva-ursi-(Dasiphora fruticosa) Dwarf-shrubland

Kinnikinnick-(Shrubby Cinquefoil) Dwarf-shrubland



Acronym: ARCUVA-(DASFLO)

NatureServe Code: CEGL001392

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Dasiphora fruticosa* Dwarf-shrubland

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier and in the North Cascades.

Plots: 8, MORA (8), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs at high elevations (1800-2225 m (5900-7300 ft)) on southerly aspects with dry soils in the alpine or upper subalpine parkland zones.

Vegetation Description: *Arctostaphylos uva-ursi* dominates or co-dominates with *Dasiphora fruticosa* ssp. *floribunda (=Potentilla fruticosa)*. *Juniperus communis* or *Empetrum nigrum* can be occasionally prominent to co-dominant dwarf-shrubs. *Carex nigricans* and *Artemisia furcata* can be prominent. Many herbaceous species typical of high elevations can occur, such as *Festuca brachyphylla* (=*ovina* var. *rydbergii*), *Lupinus sellulus var. lobbii (=lepidus* var. *lobbii)*, *Minuartia (=Arenaria) obtusiloba*, *Minuartia rubella*, *Penstemon procerus*, and *Solidago simplex var. nana (=spathulata)*.

USFWS Wetland System: Not applicable.

Comments: This association is called *Arctostaphylos uva-ursi* in the NVC. This association is similar to Rocky Mountain *Arctostaphylos uva-ursi*/*Solidago multiradiata* (CEGL005832) however, it lacks the graminoid component of *Calamagrostis koelerioides, Festuca idahoensis, F. campestris* and other typical Rocky Mountain elements. Two plots with prominent *Empetrum nigrum* probably represent a transition to the *Empetrum nigrum-Lupinus sellulus* association.

Conservation Rank: S3

Rank Justification: This association occurs within a limited geographic and ecological range but faces few threats.

Synonyms:
Arctostaphylos uva-ursi Community; Douglas and Bliss 1977
Arctostaphylos uva-ursi/*Solidago spathulata* Association; Hamann 1972
Arctostaphylos uva-ursi-Festuca brachyphylla Dwarf-shrubland; Chappell 2005

Empetrum nigrum-Lupinus sellulus var. lobbii Dwarf-shrubland

Black Crowberry-Donner Lake Lupine Dwarf-shrubland



Acronym: EMPNIG-LUPSEL

NatureServe Code: CEGL001400

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: Northern Rocky-Vancouverian Alpine-Subalpine Dwarf-shrubland

Alliance: *Empetrum nigrum* Dwarf Shrubland

Classification Confidence Level: 2

Range: This association occurs on the slopes of Mount Rainier and elsewhere in the Cascade Mountains.

Plots: 13, MORA (13), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs above upper treeline (alpine zone). Sites occupied are well-drained slopes (north aspect at Mount Rainier and on south to west aspects in North Cascades).

Vegetation Description: The dwarf-shrub *Empetrum nigrum* dominates the vegetation, which typically covers approximately half of the ground surface. Other dwarf-shrubs such as *Phyllodoce glandulifera* or *Salix nivalis* maybe present. *Lupinus sellulus var. lobbii* (=*lepidus* var. *lobbii*) is usually present to prominent at Mount Rainier but is less prominent in the North Cascades. The forbs *Erigeron aureus*, *Oreostemma alpigenum,* and *Pedicularis contorta* are frequent at Mount Rainier. *Salix cascadensis* and *Vaccinium caespitosum* are associated short shrubs in the North Cascades.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This association occurs on protected land within a restricted range of environments with few threats.

Synonyms:
Empetrum nigrum Community; Douglas and Bliss 1977
Empetrum nigrum/*Lupinus lepidus* Association; Hamann 1972
Empetrum nigrum-Lupinus sellulus var. lobbii Dwarf-shrubland; Chappell 2005

Cassiope mertensiana-Phyllodoce empetriformis Alpine Dwarf-shrubland

White Mountain Heather-Pink Mountain-heather Dwarf-shrubland

Acronym: CASMER-PHYEMP

NatureServe Code: CEGL001398

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Phyllodoce empetriformis-Cassiope mertensiana-*(*Vaccinium deliciosum*) Dwarf Shrubland

Classification Confidence Level: 2



Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 65, MORA (18), NOCA (4), OLYM (37), Other (6)

Environmental Description: This association occurs at or above treeline, usually in the lower portion of the alpine zone. Sites have well-drained mesic soils, and can be rocky.

Vegetation Description: The vegetation is dominated by *Cassiope mertensiana* and/or *Phyllodoce empetriformis*. Both are typically present and more often prominent. Tree species are usually absent. Other relatively abundant species (sometimes prominent) include *Luetkea pectinata*, *Vaccinium deliciosum*, *Carex spectabilis*, *Pedicularis ornithorhyncha*, and *Antennaria lanata*.

USFWS Wetland System: Not applicable.

Comments: This type is distinguished from the similar, but more subalpine parkland type, *Phyllodoce empetriformis-Vaccinium deliciosum*-(*Cassiope mertensiana*) (CEGL001407), by the alpine setting, presence of alpine species like *Phyllodoce glanduliflora*, and the lower mean abundance and height of *Vaccinium deliciosum*. These could be combined into a generalized heather type encompassing alpine and subalpine sub-associations.

Conservation Rank: S3S4

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas. Climate change will likely affect this vegetation.

Synonyms:
Carex – Cassiope; Schreiner 1994
Cassiope mertensiana Community*;* Edwards 1980
Phyllodoce empetriformis Community; Douglas and Bliss 1977
Cassiope mertensiana Community; Douglas and Bliss 1977
Cassiope mertensiana-Phyllodoce empetriformis Alpine Dwarf-shrubland; Chappell 2006 NPk

Phyllodoce empetriformis-(Vaccinium deliciosum)-Lupinus (arcticus, latifolius) Dwarf-shrubland

Pink Mountain-Heather-(Blueleaf Huckleberry)-Subalpine Lupine Dwarf-shrubland



Acronym: PHYEMP-(VACDEL)/LUPARC

NatureServe Code: CEGL001406

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Phyllodoce empetriformis-Cassiope mertensiana*-(*Vaccinium deliciosum*) Dwarf Shrubland

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier and in the Olympic Mountains.

Plots: 16, MORA (0), NOCA (0), OLYM (10), Other (6)

Environmental Description: This association occurs mostly in the subalpine and lower alpine, at 1460-2165 m (4800-7100 ft) elevation. In the Olympic Mountains, it occurs on flat to moderately steep slopes. Soils can be rocky.

Vegetation Description: The vegetation is dominated by the dwarf-shrub *Phyllodoce empetriformis* or *Vaccinium deliciosum* The forb *Lupinus (arcticus ssp. subalpinus, latifolius)* is always present to co-dominant. *Cassiope mertensiana* can be a member of the dwarf-shrub layer but is less prominent than other dwarf-shrubs. Other frequent species are *Luetkea pectinata*, *Hieracium gracile*, *Carex spectabilis*, *Castilleja parviflora* and *Polygonum bistortoides*.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S3

Rank Justification: This association occurs at few sites, is represented on protected areas and has few threats. Climate change will likely affect this vegetation.

Synonyms:
Phyllodoce empetriformis/*Lupinus latifolius* Community Type; Henderson 1973
Phyllodoce empetriformis-Lupinus arcticus ssp. *subalpinus* Dwarf-shrubland; Chappell 2005
Phyllodoce/Lupinus Community Type; Henderson 1974

Phyllodoce empetriformis-Vaccinium deliciosum-(Cassiope mertensiana) Subalpine Dwarf-shrubland

Pink Mountain-heather-Blueleaf Huckleberry-(White Mountain Heather) Dwarf-shrubland



Acronym: PHYEMP-VACDEL-(CASMER)

NatureServe Code: CEGL001407

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Phyllodoce empetriformis-Cassiope mertensiana*-(*Vaccinium deliciosum*) Dwarf Shrubland

Classification Confidence Level: 1

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 102, MORA (11), NOCA (0), OLYM (65), Other (26)

Environmental Description: This association is the most common subalpine meadow type in the moist to wet climatic areas (areas not greatly affected by rainshadows). It is generally found on gentle to moderate slopes with well-drained soils although it has been observed on steep slopes as well.

Vegetation Description: The relatively dense dwarf-shrub vegetation is almost always co-dominated by *Phyllodoce empetriformis* and *Vaccinium deliciosum. Cassiope mertensiana* can be prominent but rarely co-dominates. Numerous other species can be present although rarely in abundance. *Luetkea pectinata, Polygonum bistortoides,* and *Carex spectabilis* are most frequently present.

USFWS Wetland System: Not applicable.

Comments: The subalpine setting, greater abundance of *Vaccinium deliciosum*, and lack of alpine associated species distinguishes this association from the *Cassiope mertensiana-Phyllodoce empetriformis* Alpine Dwarf-shrubland (CEGL001398). The two could be combined into a generalized heather type encompassing alpine and subalpine sub-associations. This association may appear as a sparsely vegetated lithomorphic type on steep, more rocky sites where *Phyllodoce empetriformis* and *Cassiope mertensiana* are the most abundant vascular plants (PHYEMP-CASMER lithomorphic in table).

Conservation Rank: S3

Rank Justification: This association is very common in subalpine settings, is represented on protected areas and has few threats. Climate change will likely affect this vegetation.

Synonyms:
Cassiope mertensiana/*Phyllodoce empetriformis* Association; Hamann 1972
Cassiope mertensiana-Phyllodoce empetriformis Community; Douglas 1972
Heath-Shrub Type; Kuramoto and Bliss 1970
Phyllodoce empetriformis/*Cassiope mertensiana* Association; Hamann 1972
Phyllodoce empetriformis/*Vaccinium deliciosum* Association; Henderson and Peter 1982
Phyllodoce empetriformis-Vaccinium deliciosum Community Type; Henderson et al. 1979
Phyllodoce empetriformis-Vaccinium deliciosum-Cassiope mertensiana Subalpine Dwarf-shrubland-name change; Chappell 2005
Phyllodoce/Vaccinium Community Type; Henderson 1974
Vaccinium deliciosum Association; Hamann 1972
Carex – Phyllodoce; Schreiner 1994

Phyllodoce glanduliflora-(Cassiope mertensiana) Dwarf-shrubland

Yellow Mountain Heather-(White Mountain Heather) Dwarf-shrubland

Acronym: PHYGLA-(CASMER)

NatureServe Code: CEGL001408

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

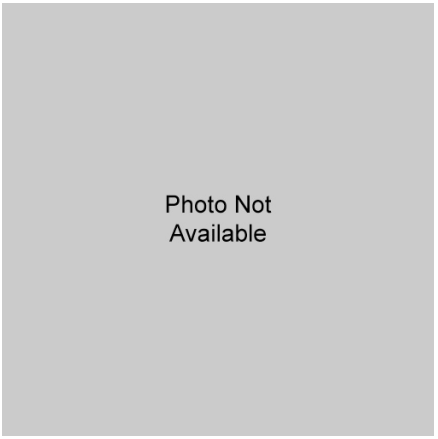
Alliance: *Phyllodoce empetriformis-Cassiope mertensiana*-(*Vaccinium deliciosum*) Dwarf Shrubland

Classification Confidence Level: 1

Range: This association occurs above treeline in the Cascade and Olympic Mountains.

Plots: 13, MORA (7), NOCA (0), OLYM (3), Other (3)

Environmental Description: This association occurs above treeline on a variety of sites. Soils are usually well-drained, but can be somewhat poorly drained.



Vegetation Description: *Phyllodoce glanduliflora* always dominates or co-dominates this primarily open vegetation type. *Cassiope mertensiana* is usually present and occasionally co-dominant. Other species can include *Penstemon procerus* var. *tolmiei*, *Carex spectabilis*, *Phyllodoce empetriformis*, *Lupinus sellulus*, and *Oreostemma (Aster) alpigenum*.

USFWS Wetland System: Not applicable.

Comments: This is a name change for *Phyllodoce glanduliflora* / *Oreostemma alpigenum* Dwarf-shrubland (CEGL001408).

Conservation Rank: S3

Rank Justification: This association occurs at few sites but is represented on protected areas and has few threats. Climate change will likely affect this vegetation.

Synonyms:
Cassiope mertensiana-Phyllodoce glanduliflora Community; del Moral 1979
Phyllodoce empetriformis-Phyllodoce glanduliflora Community; Edwards 1980
Phyllodoce glanduliflora Community; Douglas and Bliss 1977, Edwards 1980, Henderson 1974
Phyllodoce glanduliflora-(*Cassiope mertensiana*) Dwarf-shrubland-name change; Chappell 2005
Phyllodoce glanduliflora/*Aster alpigenus* Association; Hamann 1972
Phyllodoce glanduliflora-RIDGE Community; Edwards 1980

Sorbus sitchensis/Phyllodoce empetriformis-Vaccinium deliciosum Shrubland

Sitka Mountain Ash/Pink Mountain-heather-Blueleaf Huckleberry Shrubland

Acronym: SORSIT/PHYEMP-VACDEL

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Phyllodoce empetriformis-Cassiope mertensiana*-(*Vaccinium deliciosum*) Dwarf Shrubland

Classification Confidence Level: 3



Range: This association is described from the North Cascades, and may occur elsewhere in the Cascade or Olympic Mountains.

Plots: 4, MORA (0), NOCA (4), OLYM (0), Other (0)

Environmental Description: This association occurs at relatively high elevations of 1370-1675 m (4500-5500 ft). Sites are on moderately steep to steep slopes near debris avalanches, on old talus and on valley or cirque walls. Rock can be abundant when associated with open meadows in the *Tsuga mertensiana* parkland.

Vegetation Description: The vegetation is co-dominated by taller *Sorbus sitchensis* and shorter *Vaccinium deliciosum* and *Phyllodoce empetriformis* shrubs. Other shrubs, particularly *Vaccinium membranaceum*, and forbs *Carex spectabilis*, *Mitella breweri, Polygonum bistortoides* and *Veratrum viride* are frequently occurring associates. The forb layer is diverse but usually low in percent cover.

USFWS Wetland System: Not applicable.

Comments: This type is transitional with the broadly defined *Phyllodoce empetriformis-Vaccinium deliciosum*-(*Cassiope mertensiana*) association (CEGL001407) and various high elevation avalanche/debris chute communities.

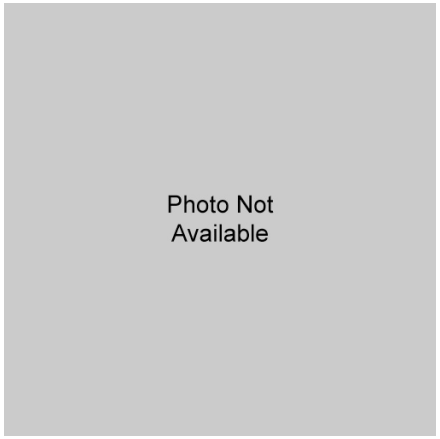
Conservation Rank: S3S4

Rank Justification: This provisional association occurs within a narrow environmental range on sites that have few threats.

Synonyms:

Vaccinium membranaceum/Phyllodoce empetriformis Shrubland

Big Huckleberry/Pink Mountain-heather Shrubland



Acronym: VACMEM/PHYEMP

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Phyllodoce empetriformis-Cassiope mertensiana*-(*Vaccinium deliciosum*) Dwarf Shrubland

Classification Confidence Level: 3

Range: This association occurs in the Olympic and possibly the Cascade Mountains.

Plots: 7, MORA (0), NOCA (0), OLYM (7), Other (0)

Environmental Description: This association occurs at subalpine elevations on moderately steep slopes, often with rock exposed at the soil surface.

Vegetation Description: The vegetation is co-dominated by *Vaccinium membranaceum* and *Phyllodoce empetriformis* or *Cassiope mertensiana*. *Luetkea pectinata* is usually present to prominent in the otherwise sparse ground vegetation.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Vaccinium membranaceum*/*Vaccinium deliciosum* shrubland association (CEGL001428) but lacks the prominence of *Vaccinium deliciosum*, appears to be less diverse, and occurs at higher elevations.

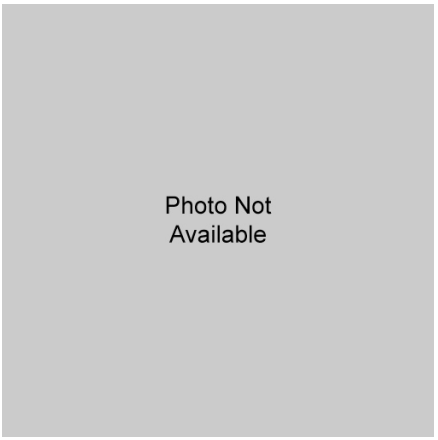
Conservation Rank: S2S3

Rank Justification: This preliminary association occurs at high elevations in the Olympic Mountains. Climate change will likely affect this vegetation.

Synonyms:

Salix cascadensis-Festuca brachyphylla Dwarf-shrubland

Cascade Willow/Sheep Fescue Dwarf-shrubland



Acronym: SALCAS-FESBRA

NatureServe Code: CEGL001433

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Salix cascadensis-Festuca brachyphylla* Dwarf-shrubland

Classification Confidence Level: 2

Range: This association occurs in the North Cascades.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This association occurs above treeline. Sites have well-drained soils and vary in aspect and slope depending on climate.

Vegetation Description: The vegetation is dominated by the short, mat-forming shrub *Salix cascadensis*. *Festuca brachyphylla (=ovina* var. *rydbergii)* and *Carex phaeocephala* are frequent. *Erigeron aureus* and *Minuartia (=Arenaria) obtusiloba* are locally important.

USFWS Wetland System: Not applicable**.**

Comments: This type is not represented in the current data for national parks in Washington.

Conservation Rank: S3

Rank Justification: This association occurs within a restricted environment in the North Cascades in Washington with few threats.

Synonyms:
Salix cascadensis Community Type; Douglas and Bliss 1977
Salix cascadensis/Festuca *ovina* Community Type; Schuller 1985 cites Douglas and Bliss 1977
Salix cascadensis-Festuca brachyphylla Dwarf-shrubland; Chappell 2005

Vaccinium deliciosum Dwarf-shrubland

Blueleaf Huckleberry Dwarf-shrubland

Acronym: VACDEL

NatureServe Code: CEGL001427

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Vaccinium* (*deliciosum*, *membranaceum*) Dwarf Shrubland

Classification Confidence Level: 1

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 52, MORA (7), NOCA (1), OLYM (39), Other (5)

Environmental Description: This association occurs in subalpine parklands and may extend up into the lower alpine. Sites have well-drained soils and occur on gentle to moderate slopes.



Vegetation Description: The vegetation is dominated by *Vaccinium deliciosum*. *Phyllodoce empetriformis* and *Cassiope mertensiana,* when present, have less than 10% cover. Associated species are variable. Frequently occurring species include *Polygonum bistortoides*, *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, *Hieracium gracile*, *Carex spectabilis*, *Veronica cusickii*, and *Valeriana sitchensis*.

USFWS Wetland System: Not applicable.

Comments: *Xerophyllum tenax* dominates the herbaceous layer in two Olympic plots and one Mount Rainier plot and may represent a subassociation. Alpine and subalpine subassociations could also be recognized within this association concept. This association may appear as a sparsely vegetated lithomorphic type on steep, rocky sites where *Vaccinium deliciosum* is the most abundant vascular plant.

Conservation Rank: S3S4

Rank Justification: This association occurs throughout the high elevations of the Cascades and Olympics in Washington. Climate change will likely affect this vegetation.

Synonyms:
Vaccinium deliciosum Community; Douglas 1972
Vaccinium deliciosum Community Type; Henderson 1974, Henderson et al. 1979
Vaccinium deliciosum Dwarf-shrubland; Chappell 2005
Vaccinium deliciosum/*Carex spectabilis* Community Type; Henderson et al. 1979
Vaccinium deliciosum/*Valeriana sitchensis-Polygonum bistortoides* Community; Wooten and Morrison 1995
Vaccinium Community; Schreiner 1994

Vaccinium deliciosum-Tauschia stricklandii Dwarf-shrubland

Blueleaf Huckleberry-Strickland's Umbrellawort Dwarf-shrubland



Acronym: VACDEL-TAUSTR

NatureServe Code: CEGL001994

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: Vaccinium (deliciosum, membranaceum) Dwarf Shrubland

Classification Confidence Level: 2

Range: This association occurs in the northern and western part of Mount Rainier.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This small patch association occurs in subalpine parklands on flat sites that have somewhat poorly drained soils.

Vegetation Description: The vegetation is co-dominated by *Vaccinium deliciosum* and the forb *Tauschia stricklandii*. *Ranunculus escholtzii*, *Oreostemma (Aster) alpigenum*, *Carex spectabilis*, *Claytonia lanceolata*, and *Antennaria lanata* also occur. Lichens and moss can provide the majority of ground cover.

USFWS Wetland System: Not applicable.

Comments: This is not represented in the current data for national parks in Washington.

Conservation Rank: S1S2

Rank Justification: This association is endemic to and occupies a very small portion of Mount Rainier National Park. It occurs within a specific environmental setting and naturally occupies a small acreage. Recreational impacts in the form of trampling and trail proliferation pose a possible threat.

Synonyms:
Tauschia stricklandii/*Vaccinium deliciosum* Association; Hamann 1972
Tauschia/Vaccinium Community Type; Henderson 1974
Vaccinium deliciosum-Tauschia stricklandii Dwarf-shrubland; Chappell 2005

Vaccinium membranaceum/Vaccinium deliciosum Shrubland

Big Huckleberry/Blueleaf Huckleberry Shrubland



Acronym: VACMEM/VACDEL

NatureServe Code: CEGL001428

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath

Alliance: *Vaccinium* (*deliciosum, membranaceum*) Dwarf Shrubland

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 6, MORA (1), NOCA (0), OLYM (5), Other (0)

Environmental Description: This association occurs at relatively high elevations. Sites are steep, southwestern slopes that probably burned in the past.

Vegetation Description: The vegetation is co-dominated by *Vaccinium membranaceum* and *Vaccinium deliciosum*. *Phyllodoce empetriformis* or *Spiraea splendens (=densiflora)* may be as prominent as the *Vaccinium* species. *Lupinus (arcticus* ssp. *subalpinus, latifolius)*, *Polygonum bistortoides*, and *Valeriana sitchensis* are frequent associates in a relatively diverse herbaceous layer.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the preliminary *Vaccinium membranaceum*/*Phyllodoce empetriformis* shrubland association with the exception of the prominence of *Vaccinium deliciosum.* The latter is also more floristically diverse and usually found at lower elevations.

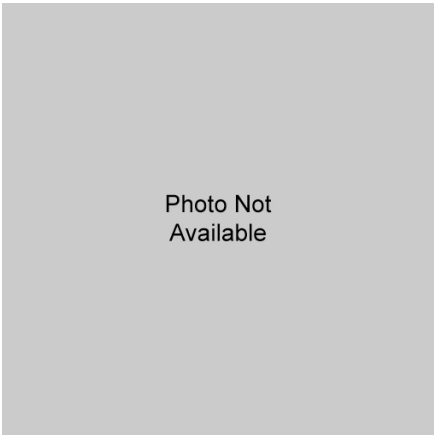
Conservation Rank: S3S4

Rank Justification: This association occurs at high elevations in the Olympic and Cascade Mountains. Climate change will likely affect this vegetation.

Synonyms:
Vaccinium membranaceum/*Vaccinium deliciosum* Association; Henderson and Peter 1982
Vaccinium membranaceum/*Vaccinium deliciosum* Shrubland; Chappell 2005

Carex breweri Herbaceous Vegetation

Brewer's Sedge Herbaceous Vegetation



Acronym: CARBRE

NatureServe Code: CEGL001805

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine Herbaceous Meadow

Alliance: *Festuca* (*brachyphylla*, *roemeri*, *saximontana*) Meadow

Classification Confidence Level: 1

Range: This association occurs only at Mount Rainier National Park and in the eastern North Cascades.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This alpine turf association occurs only above upper treeline (alpine zone). Sites have well-drained soils and occur on relatively gentle slopes.

Vegetation Description: The vegetation cover varies from moderate to dense and sometimes occurs within fellfields. The association is comprised entirely of herbaceous species, often occuring as a 'turf' of sod-forming sedges, dominated by *Carex breweri. Carex phaeocephala*, *Sibbaldia procumbens*, *Erigeron aureus*, and *Lupinus sellulus var. lobbii* (=*lepidus* var. *lobbii*) are some of the more common associates.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S2S3

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:
Carex breweri Community Type; Douglas and Bliss 1977
Carex breweri Herbaceous Vegetation; Chappell 2005
Carex breweri-Sedge Turf Community; Edwards 1980

Carex phaeocephala Herbaceous Vegetation

Dunhead Sedge Herbaceous Vegetation

Acronym: CARPHA

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine Herbaceous Meadow

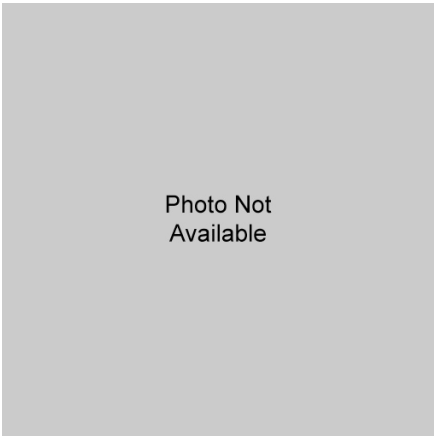
Alliance: *Festuca* (*brachyphylla*, *roemeri*, *saximontana*) Meadow

Classification Confidence Level: 2

Range: This association occurs in the North Cascades and Olympic Mountains and possible at Mount Rainier.

Plots: 6, MORA (0), NOCA (0), OLYM (5), Other (1)

Environmental Description: This association occurs near and above treeline (alpine zone). Sites are moderate to steep, well-drained upper slopes and commonly contain exposed rocks and mineral soil at the ground surface.



Vegetation Description: This open to sparse vegetation is dominated by moderate cover of *Carex phaeocephala*. A variety of other herbaceous species occur, especially *Lupinus sellulus var. lobbii* (=*lepidus* var. *lobbii*), *Minuartia (=Arenaria) obtusiloba*, *Potentilla diversifolia*, and *Phlox diffusa*. *Sedum divergens* and *Douglasia laevigata* are found primarily in the Olympic sites, while Rocky Mountain species such as *Carex scirpoidea* (*pseudoscirpoidea*) and *Oxytropis campestris* occur in the northeast Cascades.

USFWS Wetland System: Not applicable.

Comments: Most plots are Olympic legacy plots and the association is recognized in North Cascades literature.

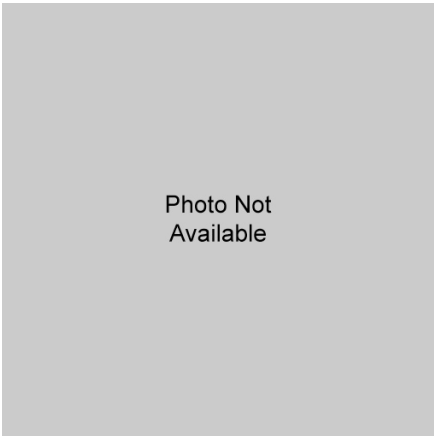
Conservation Rank: S2S3

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:
Carex phaeocephala Community Type; Douglas and Bliss 1977
Carex phaeocephala Herbaceous Vegetation-new; Chappell 2005
Phlox diffusa-Carex; Schreiner 1994

Festuca (brachyphylla, saximontana) Herbaceous Vegetation

Short-leaf and Rocky Mountain Fescue Herbaceous Vegetation



Acronym: FESBRA

NatureServe Code: CEGL001797

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine Herbaceous Meadow

Alliance: *Festuca* (*brachyphylla*, *roemeri*, *saximontana*) Meadow

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains in Washington and in the Rocky Mountains.

Plots: 2, MORA (1), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association occurs in the upper subalpine parkland and alpine zones. Sites have well-drained soils, although in the eastern Cascades it can also be found on wetland edges in broad valleys.

Vegetation Description: This sparse to open vegetation is dominated by *Festuca brachyphylla (=ovina* var. *rydbergii)* in the Cascades or *F. saximontana* (=*ovina* var. *brevifolia*) in the Olympic Mountains. *Arenaria capillaris*, *Danthonia intermedia* or *Erigeron peregrinus* are usually present.

USFWS Wetland System: Not applicable.

Comments: Both plots are legacy and list *Festuca ovina* as community dominant. Recent taxonomic treatment splits this taxon into *Festuca brachyphylla* (primarily Cascades) and *Festuca saximontana* (primarily Olympics). These two species are treated as ecologic equivalents for this classification. This association is provisionally included in the *Festuca brachyphylla* herbaceous vegetation (CEGL001797) currently recognized in the central Rockies.

Conservation Rank: S3

Rank Justification: This association occurs in narrow range of environments with few threats on protected land. Climate change will likely affect this vegetation.

Synonyms:

Festuca roemeri-(Phlox diffusa-Arenaria capillaris) Herbaceous Vegetation

Roemer's fescue-(Spreading Phlox-Slender Mountain Sandwort) Herbaceous Vegetation

Acronym: FESROE-(PHLDIF-ARECAP)

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine Herbaceous Meadow

Alliance: *Festuca* (*brachyphylla*, *roemeri, saximontana*) Meadow

Classification Confidence Level: 1

Range: This grassland association occurs in the northeastern Olympic Mountains.

Plots: 52, MORA (0), NOCA (0), OLYM (52), Other (0)

Environmental Description: This grassland occurs at high elevations as meadows in the upper subalpine parkland and in the alpine zone. Sites are typically on mesic, moderate slopes with relatively warm south to west exposures. Soils are acidic, relatively deep, poorly developed sandy loams that can be rocky.



Vegetation Description: This association is a moderately dense to dense, mixed graminoid and forb herbaceous layer that is less than 0.5 m (1.5 ft) tall. It is dominated or co-dominated by *Festuca roemeri (=idahoensis)*. *Phlox diffusa* ssp. *longistylis* is typically prominent to co-dominant. Other frequent species include *Arenaria capillaris*, *Achillea millefolium*, *Antennaria microphylla*, *Campanula rotundifolia*, *Carex phaeocephala*, *Polygonum bistortoides*, and *Silene parryi*. *Lupinus (arcticus ssp. subalpinus, latifolius)* and *Hydrophyllum fendleri* occasionally occur prominently. Dry sites commonly include *Lomatium martindalei*, *Eriophyllum lanatum*, and *Lathyrus nevadensis*.

USFWS Wetland System: Not applicable.

Comments: This association expands the concept of *Festuca roemeri - Phlox diffusa* ssp. *longistylis* Herbaceous (CEGL001622) by merging it with the *Festuca roemeri-Delphinium glareosum* (CEGL001613) association.

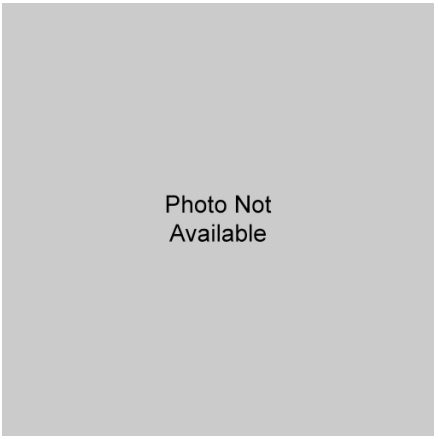
Conservation Rank: S2

Rank Justification: This community is naturally globally rare, with few occurrences (certainly less than 50, quite possibly less than 20) covering a relatively small area. This association's range is extremely restricted within a small rainshadow zone of the northeastern Olympic Mountains, where it occurs near and above treeline and is locally frequent. Stands are slightly threatened from recreational impacts and moderately threatened, in the long-term, from treeline changes associated with global climate change.

Synonyms:
Festuca roemeri-Phlox diffusa ssp. longistylis; Chappell 2005
"Subalpine" Sites; Belsky and del Moral 1982
Mesic Grass Type; Kuramoto and Bliss 1970
Festuca roemeri-Delphinium glareosum Herbaceous Vegetation; Chappell 2005
Dry Grass-Forb Type; Kuramoto and Bliss 1970

Phlox diffusa-Lupinus sellulus var. *lobbii-(Pedicularis contorta)* Herbaceous Vegetation

Spreading Phlox-Donner Lake Lupine-(Slender Mountain Sandwort) Herbaceous Vegetation



Acronym: PHLDIF-LUPSEL-(PEDCON)

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine Herbaceous Meadow

Alliance: *Festuca* (*brachyphylla*, *roemeri, saximontana*) Meadow

Classification Confidence Level: 3

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 15, MORA (14), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association typically occupies sites above treeline (alpine zone). Sites are often rocky but can occur on flat to moderately steep slopes.

Vegetation Description: This open to sparsely developed herbaceous vegetation features *Phlox diffusa* as the most abundant species, typically with *Lupinus sellulus* var. *lobbii (=lepidus* var. *lobbii)* as prominent to co-dominant. *Arenaria capillaris*, *Carex spectabilis*, *Erysimum arenicola*, *Achillea millifolium, Oreostemma alpigenum, Solidago multiradiata*, *Trisetum spicatum*, *Penstemon procerus*, and *Pedicularis contorta* are other commonly occuring species.

USFWS Wetland System: Not applicable.

Comments:

Conservation Rank: S3

Rank Justification: This preliminary association occurs at few sites, is represented on protected areas and has few threats. Climate change will likely affect this vegetation.

Synonyms:
Phlox diffusa-(*Lupinus sellulus var. lobbii-Arenaria capillaris*) Herbaceous Vegetation; Chappell 2005
Phlox diffusa-Arenaria capillaris Association; Hamann 1972
Phlox diffusa-Eriogonum pyrolifolium Community; del Moral 1979
Pedicularis contorta-Carex spectabilis Association; Hamann 1972

Selaginella wallacei-Festuca (roemeri, saximontana, brachyphylla) Herbaceous Vegetation

Wallace's Spike-moss-Roemer's or Rocky Mountain Fescue Herbaceous Vegetation



Acronym: SELWAL-(FESROE,FESBRA)

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine Herbaceous Meadow

Alliance: *Festuca* (*brachyphylla*, *roemeri*, *saximontana*) Meadow

Classification Confidence Level: 3

Range: This association occurs in the Olympic Mountains and at Mount Rainier National Park.

Plots: 10, MORA (1), NOCA (0), OLYM (9), Other (0)

Environmental Description: This association is found in dry balds within forest landscapes at middle elevations. The type can also be found on sites with exposed bedrock in the upper subalpine and alpine zones.

Vegetation Description: The sparsely developed herbaceous layer has the moss-like *Selaginella wallacei* as the most abundant species (average cover 24%). *Festuca roemeri (=idahoensis)* and *Festuca brachyphylla (=ovina* var. *rydbergii)* in the Cascades or *F. saximontana* (=*ovina* var. *brevifolia*) in the Olympic Mountains occurs on most sites, however cover is low (less than 5%). Sites with *Geum triflorum*, *Phlox diffusa*, *Erigeron compositus*, *Dasiphora fruticosa ssp. floribunda (=Potentilla fruticosa)*, and *Carex phaeocephala* present are indicative of upper subalpine and alpine environments in the Olympics.

USFWS Wetland System: Not applicable.

Comments: *Selaginella wallacei* can be abundant in many of the low to mid elevation bald associations described by Chappell (2006) and as such, the mid-montane portions of this association may be early successional sites related to one of several associations dominated by graminoid and forb species. Similar vegetation at lower elevations in British Columbia is described as the *Racomitrium spp.-Selaginella wallacei* bryophyte association that is typically is dominated by mosses with *Selaginella wallacei* prominent to co-dominant and with a more diverse assortment of grasses. This latter association occurs in Washington, but it has not been quantitatively described.

Conservation Rank: S3Q

Rank Justification: This preliminary association occurs within a narrow environmental range on sites that have few threats. Recreational use of sites would decrease their condition.

Synonyms:

Acer circinatum-(Holodiscus discolor) Lithomorphic Vegetation

Vine Maple-(Oceanspray) Lithomorphic Vegetation



Acronym: ACECIR-(HOLDIS) Lithomorphic

NatureServe Code: Provisional

Macrogroup: Vancouverian Cliff, Scree & Other Rock Vegetation

Group: North Pacific Montane Massive Bedrock, Cliff and Talus

Alliance: *Acer circinatum*-(*Holodiscus discolor*) Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 4, MORA (2), NOCA (0), OLYM (2), Other (0)

Environmental Description: This association occurs at middle elevations (1030-1400 m (3400-4600 ft)) on steep slopes (40-100%). Exposed rock, including bedrock, dry talus, scree and rock slides, are a common feature of this type.

Vegetation Description: This is an open community (6-55% total cover) with *Acer circinatum* and *Holodiscus discolor* each contributing 5-10% cover. Other shrubs may include *Acer glabrum* and *Rosa gymncarpium*. The fern *Cryptogramma acrostichoides (=crispa)* occurs frequently. Mosses and lichens often dominate the ground cover.

USFWS Wetland System: Not applicable.

Comments: This is similar to the preliminary *Acer circinatum* shrubland association. However, this lithomorhpic association is found on much drier, more harsh sites.

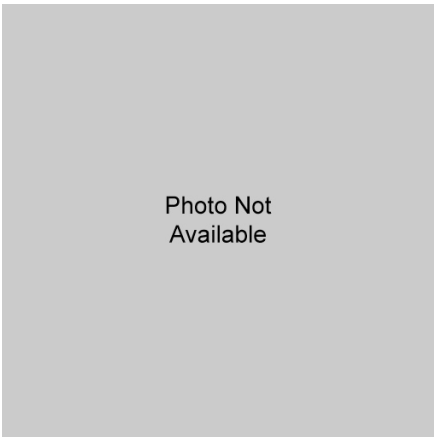
Conservation Rank: S2S4Q

Rank Justification: This association has a provisional classification status and is represented at few sites on protected areas.

Synonyms:

Campanula piperi Lithomorphic Vegetation

Olympic Bellflower Lithomorphic Vegetation



Acronym: CAMPIP Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Campanula piperi* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs only in the Olympic Mountains.

Plots: 6, MORA (0), NOCA (0), OLYM (6), Other (0)

Environmental Description: This association appears at elevations between 1460 and 1950 m (4820-6400 ft). It mostly occurs on easterly aspects and moderately steep slopes. Exposed bedrock, with little moss or lichen cover, is common.

Vegetation Description: *Campanula piperi,* averaging 5% cover, is the most common species in this sparsely vegetated, lithomorphic association. *Viola flettii* and *Paxistima (=Pachistima) myrsinites* occurred in half the plots.

USFWS Wetland System: Not applicable.

Comments: All plots are legacy plots that represent rare plant (*Campanula piperi*) habitat in the sample data and are included in the *Astragalus* community of Schreiner (1994).

Conservation Rank: S2S4

Rank Justification: This preliminary association is restricted to the Olympic Mountains and appears in a narrow environment. Most sites are in protected areas.

Synonyms:

Athyrium americanum-Cryptogramma acrostichoides Lithomorphic Vegetation

Alpine Ladyfern-American Rockbrake Lithomorphic Vegetation



Acronym: ATHAME-CRYACR

NatureServe Code: CEGL005900

Macrogroup: Vancouverian Cliff, Scree & Other Rock Vegetation

Group: North Pacific Montane Massive Bedrock, Cliff and Talus

Alliance: *Carex spectabilis – Dwarf shrub* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This preliminary type occurs in the Olympic and Cascades Mountains.

Plots: 3, MORA (0), NOCA (1), OLYM (3), Other (0)

Environmental Description: This type occurs at mid-montane elevations on moist talus with steep (30-60%) slopes.

Vegetation Description: This fern community is dominated by *Athyrium americanum* with *Cryptogramma acrostichoides (=crispa)* typically present. Cover is generally sparse but can be up to 70%. *Anaphalis margaritacea*, *Elmera racemosa*. *Eucephalus (=Aster) paucicapitatus*, *Juncus parryi*, *Luetkea pectinata*, and *Spiraea splendens* (=*densiflora*) are common, low cover associates. Mosses are usually present but rarely abundant.

USFWS Wetland System: Not applicable.

Comments: This association appears to be the same as the *Athyrium americanum - Cryptogramma acrostichoides* Lithomorphic Vegetation (CEGL005900) found in Montana although both may be part of the more broadly defined *Athyrium americanum* association recognized in Colorado (CEGL001849). This Pacific Northwest association varies from the Rocky Mountain types in the presence of endemics such as *Eucephalus (=Aster) paucicapitatus* and *Elmera racemosa* . One Olympic legacy sample (ELMPAC in synthesis tables), which features a dense herbaceous vegetation dominated by *Elmera racemosa* and *Athrium americanum*, could either represent a variant of the *Athyrium americanum-Cryptogramma acrostichoides* Lithomorphic association or represent the preliminary *Elmera racemosa-(Senecio neowebsteri*) Lithomorphic association.

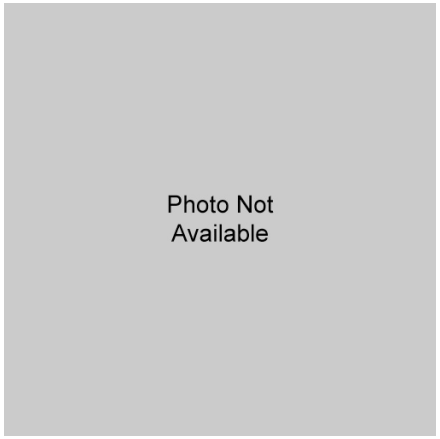
Conservation Rank: S2S4

Rank Justification: This preliminary association is narrowly restricted ecologically apparently over a wide geographic range. It, however, has few threats.

Synonyms:

Carex spectabilis Lithomorphic Vegetation

Showy Sedge Lithomorphic Vegetation



Acronym: CARSPE Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Carex spectabilis – Dwarf shrub* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 22, MORA (0), NOCA (0), OLYM (21), Other (1)

Environmental Description: This association mostly appears at elevations between 1550-1920 m (5110-6300 ft) on all aspects and moderately steep to steep slopes. Mineral soil and exposed rock and bedrock with little moss or lichen cover are often the dominant features of the site.

Vegetation Description: In this sparsely vegetated association *Carex spectabilis* is always present but never prominent. *Polygonum bistortoides, Luetkea pectinata, Lupinus (arcticus ssp subalpinus, latifolius)* and *Valeriana sitchensis* frequently occur, in equal abundance with *Carex spectabilis*.

USFWS Wetland System: Not applicable.

Comments:

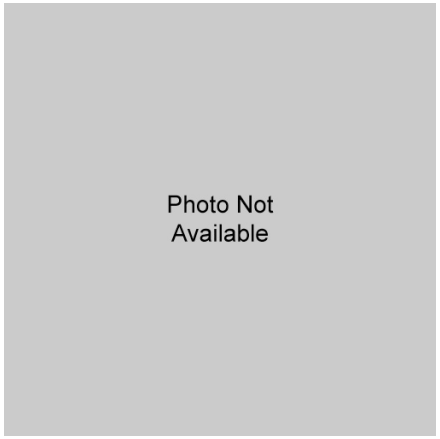
Conservation Rank: S3S5

Rank Justification: This preliminary association occurs at numerous sites within a limited geographic distribution. Sites are found on secure habitats in protected areas.

Synonyms:
Carex spectabilis -Valeriana; Schreiner 1994
Carex spectabilis -Lupinus; Schreiner 1994

Carex spectabilis-(Phyllodoce glanduliflora-Lupinus sellulus var. lobbii) Fellfield Lithomorphic Vegetation

Showy Sedge-(Yellow Mountain Heather-Donner Lake Lupine) Lithomorphic Vegetation



Acronym: CARSPE-(PHYGLA-LUPSEL)

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Carex spectabilis – Dwarf shrub* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs at Mount Rainier National Park, the Olympic Mountains and possibly in the North Cascades.

Plots: 2, MORA (1), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association occurs above treeline (alpine zone) in fellfields with a high cover of surface stones and gravel. Sites are usually southerly facing and relatively gentle slopes with well-drained soils.

Vegetation Description: This sparsely vegetated type is not clearly dominated by any particular species. *Carex spectabilis* is always present and is usually the most abundant species. At Mount Rainier, the dwarf-shrub *Phyllodoce glanduliflora* is typically the next most abundant species. Other typical species include: *Phlox diffusa*, *Penstemon procerus* var. *tolmiei, Penstemon davidsonii*, *Lupinus sellulus var. lobbii* (=*lepidus* var. *lobbii*), *Antennaria alpina*, and *Empetrum nigrum*.

USFWS Wetland System: Not applicable.

Comments: This type is distinguished from the preliminary *Carex spectabilis* Lithomorphic association by its occurrence in alpine, fellfield habitats

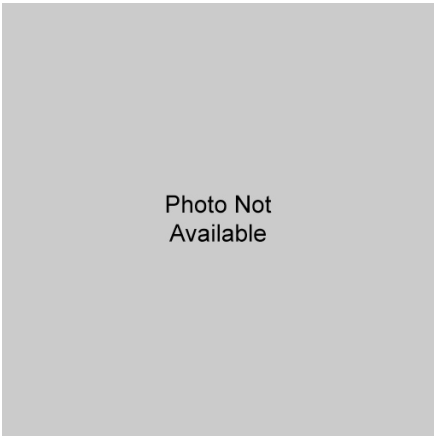
Conservation Rank: S3

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas. Climate change will likely effect this vegetation.

Synonyms:
Carex spectablis - Phyllodoce glanduliflora community; Edwards 1980
Lupinus lepidus-Carex spectabils-Artemisia trifurcata; del Moral 1979
Carex spectabils-Lupinus lepidus-Erigeron aureus; del Moral 1979

Elmera racemosa-(Senecio neowebsteri) Lithomorphic Vegetation

Yellow Coralbells-(Olympic Mountain Ragwort) Lithomorphic Vegetation



Acronym: ELMRAC-(SENNEO) Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Carex spectabilis – Dwarf shrub* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This preliminary association occurs in the Olympics Mountains.

Plots: 19, MORA (0), NOCA (0), OLYM (19), Other (0)

Environmental Description: This very sparsely vegetated association can be found on talus slopes and other loose rocky sites. It occurs at elevations between 1485 and 1980 m (4880 and 6500 ft) on moderately steep slopes.

Vegetation Description: Either *Elmera racemosa* (1.4% average cover) or *Senecio neowebsteri* (2.7% average cover), or both species, occur most abundantly in the sparse cover. *Epilobium anagallidifolium* occurs at most sites. Other species such as *Carex spectabilis* and *Sedum divergens* occur in trace amounts on some sites. These sites may be described as 'pioneer' or early seral vegetation.

USFWS Wetland System: Not applicable.

Comments: Many plots are legacy plots that represent rare plant (*Senecio neowebsteri*) habitat in the sample data. One Olympic legacy sample (that appears as ELMRAC in synthesis tables) has dense herbaceous vegetation dominated by *Elmera racemosa* (85% cover) and *Athyrium americanum*. It may represent a variant of the *Athyrium americanum-Cryptogramma acrostichoides (=crispa)* Lithomorphic association (CEGL005900) rather than a fully vegetated version of this lithomorphic type. *E. racemosa* without *S. neowebsteri* appears in the Cascades.

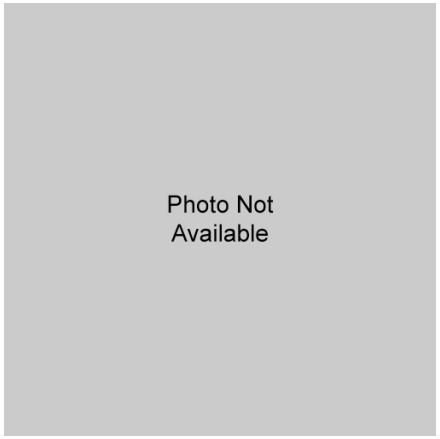
Conservation Rank: S2S3

Rank Justification: This preliminary association occurs within restricted environments with few threats. Sites are on protected land.

Synonyms:
Senecio community; Schreiner 1994

Vaccinium deliciosum Lithomorphic Vegetation

Blueleaf Huckleberry Lithomorphic Vegetation



Acronym: VACDEL Lithomorphic

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Carex spectabilis – Dwarf shrub* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is described from the Olympic and Cascade Mountains.

Plots: 3, MORA (0), NOCA (0), OLYM (2), Other (1)

Environmental Description: This high elevation association occurs on moderately steep slopes. Soils are rocky.

Vegetation Description: *Vaccinium deliciosum* is the most abundant species (3% average cover) in this association. *Carex spectabilis* and *Polygonum bistortoides* are usually present.

USFWS Wetland System: Not applicable.

Comments:

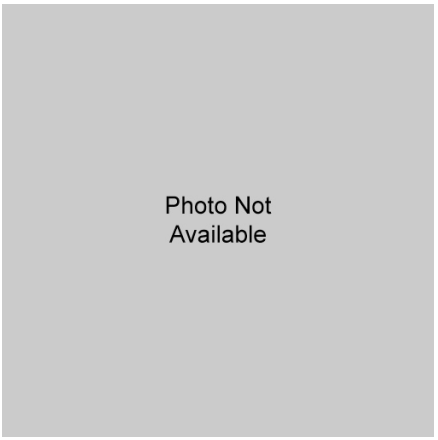
Conservation Rank: S4Q

Rank Justification: This preliminary association probably occurs throughout high elevations in western Washington. Its habitat has few threats.

Synonyms:
Vaccinium Community; Schreiner 1994

Delphinium glareosum Lithomorphic Vegetation

Olympic Larkspur Lithomorphic Vegetation



Acronym: DELGLA

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Delphinum glareosum* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association is described from the Olympic Mountains and Mount Rainier National Park.

Plots: 23, MORA (1), NOCA (0), OLYM (22), Other (0)

Environmental Description: This association occurs at high elevations on ridges, talus, scree slopes and bedrock scoured by glaciers. Surface rocks are common and typically in the 2-10 cm (3/4-4 in) size class. It is found on moderately steep, northwest to south-facing slopes.

Vegetation Description: This open to sparse vegetation typically has *Delphinium glareosum* as the most abundant species (average cover 11%) with few constant associates. *Epilobium anagallidifolium, Phacelia hastata,* and *Lomatium martindalei* contribute little cover but are often present.

USFWS Wetland System: Not applicable.

Comments: There has been limited sampling of sparse and lithomorphic vegetation at MORA and NOCA.

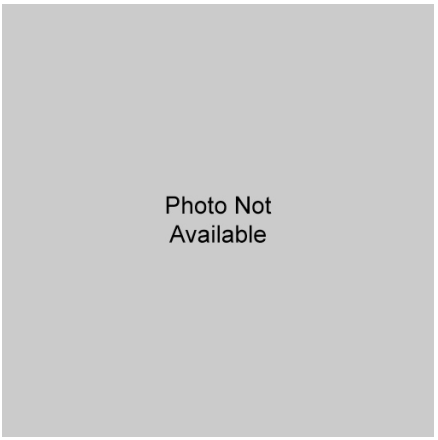
Conservation Rank: S3S4

Rank Justification: This association occurs within a restricted range of environments with few threats. Sites are on protected land.

Synonyms:
Delphinium community; Schreiner 1994

Eriogonum pyrolifolium Lithomorphic Vegetation

Shasta Buckwheat Lithomorphic Vegetation



Acronym: ERIPYR Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Eriogonum pyrolifolium* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Cascade Mountains.

Plots: 4, MORA (0), NOCA (0), OLYM (0), Other (4)

Environmental Description: This association occurs above treeline on north-facing, gentle to moderate slopes with very late snow-melt and well-drained soils.

Vegetation Description: The vegetation is sparse (17% mean cover) and *Eriogonum pyrolifolium* is the most abundant species. *Luzula piperi* is also frequently present. *Oreostemma alpigenum* var. *alpigenum*, *Luetkea pectinata* and *Lupinus (arcticus ssp. subalpinus, latifolius)* are frequently present but less abundant than *Eriogonum pyrolifolium*.

USFWS Wetland System: Not applicable.

Comments: This association is not represented in the current data for national parks in Washington.

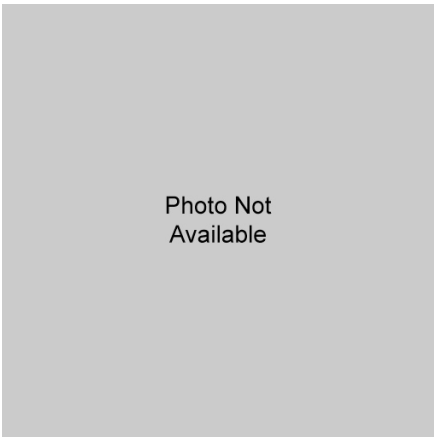
Conservation Rank: S4

Rank Justification: This association occurs within a restricted range of environments with few threats. Sites are on protected land.

Synonyms:
Eriogonum pyrolifolium Sparse Vegetation; Chappell 2005
Eriogonum pyrolifolium-Luzula piperi Community; Douglas and Bliss 1977
Eriogonum/Spraguea Community Type; Henderson 1974

Carex breweri-Carex phaeocephala Fellfield Lithomorphic Vegetation

Brewer's Sedge-Dunhead Sedge Lithomorphic Vegetation



Acronym: CARBRE-CARPHA

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Lupinus sellulus var. lobbii* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is only documented at Mount Rainier National Park.

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

Environmental Description: This fellfield association occurs at very high elevations (i.e. alpine). Sites are generally gentle, south-facing slopes. Fellfields often have diverse species assemblages and relatively high cover of surface stones and gravel.

Vegetation Description: In this sparsely vegetated association, *Carex breweri* and *Carex phaeocephala* are the most abundant species. Typically, this association has relatively low cover of vascular plants (mean 14%). Other species commonly present include: *Polemonium elegans*, *Festuca brachyphylla (=ovina* var. *rydbergii)*, *Smelowskia ovalis*, *Draba lonchocarpa*, and *Poa lettermanii*.

USFWS Wetland System: Not applicable.

Comments: This association may be a high elevation, sparse-to-open variant of the *Carex breweri* alpine turf association.

Conservation Rank: S2S3

Rank Justification: This association occurs within a limited geographic range and environment. Known sites are in protected areas.

Synonyms:
Carex breweri-Carex phaeocephala Community Type; Edwards 1980
Carex breweri-Carex phaeocephala Fellfield Sparse Vegetation; Chappell 2005

Lupinus sellulus var. lobbii-(Erigeron aureus-Minuartia obtusiloba) Lithomorphic Vegetation

Donner Lake Lupine-(Alpine Yellow Fleabane-Alpine Sandwort) Lithomorphic Vegetation



Acronym: LUPSEL-(ERIAUR-MINOBT)

NatureServe Code: CEGL001952

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Lupinus sellulus var. lobbii* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs above treeline at Mount Rainier National Park and in the Olympic Mountains.

Plots: 21, MORA (14), NOCA (0), OLYM (7), Other (0)

Environmental Description: This association occurs above treeline (alpine zone) at Mount Rainier. In the Olympics, it can occur at subalpine elevations on harsh, rocky sites. Sites are flat to gentle slopes with well-drained, often rocky soils.

Vegetation Description: This association is found in patches or strips among stones and/or gravel. *Lupinus sellulus var. lobbii* (=*lepidus* var. *lobbii*) is typically prominent to co-dominant. *Erigeron aureus* and/or *Minuartia (=Arenaria) obtusiloba* are also typically prominent to co-dominant. *Festuca brachyphylla (=ovina* var. *rydbergii)* in the Cascades or *F. saximontana* (=*ovina* var. *brevifolia*) in the Olympic Mountains, along with *Carex phaeocephala*, *Luzula spicata*, *Penstemon procerus*, *Phlox diffusa*, and *Solidago simplex* var. *nana* (=*spathulata*) are frequently present.

USFWS Wetland System: Not applicable.

Comments: This association includes (merges) two NatureServe units: *Minuartia (=Arenaria) obtusiloba - Lupinus sellulus* var. *lobbii* (CEGL001952) and *Erigeron aureus - Lupinus sellulus* var. *lobbii* Herbaceous Vegetation (CEGL001961). Part of the variation of the *Phlox-Carex* community described by Schreiner (1994) is included here.

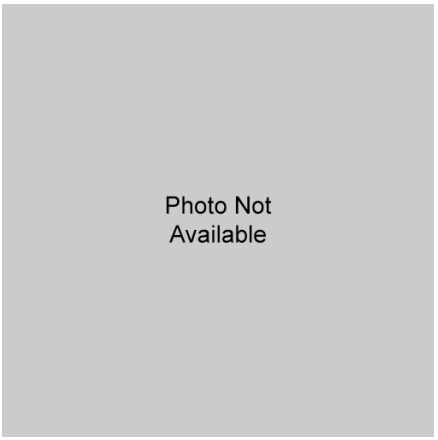
Conservation Rank: S2S3

Rank Justification: This association is restricted to a narrow range of habitats and is represented on protected areas. The association has few threats.

Synonyms:
Arenaria obtusiloba/*Lupinus lepidus* Association; Hamann 1972
Arenaria obtusiloba-Lupinus lepidus var. *lobbii* Community Type;
Erigeron aureus/*Lupinus lepidus* Association; Hamann 1972
Erigeron aureus-Lupinus lepidus var. *lobbii* Community Type;
Lupinus sellulus var. lobbii-(*Erigeron aureus-Minuartia obtusiloba*) Herbaceous Vegetation; Chappell 2005

Arnica X diversifolia Lithomorphic Vegetation

Sticky Arnica Lithomorphic Vegetation



Acronym: ARNXDIV Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is recognized in the Olympic Mountains and may be in the Cascade Mountains.

Plots: 5, MORA (0), NOCA (0), OLYM (5), Other (0)

Environmental Description: This association occurs on moderately steep to steep slopes at high elevations on easterly aspects. Sites are rocky with over 60% ground cover of rocks. Bedrock may be present.

Vegetation Description: *Arnica X diversifolia* is the most abundant (6% average cover) vascular plant in this lithomorphic vegetation type. Although species diversity can be high, only *Achillea millefolium*, *Douglasia laevigata*, *Epilobium anagallidifolium*, *Lomatium martindalei*, *Phlox diffusa*, and *Poa cusickii* show fairly high contancy.

USFWS Wetland System: Not applicable.

Comments: This association is similar to the *Carex spectabilis - Arnica X diversifolia* alpine association described in Glacier Park, Montana (CEGL005867) although the association described here is nearly lacking *Carex spectabilis,* the diagnositc species of the Rocky Mountain type.

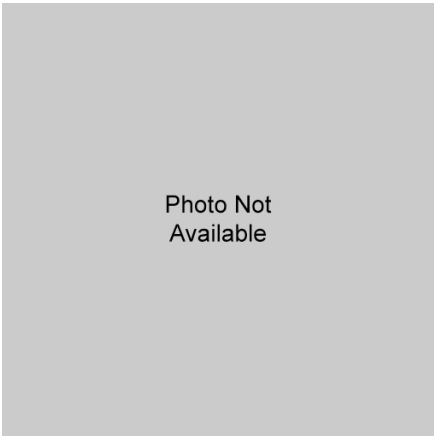
Conservation Rank: S3S4

Rank Justification: This preliminary association occurs within a restricted range with few threats.

Synonyms:

Astragalus cottonii Lithomorphic Vegetation

Cotton's Milkvetch Lithomorphic Vegetation



Acronym: ASTCOT Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs only in the northeastern Olympic Mountains.

Plots: 48, MORA (0), NOCA (0), OLYM (48), Other (0)

Environmental Description: This sparsely vegetated type appears at elevations between 1460 and 1900 m (4800 and 6200 ft) on 16-36% slopes associated with gravelly-sandy, limestone scree. Sites are rocky with some exposed bedrock and mineral soil with a pH 6.0 or higher. Aspects are mostly southwesterly.

Vegetation Description: This lithomorphic vegetation type (average 10% cover) always contains *Astragalus cottonii*. *Phlox diffusa*, *Phacelia sericea*, and *Eriophyllum lanatum* are often present.

USFWS Wetland System: Not applicable.

Comments: All plots are legacy plots that represent rare plant (*Astragalus cottonii*) habitat in the sample data.

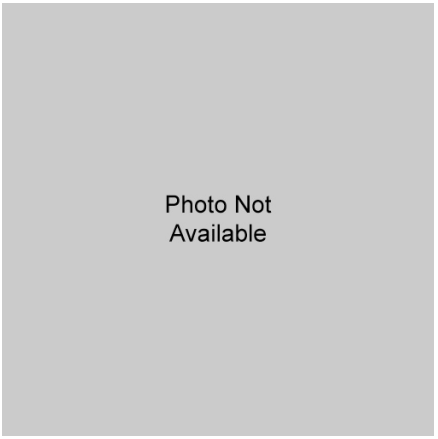
Conservation Rank: S4

Rank Justification: This preliminary association occurs within a restricted range by substrate and geography but has few threats.

Synonyms:
Astragalus community; Schreiner 1994

Dasiphora fruticosa Lithomorphic Vegetation

Shrubby Cinquefoil Lithomorphic Vegetation



Acronym: DASFLO Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs in the Olympic Mountains.

Plots: 14, MORA (0), NOCA (0), OLYM (14), Other (0)

Environmental Description: This association occurs at high elevations. Sites are usually southerly aspects on gentle to moderately steep slopes. In alpine settings, loose rock, although typically not bedrock, dominates the groundcover.

Vegetation Description: *Dasiphora fruticosa ssp. floribunda (=Potentilla fruticosa)* and *Phlox diffusa* are the most abundant species (average cover of 3% each) in this association. *Phacelia sericea*, *Erigeron compositus, Smelowskia calycina, Elymus elymoides*, and *Achillea millefolium* are the most frequent associates.

USFWS Wetland System: Not applicable.

Comments: This sparsely vegetated version of the preliminary *Dasiphora fruticosa*-(*Phlox diffusa*) Dwarf-shrubland is found on very rocky sites. Limited sampling of lithomorphic vegetation has occurred at MORA and NOCA but this association may occur in those parks.

Conservation Rank: S3S5

Rank Justification: This preliminary association may occur over a wide geographic area but it is limited by substrate condition.

Synonyms:
Phlox-Potentilla community; Schreiner 1994

Dasiphora fruticosa-(Phlox diffusa) Dwarf-shrubland

Shrubby Cinquefoil-(Spreading Phlox) Dwarf-shrubland

Acronym: DASFLO-(PHLDIF)

NatureServe Code: Preliminary



Macrogroup: Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Sparse Vegetation

Classification Confidence Level: 2

Range: This association is described from the Olympic and Cascade Mountains.

Plots: 11, MORA (2), NOCA (0), OLYM (9), Other (0)

Environmental Description: This association occurs in the upper subalpine and alpine zones on rocky substrates.

Vegetation Description: This typically open to sparse dwarf-shrub association is dominated by *Dasiphora fruticosa* ssp. *floribunda* (=*Potentilla fruticosa*) with *Phlox diffusa*, *Elymus elymoides* and *Carex phaeocephala* as frequent associates. Other constant, low cover species are *Smelowskia calycina*, *Phacelia sericea* and *Erigeron compositus*.

USFWS Wetland System: Not applicable.

Comments: This association broadly overlaps with the preliminary *Dasiphora fruticosa* ssp. *floribunda* lithomorphic vegetation which is very sparsely vegetated less than 10% over all cover. This association shares landscape setting with *Dasiphora fruticosa* ssp. *floribunda* Subalpine Shrubland (CEGL003499) described in Colorado and New Mexico but differs significantly in associated species.

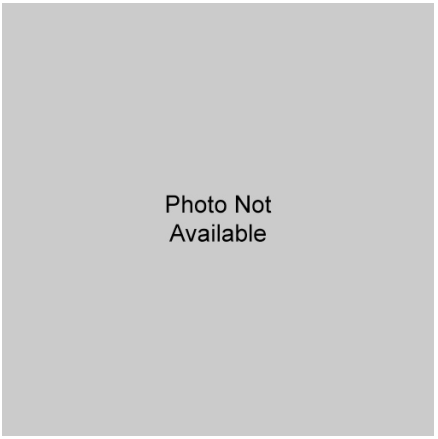
Conservation Rank: S3S4

Rank Justification: This preliminary association occurs within restricted range of environments on protected land.

Synonyms:

Juniperus communis Lithomorphic Vegetation

Common Juniper Lithomorphic Vegetation



Acronym: JUNCOM Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is broadly described from the Olympic Mountains and likely occurs in the Cascades.

Plots: 25, MORA (0), NOCA (0), OLYM (25), Other (0)

Environmental Description: This association occurs at higher elevations, 1675-1990 m (5500-6500 ft), on steep slopes on most aspects. Rocky slopes with exposed bedrock are characteristic features of these sites.

Vegetation Description: *Juniperus communis* is the most abundant species (3-15% cover) in this association. Other species have very low cover (trace to present). *Phlox diffusa* and *Douglasia laevigata* appear with the most constancy (precent of plots). *Penstemon davidsonii*, *F. saximontana* (=*ovina* var. *brevifolia*), *Carex phaeocephala*, *Saxifraga bronchialis*, *Sedum divergens*, or *Erysimum arenicola* are frequently present.

USFWS Wetland System: Not applicable.

Comments: This association is the sparsely vegetated version of the *Juniperus communis-(Phlox diffusa)* association. If this association appears in the Cascades, *Festuca brachyphylla (=ovina* var. *rydbergii)* would be a likely associate.

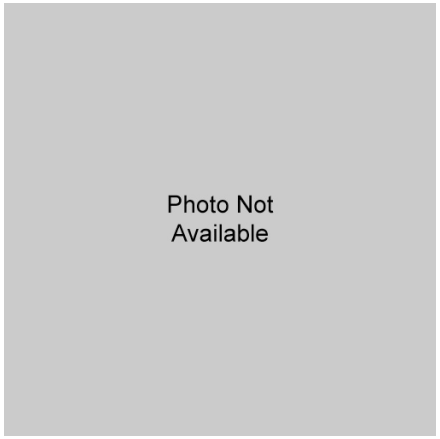
Conservation Rank: S4S5

Rank Justification: This preliminary association occurs within a narrow range of environments with few threats. Sites are on protected land.

Synonyms:
Juniperus – Phlox community; Schreiner 1994

Luina hypoleuca Lithomorphic Vegetation

Littleleaf Silverback Lithomorphic Vegetation



Acronym: LUIHYP

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 11, MORA (0), NOCA (0), OLYM (11), Other (0)

Environmental Description: This association occurs on steep, gravelly slopes to near vertical cliffs at 1220-1980 m (4000 to 6500 ft) elevation. Aspects are southerly. The soil surface has a high cover of mineral soil, rocks or bedrock and can have an abundance of mosses.

Vegetation Description: This sparse to moderately open vascular plant association is dominated or co-dominated by *Luina hypoleuca*. *Phlox* frequently co-dominates. Other species frequently present but with low cover include: *Cryptogramma acrostichoides (=crispa)*, *Lomatium martindalei*, *Silene parryi*, *Achillea millefolium*, *Sedum divergens*, *Douglasia laevigata*, and *Eucephalus (=Aster) paucicapitatus*. *Paxistima (=Pachistima) myrsinites* is the only shrub that appears frequently but when present, it has low cover.

USFWS Wetland System: Not applicable.

Comments: Part of the variation of the *Pachistima- Sedum* and *Pachistima – Phacelia* community described by Schreiner (1994) is included here.

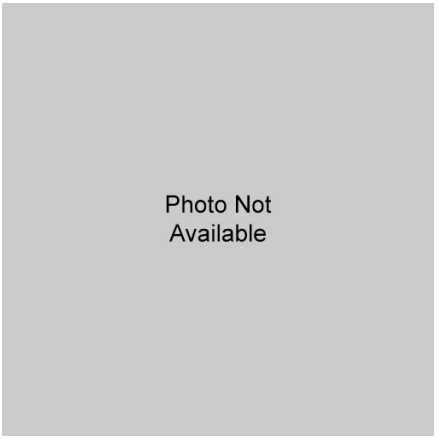
Conservation Rank: S3S4

Rank Justification: This preliminary association is restricted to a narrow range of habitats. It is represented in many protected areas and has few threats.

Synonyms:

Paxistima myrsinites/Sedum divergens Lithomorphic Vegetation

Oregon boxwood/Pacific Stonecrop Lithomorphic Vegetation



Acronym: PAXMYR/SEDDIV Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is described in the Olympic Mountains and likely occurs the Cascades.

Plots: 13, MORA (0), NOCA (0), OLYM (13), Other (0)

Environmental Description: This is a talus and bedrock community. Slopes are southeasterly and moderately steep. Exposed mineral soil, rock and bedrock are characteristic. It is associated with *Abies lasiocarpa* trees near treeline.

Vegetation Description: *Paxistima (=Pachistima) myrsinites* is most abundant (average cover 2.5%) and typically grows in cracks in rocks. *Sedum divergens* may also be abundant (average cover 4%). *Phlox diffusa* is usually present and can be as abundant as *Paxistima*. *Saxifraga bronchialis*, *Penstemon davidsonii*, *Cryptogramma acrostichoides (=crispa)*, *Douglasia laevigata* and *Erysimum arenicola* are frequent associates.

USFWS Wetland System: Not applicable.

Comments:

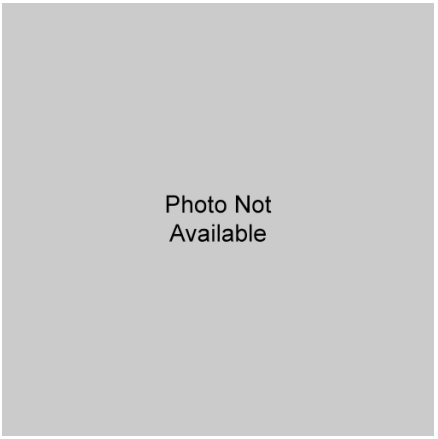
Conservation Rank: S3S4

Rank Justification: This preliminary association is restricted to a narrow range of habitats. It is represented on many protected area and has few threats.

Synonyms:
Pachistima – Sedum community; Schreiner 1994
Pachistima – Phacelia community; Schreiner 1994

Penstemon davidsonii Lithomorphic Vegetation

Davidson's Penstemon Lithomorphic Vegetation



Acronym: PENDAV Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Olympic and Cascade Mountains.

Plots: 15, MORA (1), NOCA (0), OLYM (14), Other (0)

Environmental Description: This association is found in open, rocky areas such as active and stabilized scree and bedrock. It occurs on moderately steep slopes on all, but most frequently westerly, aspects at mid- to high elevation.

Vegetation Description: *Penstemon davidsonii* is the most abundant plant in this sparsely vegetated association. *Phlox diffusa* is the most frequent associate. *Erysimum arenicola*, *Douglasia laevigata, and Lomatium martindalei* also occur, but with low cover. Mosses/lichen cover can be prominent on more stabilized sites.

USFWS Wetland System: Not applicable.

Comments: Part of the variation of the *Juniperus–Phlox* community described by Schreiner (1994) is included here.

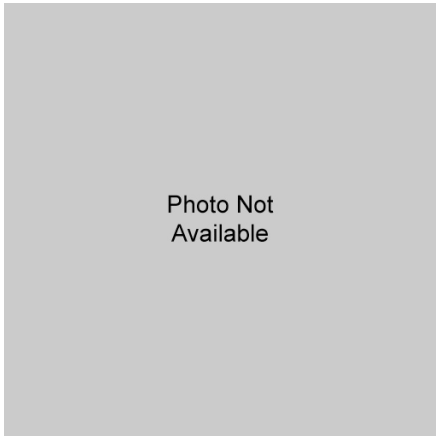
Conservation Rank: S4

Rank Justification: This preliminary association is restricted to a narrow range of habitats, is represented in many protected areas, and has few threats.

Synonyms:

Petrophyton hendersonii Lithomorphic Vegetation

Olympic Rockmat Lithomorphic Vegetation



Acronym: PETHEN

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs in the Olympic Mountains.

Plots: 4, MORA (0), NOCA (0), OLYM (4), Other (0)

Environmental Description: This association occurs on rocky cliffs and talus slopes at mid- to high elevations.

Vegetation Description: This is primarily a cliff or rock crevice association with *Petrophyton hendersonii* occurring most abundantly (average cover 12%). *Phlox diffusa*, *Hedysarum occidentale* and *Saxifraga bronchialis* occur occasionally and are usually present to prominent.

USFWS Wetland System: Not applicable.

Comments: All plots are legacy plots which represent sampled rare plant (*Petrophyton hendersonii*) habitat. It is, environmentally, within the variation of the *Pachistima – Sedum* community of Schreiner (1994).

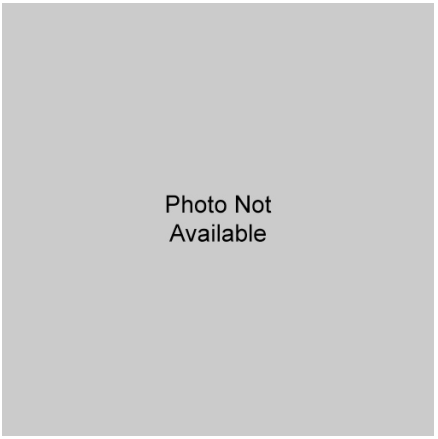
Conservation Rank: S2S3

Rank Justification: This preliminary Olympic endemic association is restricted to a narrow range of habitats, is represented on protected area, and has few threats.

Synonyms:

Phlox diffusa-Allium crenulatum Lithomorphic Vegetation

Spreading Phlox-Olympic Onion Lithomorphic Vegetation



Acronym: PHLDIF-ALLCRE Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs in the northeast Olympic Mountains.

Plots: 10, MORA (0), NOCA (0), OLYM (10), Other (0)

Environmental Description: This association occurs mostly in the subalpine on steep to moderately steep slopes. Mineral soil and rock are common with frequent exposed bedrock.

Vegetation Description: *Phlox diffusa* and *Allium crenulatum* are the most abundant species in this sparsely vegetated association (3% and 5% average cover respectively). *Festuca roemeri (=idahoensis)* is frequently present in similar abundance as the two indicator species. Other common species are *Lomatium martindalei*, *Campanula rotundifolia,* and *Elymus elymoides*.

USFWS Wetland System: Not applicable.

Comments: This association is related to the preliminary *Phlox diffusa* Lithomorphic Vegetation differing primarily in the species listed above.

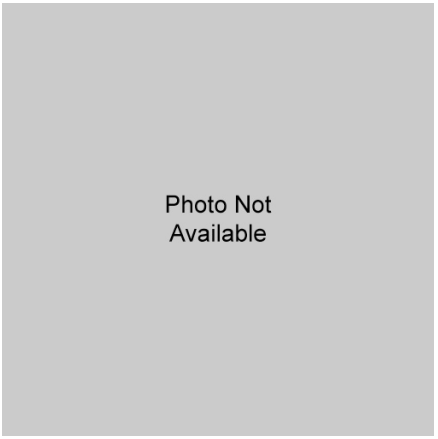
Conservation Rank: S3

Rank Justification: This preliminary association occurs at few sites, is represented on protected areas and has few threats.

Synonyms:
*Phlox-Festuc*a community, Schreiner 1994

Phlox diffusa Lithomorphic Vegetation

Spreading Phlox Lithomorphic Vegetation



Acronym: PHLDIF Lithomorphic

NatureServe Code: Preliminary

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association occurs in the Olympic Mountains and very likely may occur in the Cascades.

Plots: 34, MORA (0), NOCA (0), OLYM (34), Other (0)

Environmental Description: This association occurs on a range of harsh sites including: cliff faces, talus, and scree slopes between 1520-2040 m (5000 and 6700 ft) elevation.

Vegetation Description: *Phlox diffusa* is the most abundant plant (3% average cover) in the sparse vegetation. Diversity and cover are generally low in this association. *Douglasia laevigata* and *Paxistima (=Pachistima) myrsinites* are frequently present.

USFWS Wetland System: Not applicable.

Comments: Documented plots are from high elevations. With additional sampling, this concept may apply to lower elevation sparsely vegetated sites containing few species other than *Phlox diffusa.*

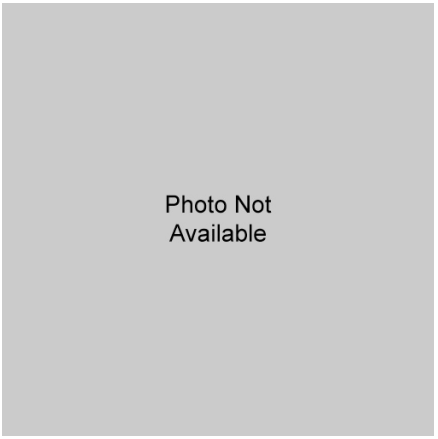
Conservation Rank: S4

Rank Justification: This preliminary association occurs at many sites, is represented on protected areas and has few threats.

Synonyms:

Saxifraga bronchialis Lithomorphic Vegetation

Yellowdot Saxifrage Lithomorphic Vegetation



Acronym: SAXBRO Lithomorphic

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Phlox diffusa - Lomatium martindalei* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association is described from the Olympic Mountains and very likely occurs in the Cascade Mountains.

Plots: 3, MORA (0), NOCA (0), OLYM (3), Other ()

Environmental Description: This rock association occurs near treeline at mid-elevations on moderately steep slopes. Bedrock and exposed rock are characteristic of these sites.

Vegetation Description: *Saxifraga bronchialis* is the most abundant species in this sparsely vegetated association (average 5% total cover). *Phlox diffusa*, *Sedum divergens*, *Achillea millefolium* and *Douglasia laevigata* frequently appear with low prominence.

USFWS Wetland System: Not applicable.

Comments: Part of the variation of the *Juniperus–Phlox* community described by Schreiner (1994) is included here.

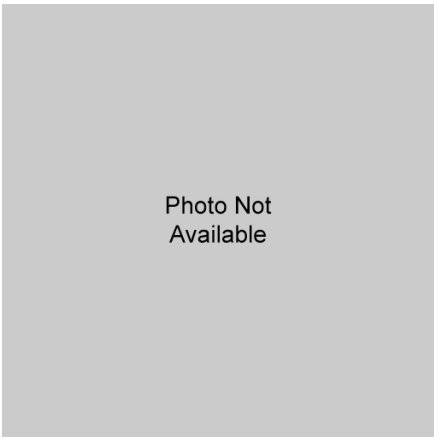
Conservation Rank: S2S4

Rank Justification: This preliminary association appears to have a narrow geographic and environmental range but occurs on habitats with few threats.

Synonyms:

Poa stenantha-Cerastium arvense Lithomorphic Vegetation

Northern Bluegrass-Field Chickweed Lithomorphic Vegetation



Acronym: POASTE-CERARV

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Poa stenantha* Lithomorphic Vegetation

Classification Confidence Level: 3

Range: This association is described from a single site in the Olympic Mountains.

Plots: 1, MORA (0), NOCA (0), OLYM (1), Other (0)

Environmental Description: This association appears on rock shelves on stable slopes at 1555 m (5100 ft) elevation. Litter and duff is more abundant than exposed rock.

Vegetation Description: This grass-forb community is surrounded by forest. *Poa stenantha*, *Cerastium arvense*, and *Achillea millefolium* co-dominate the open vegetation. *Trisetum spicatum*, *Phlox diffusa*, *Campanula rotundifolia, Poa secunda (=sandbergii)*, and *Montia parvifolia* are abundant associates.

USFWS Wetland System: Not applicable.

Comments: This tentative association is represented by a single Olympic legacy plot and more sampling is needed.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this tentative association.

Synonyms:

Polygonum minimum-Racomitrium elongatum Lithomorphic Vegetation

Broadleaf Knotweed-Racomitrium Moss Lithomorphic Vegetation



Acronym: POLMIN-RACELO Lithomorphic

NatureServe Code: Provisional

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Racomitrium elongatum* Lithomorphic Vegetation.

Classification Confidence Level: 3

Range: This association is described from one plot sampled at Mount Rainier National Park.

Plots: 1, MORA (1), NOCA (0), OLYM (0), Other (0)

Environmental Description: This single plot is a small bald located on bedrock sloping down to a river.

Vegetation Description: This association is a moss-dominated community of almost exclusively *Racomitrium elongatum.* It is also sparsely vegetated by vascular plants *Polygonum minimum* and *Sedum divergens*. The bald is surrounded by forests of *Abies amabilis* and *Cupressus (=Chamaecyparis) nootkatensis*.

USFWS Wetland System: Not applicable.

Comments: This is a mapping plot that may provisionally represent all moss-dominated rock balds.

Conservation Rank: SUQ

Rank Justification: Insufficient information exists to rank this provisional type.

Synonyms:

Saxifraga tolmiei-Luzula piperi Lithomorphic Vegetation

Tolmie's Saxifrage-Piper's Woodrush Lithomorphic Vegetation



Acronym: SAXTOL-(LUZPIP) Lithomorphic

NatureServe Code: CEGL001986

Macrogroup: Vancouverian Alpine Cliff, Scree & Other Rock Vegetation

Group: North Pacific Alpine and Subalpine Bedrock and Scree

Alliance: *Saxifraga tolmiei* Lithomorphic Vegetation

Classification Confidence Level: 2

Range: This association occurs in the Cascade and Olympic Mountains.

Plots: 11, MORA (3), NOCA (0), OLYM (5), Other (3)

Environmental Description: This association occurs at high elevations on snowbed sites with a very long-lasting snowpack. In subalpine parklands, the association tends to occur on north-facing slopes. In the alpine zone, above treeline, the assoication occurs on gentle to moderate slopes with a greater variety of aspects.

Vegetation Description: The vegetation is sparse, less than 25% total cover, and is characterized by the prominence of *Saxifraga tolmiei*. *Luzula piperi* is usually present to prominent in the North Cascades but is less frequent at Mount Rainier. *Luetkea pectinata*, *Carex spectabilis*, *Carex nigricans* or *Juncus drummondii* are usually present but are less abundant than *Saxifraga tolmiei* or *Luzula piperi*.

USFWS Wetland System: Not applicable.

Comments: This association and the *Luetkea pectinata* - *Saxifraga tolmiei* Herbaceous Vegetation (CEGL001918) are similar and may represent the same association.

Conservation Rank: S4

Rank Justification: This association appears to have a narrow environmental range but occurs on habitats with few threats. Climate change will likely effect this vegetation.

Synonyms:
Eriogonum pyrolifolium-Saxifraga tolmiei Community; Edwards 1980
Saxifraga tolmiei Association; Hamann 1972
Saxifraga tolmiei Community; Douglas 1972
Saxifraga tolmiei Community Type; Henderson 1974
Saxifraga tolmiei-Luzula piperi Community Type; Douglas and Bliss 1977
Saxifraga tolmiei-Luzula piperi Sparse Vegetation; Chappell 2005
Luetkea -Saxifraga community; Schreiner 1994

Appendix B. Preliminary key to wetland and riparian plant associations of the Mount Rainier, North Cascades and Olympic National Parks.

Forested, scrub-shrub, and herbaceous wetlands and riparian areas are often highly diverse in species composition and vegetation pattern, and are very often complex in their spatial pattern on the landscape. Patches of homogeneous vegetation are typically quite small. Sampling therefore requires a large number of plots. Because wetlands have not been the subject of much vegetation sampling in these parks to date, currently little data exists upon which to base a vegetation classification. However, likely wetland and riparian plant associations in MORA, NOCA and OLYM are described from adjacent areas.

The following is a preliminary key and includes expected associations for MORA, NOCA and OLYM *with the exception of Lake Chelan NRA*. The key also includes riparian and wetland associations included in Appendix A with a cross-reference back to that document for each type. The key is arranged by major wetland ecosystem types. Brief bullets are included on how to identify each type, which park it may occur in, and number of plots in parks and NatureServe Code and state rank, if present.

KEY TO PLANT ASSOCIATIONS OF MOUNT RAINIER, NORTH CASCADES, AND OLYMPIC NATIONAL PARKS

Instructions:

1. Select a relatively uniform area of vegetation and topography to key out. A representative 1/10 acre plot is a simple way to examine a stand, just be sure the plot represents the stand of interest.
2. "Present" means the species is typically found on a representative 1/10 acre plot, i.e. it regularly occurs in the stand.
3. If the stand or plot meets the criteria in a line, then read to the right or (if blank) to the next indented line down. If the stand or plot does not meet the criteria, then go to the next line down that is not indented from the current line.
4. Some associations key to multiple different lines. For associations that may be distinguished by any one of a number of different characteristics, the criteria are broken into multiple lines so as to avoid excessive and confusing use of "and" and "or" statements. Go to the next line down if the criteria is not met.
5. Percentage values refer to crown cover, that is, the vertical projection below the entire crown of the plant, do not subtract for spaces between leaves and branches
6. "+" = add the crown cover of each of the species indicated, e.g. 7+22 = 29% cover, overlap between the species gets counted twice. One species may be absent.
7. The key is not the classification. After you have keyed out a stand, always read the association description of vegetation composition, geographic distribution, and physical environment. If it sounds like it fits in most regards, you have made a correct identification. If there are multiple inconsistencies between the stand and the description, the key probably was incorrect. In this case, you probably need to try the key again and follow slightly different leads or identify the stand by reading the descriptions. There are also many undescribed communities in the area and the key does not deal with non-forested wetlands or riparian communities for the most part, so the vegetation you are looking at may be an undescribed type.
8. Park where the association is located or likely located is listed at each selection as MORA, NOCA or OLYM.

KEY TO PHYSIOGNOMIC CATEGORIES: (page numbers refer to key)

Trees > 25%, or stand is a tree island in subalpine parkland

Deciduous broadleaf trees clearly > canopy cover than conifer trees ..... **Key to Deciduous Forest Types p. 4**

Conifer trees approximately equal in canopy cover or > than deciduous broadleaf trees ..... **Key to Conifer Forest and Woodland Types p. 5**

Shrubs (taller than 0.5 m) or dwarf-shrubs (shorter than 0.5 m) >25% or shrub-form trees (krummholz) > 25%

Site occurs in a landform where groundwater discharge, seasonally high water tables, and/or overbank flooding heavily influence vegetation composition (e.g. seeps/springs, depressions, riparian areas); soils can be organic (fibrous or woody peat or muck) or mineral; includes shrub swamps and fens. ..... **Key to Shrub Swamp & Fen Types, p.** 7

Site occurs in an upland environment such as steep slopes, rocky and/or well-drained soils, or other areas where surface and/or groundwater do not affect vegetation composition ..... **Key to Upland Shrubland Types, Appendix A**

Herbaceous Vegetation > 25%

Site occurs in a landform where surface water accumulates or groundwater discharges (e.g. marsh, wet meadow, fen, or aquatic bed); may be near late-lying snowbeds; water table near, at, or above soil surface for significant portion of growing season; soil very moist to saturated, although may be dry in late summer/early fall; organic soils may be present; .... **Key to Herbaceous Wetland Types, p. 11**

Site occurs in an upland environment (steep slopes, rocky and/or well-drained soils, other areas where surface and/or groundwater do not affect vegetation); may be near early melting snowbeds; soils are rarely saturated (and if so, only in early spring) but can be moist; organic soils or even organic soil horizons not present; ..... **Key to Herbaceous Upland Vegetation Appendix A**

Herbaceous Vegetation < 25%..... **Key to Bryophyte and Sparse Vegetation Types Appendix A**

KEY TO PRELIMINARY WETLAND AND RIPARIAN DECIDUOUS FOREST TYPES (the following types are also in the Appendix A key; refer to Appendix A for descriptions)

Populus balsamifera or Acer macrophyllum > 25%
- Populus balsamifera, Picea sitchensis, and Oxalis oregana each > 5% OLYM ..... **POPBAL-PICSIT-(ACEMAC)/OXAORE**

- Populus balsamifera dominant
  - Cornus sericea > 10% NOCA ..... **POPBAL/CORSER**
  - Gaultheria shallon >10% Polystichum munitum > 10% MORA ..... **POPBAL/GAUSHA/POLMUN**
  - Carex obnupta >10% OLYM ..... **POPBAL-ALNRUB/CAROBN**
  - Lahar or debris flow surface MORA ..... **POPBAL-ALNRUB/RUBURS-EQUARV**
  - Alnus incana > 10% NOCA ..... **POPBAL/ALNINC**
  - Not as above ..... **variation in types above or represents an undescribed type**

- Acer macrophyllum dominant
  - Rubus spectabilis > 10% MORA NOCA OLYM ..... **ACEMAC/RUBSPE**
  - Oxalis oregana each > 3% OLYM ..... **ACEMAC/OXAORE**
  - Riparian Polystichum munitum > 10% Tolmiea menziesii present OLYM ..... **ACEMAC/POLMUN-TOLMEN**

- Not as above see possible types represented by 1 plot ..... **ACEMAC/MAISTE or variation in types above or represents an undescribed type**

Alnus rubra dominant
- Carex obnupta or Lysichiton americanus > 5% wetland
  - Carex obnupta present and > Athyrium filix-femina OLYM **ALNRUB/RUBSPE/CAROBN-LYSAME**
  - Athyrium filix-femina present and > Carex obnupta MORA NOCA OLYM ..... **ALNRUB/ATHFIL-LYSAME**

- Chrysosplenium glechomifolium > 10% riparian OLYM ..... **ALNRUB/RUBSPE/CHRGLE**

- Understory dominated by grasses and/or Rubus ursinus, and Elymus glaucus or E. hirsutus > 1% riparian MORA NOCA OLYM ..... **ALNRUB/ELYGLA**

- Shrubs > 20% and site is riparian or wetland
  - Oplopanax horridus > 10% MORA NOCA OLYM ..... **ALNRUB/OPLHOR-RUBSPE**
  - Rubus parviflorus the dominant shrub MORA NOCA OLYM ..... **ALNRUB/RUBPAR**
  - Rubus spectabilis + Ribes bracteosum > 20% MORA NOCA OLYM ..... **ALNRUB/RUBSPE**
  - Acer circinatum dominant Oxalis oregana >5% MORA OLYM ..... **ALNRUB/OXAORE**
  - Acer circinatum dominant, not as above MORA NOCA OLYM ..... **ALNRUB/ACECIR/CLASIB**
  - Alnus viridis dominant shrub MORA NOCA OLYM ..... **ALNRUB/ALNVIR**
  - Salix sitchensis dominant shrub, riparian OLYM MORA ..... **SALSIT/EQUARV-PETFRI**

- Shrubs < 20% and site is riparian or wetland
  - Petasites frigidus > 10% MORA NOCA OLYM ..... **ALNRUB/PETFRI**
  - Oxalis oregana or trillifolia the dominant herb ..... **ALNRUB/OXAORE**
  - Tolmiea menziesii, Stachys chamissonis var. cooleyae and/or Claytonia sibirica dominant MORA NOCA OLYM ..... **ALNRUB/STACHA-TOLMEN**
  - Glyceria striata (=elata) the dominant herb MORA NOCA OLYM ..... **ALNRUB/GLYSTR**

- Not as above ..... **variation in types above or represents an undescribed type**

KEY TO PRELIMINARY WETLAND AND RIPARIAN CONIFEROUS FOREST TYPES (the following types are also in the Appendix A key; refer to Appendix A for descriptions)

Picea sitchensis > 10%
- Tsuga heterophylla <25% Populus balsamifera >5% Oxalis oregana >5% valley bottom OLYM ..... **POPBAL-PICSIT-(ACEMAC)/OXAORE**
- Carex obnupta or Lysichiton americanus > 5% and Carex obnupta present wetland OLYM ..... **PICSIT/RUBSPE/CAROBN-LYSAME**
- Oplopanax horridus > 10% riparian OLYM ..... **PICSIT-TSUHET-(ALNRUB)/OPLHOR/POLMUN**
- Oxalis oregana > 5% OLYM ..... **PICSIT-TSUHET/POLMUN-OXAORE**
- Polystichum munitum > 5% MORA OLYM ..... **PICSIT-TSUHET/POLMUN**
- Scirpus microcarpus or Glyceria striata (=elata) >10% wetland OLYM ..... **PICSIT/SCIMIC**
- Not as above ..... **variation in types above or represents an undescribed type**

Tsuga mertensiana > 10%, or stand is a tree island in subalpine parkland with Tsuga mertensiana > 5%
- Oplopanax horridus > 5% MORA NOCA OLYM ..... **ABIAMA-TSUMER/OPLHOR**
- Caltha leptosepala > 10% wet site NOCA OLYM ..... **TSUMER-ABIAMA/CALLEP**
- Not as above ..... **variation in types above or represents an undescribed type**

Abies amabilis or Abies procera > 10%
- Lysichiton americanus > 5%
  - Gaultheria shallon > 10% and Thuja plicata > 20% wetland MORA OLYM ..... **TSUHET-THUPLI/GAUSHA/LYSAME**
  - Not as above, Vaccinium alaskaense >5% wetland NOCA OLYM ..... **TSUHET-ABIAMA/VACALA/LYSAME**
- Oplopanax horridus > 5%
  - Cupressus nootkatensis >50% of total tree cover and site is an avalanche chute or slope ..... MORA NOCA OLYM ..... **CUPNOO/OPLHOR-(ALNVIR)**
  - Site type not an avalanche chute or Chamaecyparis nootkatensis <50% of total tree cover MORA NOCA OLYM ..... **ABIAMA-TSUHET/OPLHOR**
- Rubus spectabilis > 10% and valley bottom sites riparian OLYM ..... **ABIAMA/RUBSPE-VACALA**
- Not as above ..... **variation in types above or undescribed type**

Tsuga heterophylla or Thuja plicata > 10%
- Ledum groenlandicum + Kalmia microphylla > 10% wetland
  - Pinus contorta the dominant tree MORA NOCA OLYM ..... **PINCON/LEDGRO/SPHAGN**
  - Tsuga heterophylla or Thuja plicata the dominant tree wetland MORA NOCA OLYM ..... **TSUHET-(THUPLI)/LEDGRO/SPHAGN**
- Lysichiton americanus > 5% wetland
  - Gaultheria shallon and Thuja plicata each > 10%
    - Sphagnum spp. >10%, open woodland with stunted trees OLYM ..... **THUPLI-TSUHET/LYSAME/SPHAGN**
    - Not as above MORA OLYM ..... **TSUHET-THUPLI/GAUSHA/LYSAME**

Rubus spectabilis or Athyrium filix-femina present OLYM ..... **TSUHET-(THUPLI-ALNRUB)/LYSAME-ATHFIL**

Oplopanax horridus > 5% riparian MORA NOCA OLYM ..... **TSUHET-PSEMEN-(THUPLI)/OPLHOR/POLMUN**

Not as above ..... **variation in types above or represents an undescribed type**

Abies lasiocarpa > 10%, or stand is a tree island in subalpine parkland with Abies lasiocarpa > 5%, or Picea engelmannii > 10% and > Abies grandis

Rubus spectabilis > 10% riparian OLYM..... **ABILAS/RUBSPE**

Not as above ..... **variation in types above or represents an undescribed type**

Cupressus (Chamaecyparis) nootkaensis >10%

Oplopanax horridus > 5% and site is an avalanche chute or slope MORA NOCA OLYM ..... **CUPNOO/OPLHOR-(ALNVIR)**

Valeriana sitchensis > 5% MORA NOCA OLYM ..... **CUPNOO/VALSIT**

Tiarella trifoliata + Streptopus lanceolatus + Rubus pedatus > 2% often avalanche MORA NOCA OLYM..... **CUPNOO/STRLAN**

Not as above, see possible types represented by 1 plot ..... **CUPNOO/RIBLAC, p. 18 CUPNOO/VACDEL, p. 18 CUPNOO-PSEMEN/ACECIR**

Abies grandis > 10%

Oplopanax horridus > 5% MORA NOCA OLYM ... **TSUHET-PSEMEN-(THUPLI)/OPLHOR/POLMUN**

Not as above ..... **variation in types above or represents an undescribed type**

Pseudotsuga menziesii > 10%

Pinus contorta > 25% ..... **Pinus contorta key (below)**

Symphoricarpos albus > 5% Acer circinatum >2% riparian NOCA **PSEMEN-PINPON-POPBAL/ACECIR**

Not as above ..... **variation in types above or represents undescribed type**

Pinus contorta > 10%

Ledum groenlandicum + Kalmia microphylla > 10% wetland MORA NOCA OLYM..... **PINCON/LEDGRO/SPHAGN**

Not as above ..... **variation in types above or represents an undescribed type**

KEY TO SHRUB and DWARF-SHRUB SWAMP AND FEN TYPES

Betula nana >25%; Carex aquatilis var. dives the dominant herb ..... **BETNAN/CARAQUD**

Betula nana/Carex aquatilis var. dives Shrubland

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- BETNAN >25%, CARAQUD the dominant herb
- Montane, possible in lowlands as well, occurs in fens (e.g. shrub-carr)

Cornus sericea dominant, riparian or swamp..... **CORSER Appendix A**

Rhynchospora alba >10% and dominant vascular plant; Vaccinium oxycoccos sometimes codominant; .....**RHYALB-(VACOXY) / SPHAGN**

Rhynchospora alba - (Vaccinium oxycoccus)/Sphagnum spp. Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- RHYALB >10% and the dominant herb, Sphagnum >5%, VACOXY sometimes codominant as dwarf-shrub
- Lowlands in bogs and poor fens

Ledum groenlandicum and/or Kalmia microphylla >25%; Myrica gale absent or <10%; low elevation, bogs and poor fens OLYM .....**LEDGRO-KALMIC/SPHAGN, Appendix A**

Kalmia microphylla (dwarf form) >5%; Carex nigricans usually present & often dominant; high montane to subalpine, wet meadows MORA ..... **KALMIC-CARNIG, Appendix A**

Ledum groenlandicum and Myrica gale each >15% ..... **LEDGRO-MYRGAL/SPHAGN**

Ledum groenlandicum - Myrica gale / Sphagnum spp. Shrubland

NatureServe Code: CEGL003335

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- LEDGRO and MYRGAL each >15%, Sphagnum >10%
- Low elevation west side of Olympics in bog and fens
- S1

Malus fusca >25% and dominant shrub; Salix hookeriana absent..... **MALFUS**

Malus fusca Shrubland

NatureServe Code: CEGL003385

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- MALFUS >25% and the dominant shrub, SALHOO absent
- Lowlands to low montane, can occur around edges of bogs and fens
- S2S3

Myrica gale >5%; Boykinia intermedia >1%; Carex obnupta >1%.....**MYRGAL/BOYINT-CAROBN**

Myrica gale/Boykinia intermedia-Carex obnupta Shrubland

NatureServe Code: CEGL003336

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- MYRGAL >5% BOYINT >1%, CAROBN >1%
- Can be shrubland or species rich herbaceous vegetation with scattered shrubs or dwarf-shrubs
- Lake Ozette in shrub swamps
- S2

Myrica gale >25% and dominant shrub; Carex aquatilis var. dives or C. utriculata >5%..... ..... **MYRGAL/CAR(AQUD , UTR)**

Myrica gale / Carex (aquatilis var. dives, utriculata) Shrubland

NatureServe Code: CEGL003376

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MYRGAL >25% and the dominant shrub
- CARAQUDIV or CARUTR >5%
- Low elevations, mostly west Olympic, possible elsewhere, in shrub swamps, fen (carr)
- S2

Myrica gale dominant; Sphagnum >10%..... **MYRGAL/SANOFF/SPHAGN**

Myrica gale / Sanguisorba officinalis / Sphagnum spp. Shrubland

NatureServe Code: CEGL003419

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MYRGAL dominant, Sphagnum >10%
- Low elevation west side of Olympics in bogs and poor fens
- S1

Myrica gale >25%; Spiraea douglasii >10%; Sphagnum >5% ..... **MYRGAL-SPIDOU/SPHAGN**

Myrica gale-Spiraea douglasii/Sphagnum spp. Shrubland

NatureServe Code: CEGL003420

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MYRGAL >25%, SPIDOU >10%, Sphagnum >5%
- Lowlands in bogs and poor fens
- S2

Salix commutata >25% and dominant shrub mid-montane and subalpine fens (carr)
MORA NOCA OLYM ..... **SALCOM, Appenidx A**

Salix hookeriana and Malus fusca both present; one or both dominant; Carex obnupta >10%, Lysichiton americanum present..... **SALHOO-MALFUS/CAROB**

Salix hookeriana - Malus fusca / Carex obnupta – Lysichiton americanus Shrubland

NatureServe Code: CEGL003432

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MALFUS and SALHOO both present, one or both dominant
- CAROBN >10%, LYSAME present
- Outer coast only
- S2

Salix hookeriana or sitchensis and Spiraea douglasii codominant ..... **SAL(HOO or SIT)-SPIDOU**

Salix (hookeriana, sitchensis)-Spiraea douglasii Shrubland

NatureServe Code: CEGL003386

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- Salix spp and SPIDOU codominant
- Lowlands, possibly to low-montane
- Some confusion on outer coast in relation to Salix hookeriana - Malus fusca / Carex obnupta – Lysichiton americanus
- S3

Salix sitchensis > 10% Petasites frigidus > 10% riparian MORA NOCA OLYM ..... **SALSIT/EQUARV-PETFRI**

Salix sitchensis dominant; Equisetum arvense and Petasites frigidus absent; MORA NOCA OLYM ..... **SALSI**

Salix sitchensis Shrubland

NatureServe Code: CEGL002896

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SALSIT dominant, many other spp possible, LYSAME usually present
- Lowlands to mid-montane wetlands, wetter than SALSIT/EQUARV-PETFRI
- S3

Spiraea douglasii dominant; Carex aquatilis var. dives absent ..... **SPIDOU, p.**

Spiraea douglasii Shrubland

NatureServe Code: CEGL001129

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SPIDOU dominant, CARAQUDIV absent
- Lowland to mid-montane, swamps or carrs or edges of bogs
- S5

Spiraea douglasii >10% and dominant shrub; Carex aquatilis var. dives >5% ..... **SPIDOU/CARAQUD, p.**

Spiraea douglasii / Carex aquatilis var. dives Shrubland

NatureServe Code: CEGL003415

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SPIDOU the dominant shrub and >10%, CARAQUDIV >5%
- Lowlands, fen/carr
- Usually shrubland but can be herbaceous vegetation with scattered shrubs
- S2S3

Acer circinatum the dominant shrub
Rubus spectabilis, Oplopanax horridus, Athyrium filix-femina, Tolmiea menziesii, Maianthemum stellatum, or Stachys chammisonis present, riparian MORA NOCA OLYM ..... **ACECIR/ATHFIL-TOLMEN, Appendix A**

Rubus parviflorus the dominant shrub and Rubus spectabilis present, riparian MORA NOCA OLYM ..... **RUBPAR-RUBSPE, Appendix A**

Oplopanax horridus > 10% riparian MORA NOCA OLYM ..... **OPLHOR, Appendix A**

Rubus spectabilis and/or Ribes bracteosum dominant riparian MORA NOCA OLYM ....**RUBSPE-RIBBRA, Appendix A**

Spiraea splendens >10% dominant Carex lenticularis > 10% ..... **SPLSPL/CARLEN**

Spiraea splendens/Carex lenticularis Shrubland

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SPISPL the dominant shrub and >10%, CARLEN >10%
- Lowlands, fen/carr
- Usually dwarf-shrubland but could be herbaceous vegetation with scattered shrubs

Not as above..... **variation in types above or undescribed types**

KEY TO PRELIMINARY HERBACEOUS WETLAND TYPES

Site is aquatic and permanently flooded; standing water can be up to several feet above the soil surface; rooted vegetation may be submerged or emergent; some vegetation may be or appear to be floating; includes ponds, lakes, oxbows, etc.; Characteristic species include Utricularia, Brasenia, Elodea, Nuphar, Potamogeton, Ranunculus (aquatilis), Sparganium, and Lemna. ..... **Key to Aquatic Bed Vegetation, p. 11**

Site is seasonally to semi-permanently flooded; vegetation typically taller than in wet meadows or fens; topography flat or nearly so; includes marshes found along perimeter of beaver ponds, lakes, and in depressions; Characteristic species include Carex exsiccata, C. obnupta, Hippuris vulgaris, Schoenoplectus (acutus, tabernaemontani, Juncus effusus, Menyanthes trifoliata, Oenanthe sarmentosa ..... **Key to Freshwater Marsh Vegetation, p. 13**

Site has organic soils; standing water, if present, rarely more than a few inches above the soil surface; soils are typically saturated year-round; some sites may have hummocks; Sphagnum or "brown" mosses may be abundant; Graminoids typically dominate but forbs can be abundant; Characteristic species include Carex aquatilis var. dives, C. utriculata, C. livida, C. nigricans, C. limosa, C. lenticularis, C. interior, C. utriculata, C. exsiccata, Dulichium arundinaceum, Eleocharis quinqueflora, E. palustris, Trichophorum caespitosum, Rhynchospora alba, Eriophorum spp., Comarum palustre, Calamagrostis canadensis, Menyanthes trifoliata., and Caltha leptosepala. **Key to Bog or Fen Vegetation, p. 15**

Site has mineral soils; seasonal standing water may be present early in the growing season; sites typically dry out by late summer/early fall. However, early season flooding or soil saturation result in distinctive wetland vegetation; forbs are typically more abundant than previous, however graminoids can be dominant. ..... **Key to Wet Meadow Vegetation; p. 21**

Site has mineral soils; soils are moist and rarely wet (except potentially early spring); fine-textured soils, snow deposition, or windswept dry conditions limit tree establishment; forbs are often abundant. **Key to mesic meadows; see Herbaceous Upland Vegetation Appendix A**

Aquatic Bed Vegetation

Brasenia schreberi dominant..... **BRASCH**

Brasenia schreberi Herbaceous Vegetation

NatureServe Code: CEGL004527

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- BRASCH dominant
- lowlands
- S3S4

Elodea canadensis dominant ..... **ELOCAN**

Elodea canadensis Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- ELOCAN dominant
- lowlands to mid-montane

Menyanthes trifoliata dominant..... **MENTRI**

Menyanthes trifoliata Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MENTRI dominant
- Lowlands to mid-montane, can also occur in marshes and fens

Nuphar lutea ssp. polysepala dominant..... **NUPLUT**

Nuphar lutea ssp. polysepala Herbaceous Vegetation

NatureServe Code: CEGL002001

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- NUPLUT dominant
- Lowlands to mid-montane
- S4S5

Polygonum amphibium dominant.....**POLAMP**

Polygonum amphibium Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- POLAMP dominant
- lowlands

Potamogeton natans dominant ..... **POTNAT**

Potamogeton natans Herbaceous Vegetation

NatureServe Code: CEGL002925

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- POTNAT dominant
- Lowlands
- S5

Ranunculus aquatilis dominant ..... **RANAQU**

Ranunculus aquatilis Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- RANAQU dominant
- Lowlands, possibly to mid montane

Schoenoplectus subterminalis dominant.....**SCHSUB**

Schoenoplectus subterminalis Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SCHSUB dominant
- Lowlands

Utricularia macrorhiza dominant..... **UTRMAC**

Utricularia macrorhiza Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- UTRMAC dominant

Not as above ..... see Freshwater Marsh key or may represent an undescribed type

Freshwater Marsh Vegetation

Carex athrostachya dominant; Carex aquatilis may be codominant..... **CARATH**

Carex athrostachya Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARATH (formerly vesicaria) dominant
- Lowland to mid-montane, can occur also in fens

Carex exsiccata dominant..... **CAREXS**

Carex exsiccata Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CAREXS (formerly vesicaria) dominant
- Lowland to mid-montane, can occur also in fens

Carex obnupta dominant..... **CAROBN**

Carex obnupta Herbaceous Vegetation

NatureServe Code: CEGL003313

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CAROBN dominant
- Lowland to low montane, can occur also in fens and wet meadows
- S4

Hippuris vulgaris dominant..... **HIPVUL**

Hippuris vulgaris Herbaceous Vegetation

NatureServe Code: CEGL003315

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- HIPVUL dominant
- Lowlands, possibly montane
- S2S3

Juncus effusus dominant..... **JUNEFF**

Juncus effusus Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- JUNEFF dominant
- Lowland to low montane, can occur also in fens or wet meadows

Lysichiton americanus dominant ..... **LYSAME**

Lysichiton americanus Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- LYSAME dominant
- Lowlands, possibly up to mid-montane?

Menyanthes trifoliata dominant ..... **MENTRI**

Menyanthes trifoliata Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MENTRI dominant
- Lowlands to mid-montane, can also occur in aquatic beds and fens

Oenanthe sarmentosa dominant ..... **OENSAR**

Oenanthe sarmentosa Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- OENSAR dominant
- Lowlands

Ranunculus flammula, Juncus nevadensis, Carex lenticularis, & C. obnupta all present and >5% ..... **RANFLA-JUNNEV-CARLEN**

Ranunculus flammula - Juncus nevadensis - Carex lenticularis Herbaceous Vegetation

NatureServe Code: CEGL003426

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARLEN, CAROBN, JUNNEV, and RANFLA all present, usually each with >5% and 2-4 of them codominant, not a single dominant species, low growing stature
- Lake Ozette
- S1

Scirpus microcarpus dominant ..... **SCIMIC**

Scirpus microcarpus Herbaceous Vegetation

NatureServe Code: CEGL003322

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SCIMIC dominant
- Lowlands, perhaps up to mid-montane

- S4

Schoenoplectus acutus dominant .....**SCHACU**

Schoenoplectus acutus Herbaceous Vegetation

NatureServe Code: CEGL001840

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SCHACU dominant
- lowlands
- S4

Schoenoplectus tabernaemontani dominant..... **SCHTAB**

Schoenoplectus tabernaemontani Herbaceous Vegetation

NatureServe Code: CEGL002623

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SCHTAB dominant
- lowlands
- S3S4

Sparganium eurycarpum dominant ..... **SPAEUR**

Sparganium eurycarpum Herbaceous Vegetation

NatureServe Code: CEGL003323

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SPAEUR dominant
- lowlands
- S2S3

Typha latifolia dominant ..... **TYPLAT**

Typha (latifolia, angustifolium) Western Herbaceous Vegetation

NatureServe Code: CEGL002010

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- TYPLAT dominant
- Lowland to mid-montane
- S5

Not as above .....see Aquatic Bed or Wet Meadow key or may represent an undescribed type

Bog and Fen Vegetation

Ledum groenlandicum and/or Kalmia microphylla >25%; Myrica gale absent or <10%; low elevation .....**LEDGRO-KALMIC/SPHAGN, Appendix A**

Kalmia microphylla (dwarf form) >5%; Carex nigricans usually present & often dominant; high montane to subalpine ..... **KALMIC-CARNIG, Appendix A**

Ledum groenlandicum and Myrica gale each >15% ..... **LEDGRO-MYRGAL/SPHAGN**

Ledum groenlandicum - Myrica gale / Sphagnum spp. Shrubland

NatureServe Code: CEGL003335

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- LEDGRO and MYRGAL each >15%, Sphagnum >10%
- Low elevation west side of Olympics in bog and fens
- S1

Myrica gale dominant; Sphagnum >10% ..... **MYRGAL/SANOFF/SPHAGN**

Myrica gale / Sanguisorba officinalis / Sphagnum spp. Shrubland

NatureServe Code: CEGL003419

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MYRGAL dominant, Sphagnum >10%
- Low elevation west side of Olympics in bogs and poor fens
- S1S2

Myrica gale >25%; Spiraea douglasii >10%; Sphagnum >5%..... **MYRGAL-SPIDOU/SPHAGN, p.**

Myrica gale-Spiraea douglasii/Sphagnum spp. Shrubland

NatureServe Code: CEGL003420

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- MYRGAL >25%, SPIDOU >10%, Sphagnum >5%
- Lowlands in bogs and poor fens
- S1

Rhynchospora alba >10% and dominant vascular plant; Vaccinium oxycoccos sometimes codominant..... **RHYALB-(VACOXY) / SPHAGN.**

Rhynchospora alba - (Vaccinium oxycoccus)/Sphagnum spp. Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- RHYALB >10% and the dominant herb, Sphagnum >5%, VACOXY sometimes codominant as dwarf-shrub

Vaccinium uliginosum >5%; Dodecatheon jeffreyi, Caltha leptosepala or Carex aquatilis var. dives present..... **VACULI-(DODJEF-CALLEP)**

Vaccinium uliginosum-(Dodecatheon jeffreyi-Caltha leptosepala ssp. howellii) Dwarf-shrubland

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- VACULI >5%
- DODJEF, CALLEP, or CARAQUDIV present
- mid-montane, possibly subalpine

Sphagnum moss >30%

Carex aquatilis var. dives >15% and dominant vascular plant ..... **CARAQUD/SPHAGN**

Carex aquatilis var. dives/Sphagnum spp. Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- CARAQUD >15% and dominant herb, Sphagnum >30%
- Lowland to montane, occupies small areas

Carex livida or C. utriculata) >15% ..... **CAR(LIV, UTR)/SPHAGN**

Carex (livida, utriculata)/*Sphagnum* spp. Herbaceous Vegetation

NatureServe Code: CEGL003423

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- CARLIV or CARUTR >15%, low growing, species rich, Sphagnum >50%
- Low elevation western Olympic
- S1S2

Eriophorum angustifolium ssp. subarcticum var. majus dominant..... **ERIANG/SPHAGN**

Eriophorum angustifolium ssp. subarcticum var. majus / Sphagnum spp. Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- ERIANG the dominant herb, Sphagnum usually abundant
- Mid-montane to subalpine

Eriophorum chamissonis the most abundant vascular plant .....**ERICHA/SPHAGN**

Eriophorum chamissonis/Sphagnum spp. Herbaceous Vegetation

NatureServe Code: CEGL003333

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- ERICHA the dominant herb, Sphagnum >50%
- Low elevation, probably only in Olympic, though not certain its there
- S1

Calamagrostis canadensis the most abundant vascular plant .....**CALCAN**

Calamagrostis canadensis Herbaceous Vegetation

NatureServe Code: CEGL001559

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CALCAN dominant
- Montane to possibly subalpine
- S3S4

Caltha leptosepala >15%, Carex nigricans and C. aquatilis var. dives <5% .....**CALLEP**

Caltha leptosepala ssp. howellii Herbaceous Vegetation

NatureServe Code: CEGL001566

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CALLEP >15% and the dominant herb, Carex nigricans and Carex aquatilis var. dives <5%
- Mid-montane to possibly low subalpine

- S3S4

Carex aquatilis var. dives dominant; C. utriculata and Sphagnum <10% .....**CARAQUD**

Carex aquatilis var. dives Herbaceous Vegetation

NatureServe Code: CEGL001826

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARAQUDIV the dominant herb, CARUTR <10% if present, Sphagnum absent or <10%, CALLEP <5%
- Lowland to mid-montane
- S3

Caltha leptosepala > 5% AND Carex aquatilis var. dives and/or C. nigricans >5% ....**CARAQU-(CARNIG)-CALLEP**

Carex (aquatilis var. dives, nigricans) - Caltha leptosepala ssp. howellii Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CALLEP >5% and CARAQUDIVor CARNIG >5%, one or more of these species dominate
- mid-montane to subalpine
- S3

Carex exsiccata dominant ..... **CAREXS**

Carex exsiccata Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CAREXS (formerly vesicaria) dominant
- Lowland to mid-montane, can occur also in fens

Carex obnupta dominant ..... **CAROBN**

Carex obnupta Herbaceous Vegetation

NatureServe Code: CEGL003313

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CAROBN dominant
- Lowland to low montane, can occur also in marshes and wet meadows
- S4

Carex interior dominant .....**CARINT-HYPANG**

Carex interior-Hypericum anagalloides Herbaceous Vegetation

NatureServe Code: CEGL001857

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARINT dominant
- mid-montane in central Cascades, uncertain in the parks
- S2?

Carex lenticularis dominant ..... **CARLEN**

Carex lenticularis Herbaceous Vegetation

NatureServe Code: none (new)

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- CARLEN dominant
- Lowlands to mid-montane, can be riparian, wet meadow, or fen

Carex nigricans dominant AND Caltha leptosepala <5%.....**CARNIG, Appendix A**

Carex utriculata and/or C. aquatilis var. dives>10%; Sphagnum absent or <10%**CARUTR-(CARAQUD)**

Carex utriculata - (Carex aquatilis var. dives) Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARUTR >10%, Sphagnum absent or <10%, dominated by CARUTR and/or CARAQUDIV
- Westside lowlands

Carex utriculata and/or C. aquatilis var. dives>10%; Sphagnum absent or <10% .....**CARUTR**

Carex utriculata Herbaceous Vegetation

NatureServe Code: CEGL001562

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARUTR dominant, CARAQU absent or low cover
- Montane, mostly eastside but maybe west also
- S4

Deschampsia caespitosa dominant.....**DESCAE**

Deschampsia caespitosa Herbaceous Vegetation

NatureServe Code: CEGL001599

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- DESCAE dominant
- mid-montane to subalpine
- S2S3

Dulichium arundinaceum dominant.....**DULARU**

Dulichium arundinaceum Herbaceous Vegetation

NatureServe Code: CEGL001831

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- DULARU dominant
- Lowlands only?
- S3S3

Eleocharis palustris dominant .....**ELEPAL**

Eleocharis palustris Herbaceous Vegetation

NatureServe Code: CEGL001833

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- ELEPAL dominant

- Lowlands to mid-montane, can be in marshes too
- S3

Eleocharis quinqueflora dominant ..... **ELEQUI**

Eleocharis quinqueflora Herbaceous Vegetation

NatureServe Code: CEGL001836

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- ELEQUI dominant
- Mid-montane to subalpine
- S2?

Equisetum arvense dominant ..... **EQUARV**

Equisetum arvense

NatureServe Code: CEGL003314

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- EQUARV dominant
- Lowlands to low-montane, may also occur in wet meadows
- S5

Juncus balticus dominant ..... **JUNBAL**

Juncus balticus Herbaceous Vegetation

NatureServe Code: CEGL001838

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- JUNBAL dominant
- Lowlands, probably to mid or high montane
- S5

Juncus effusus dominant ..... **JUNEFF**

Juncus effusus Herbaceous Vegetation

NatureServe Code: CEGL003317

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- JUNEFF dominant
- Lowland to low montane, can occur also in wet meadows
- S5

Menyanthes trifoliata dominant ..... **MENTRI**

Menyanthes trifoliata Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- MENTRI dominant
- Lowlands to mid-montane, can occur in aquatic beds and marshes

Trichophorum caespitosum dominant ..... **TRICAE**

Trichophorum caespitosum Herbaceous Vegetation

NatureServe Code: none (new)

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- TRICAE dominant
- mid-montane

Not as above ..... see Wet Meadow key or may represent an undescribed type

Wet Meadow Vegetation

Antennaria lanata dominant ..... **ANTLAN, Appendix A**

Antennaria lanata and Juncus parryi co-dominant..... **JUNPAR-(POLBIS), Appendix A**

Carex athrostachya dominant; Carex aquatilis may be codominant..... **CARATH**

Carex athrostachya Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CARATH (formerly vesicaria) dominant
- Lowland to mid-montane, can occur also in fens

Carex nigricans dominant AND Caltha leptosepala <5%..... **CARNIG, Appendix A**

Carex obnupta dominant ..... **CAROBN**

Carex obnupta Herbaceous Vegetation

NatureServe Code: CEGL003313

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- CAROBN dominant
- Lowland to low montane, can occur also in marshes and fens

Danthonia intermedia >10% or dominant..... **DANIN**

Danthonia intermedia Herbaceous Vegetation

NatureServe Code: CEGL001794

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- DANINT > 10% or dominant
- Subalpine to alpine meadows
- moderately steep to steep slopes that receive additional moisture seepage from upslope
- S3

Deschampsia caespitosa dominant..... **DESCAE**

Deschampsia caespitosa Herbaceous Vegetation

NatureServe Code: CEGL001599

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- DESCAE dominant
- mid-montane to subalpine

Equisetum arvense dominant.....**EQUARV**

Equisetum arvense Herbaceous Vegetation

NatureServe Code: CEGL003314

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- EQUARV dominant
- Lowlands to low-montane, may also occur in fens

Festuca brachyphylla dominant.....**FESBRA, Appendix A**

Juncus effusus dominant.....**JUNEFF**

Juncus effusus Herbaceous Vegetation

NatureServe Code: CEGL003317

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0)

- JUNEFF dominant
- Lowland to low montane, can occur also in fens as well

Leptarrhena pyrolifolia the most abundant vascular plant .....**LEPPYR**

Leptarrhena pyrolifolia Herbaceous Vegetation

NatureServe Code:

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (2

- LEPPYR dominant plant; but overall vascular cover is sparse

Mimulus lewisii dominant.....**MIMLEW**

Mimulus lewisii Herbaceous Vegetation
NatureServe Code: none (new)

Plots: 0, MORA (0), NOCA (0), OLYM (2), Other (1)

- MIMLEW dominant
- High montane to subalpine

Petasites frigidus .....**PETFRI**

Petasites frigidus Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (1), Other (0
– new

- PETFRI dominant
- Lowlands to mid-montane

Ranunculus eschscholtzii dominant .....**RANESC**

Ranunculus eschscholtzii Herbaceous Vegetation

NatureServe Code: none

Plots: 0, MORA (0), NOCA (0), OLYM (1), Other (0

- RANESC dominant

Saxifraga odontoloma >10% and Senecio triangularis >5%.....**SAXODO-SENTRI**

Saxifraga odontoloma – Senecio triangularis Herbaceous Vegetation

NatureServe Code: none (new)

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SAXODO >10%, SENTRI >5%, the two codominant, sometimes along with Caltha leptosepala
- mid-montane to subalpine

Senecio triangularis >10% and at least codominant; Saxifraga odontoloma absent or <10% ..**SENTRI**

Senecio triangularis Herbaceous Vegetation

NatureServe Code: CEGL001987

Plots: 0, MORA (0), NOCA (0), OLYM (0), Other (0

- SENTRI at least codominant, gen >10% cover, SAXODO absent or <10%
- mid to high montane

Carex mertensia dominant, often avalanche MORA NOCA OLYM ..... **CARMER, Appendix A**

Carex neurophora dominant >10% MORA NOCA OLYM.....**CARNEU**

Carex neurophora Herbaceous Vegetation

NatureServe Code:

Plots: 0, MORA (0), NOCA (0), OLYM (1), Other (0

- CARNEU dominant or > 10%

Saussurea americana > 10% MORA NOCA OLYM ..... **SAUAME-(HERMAX), Appendix A**

Veratrum viride ..... **VALSIT-VERVIR, Appendix A**

Not as above .....see Bog & Fen (for wetter types) or Herbaceous Upland key (for moist/drier types) or may represent an undescribed type

Appendix C. Synthesis tables of plant associations sampled at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix C summarizes vegetation samples of plant associations from Mount Rainier, North Cascades and Olympic National Parks into a synthesis table format. The synthesis table displays plant associations in columns and species in rows. Values in table cells are constancy (percent of plots a species occurs in, represented as a decimal, i.e. 0.97 = 97%) and relative average cover (mean cover of a species in the plots in which it occurs in, expressed as percent, i.e. 97.00 =97%) of selected tree, shrub and herbaceous species for each plant association. The table was generated from VPro (MacKenzie and Klaussen 1999). Plant association names appear by their acronym (the first three letter of genus and species, for example **ACEMAC** = ***Ace**r **mac**rophyllum*) as listed below and in plant association descriptions in Appendix A. Plant associations in synthesis tables are arranged by the NVC hierarchy, as listed below and in the "Table of Contents" in Appendix A. This is the first application of the 2008 NVC hierarchy (FGDC 2008) to a NPS classification and consequently, the hierarchical organization of the associations in this report is expected to change. The arrangement listed below reflects the hierarchical status developed by NatureServe and partners as of March 31, 2009. Future changes in the classification hierarchy will be available from NatureServe (http://www.natureserve.org/explorer/index.htm) as modified. Each table is headed by Class and associations are blocked by Group. Changes in shading in the table heading indicate changes in hierarchy level. The order in which associations appear in the following synthesis tables is listed below. The number along the right indicates NVC hierarchical level: 1= Class, 2=Subclass, 3=Formation, 4=Division, 5=Macrogroup, 6=Group, 7=Alliance.

Level	Name	Acronym
1	Forest & Woodland Class	
2	1.C Temperate Forest Subclass	
3	1.C.1 Warm Temperate Forest Formation	
4	1.C.1.c Madrean Forest	
5	Californian-Vancouverian Foothill and Valley Forest & Woodland Macrogroup	
6	North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland Group	
7	Pseudotsuga menziesii-(Arbutus menziesii) Forest and Woodland Alliance	
	Pseudotsuga menziesii/Gaultheria shallon-Holodiscus discolor Forest	**PSEMEN/GAUSHA-HOLDIS**
	Pseudotsuga menziesii/Holodiscus discolor-Rosa gymnocarpa/Festuca occidentalis Forest	**PSEMEN/HOLDIS-ROSGYM/FESOCC**
3	1.C.2 Cool Temperate Forest Formation	
4	1.C.2.b Western North America Cool Temperate Forest Division	
5	Northern Rocky Mountain Lower Montane and Foothill Forest Macrogroup	
6	East Cascades Grand-fir-Douglas-fir Forest Group	
7	Abies grandis-Pseudotsuga menziesii Forest Alliance	
	Pseudotsuga menziesii-(Abies grandis)/Acer circinatum/Paxistima myrsinites Forest	**PSEMEN-(ABIGRA)/ACECIR-PAXMYR**
	Pseudotsuga menziesii-(Tsuga heterophylla)/Acer circinatum-Paxistima myrsinites Forest	**PSEMEN-(TSUHET)/ACECIR-PAXMYR**
7	Pseudotsuga menziesii-(Tsuga heterophylla)-Calamagrostis rubescens Woodland Allilance	
	Pseudotsuga menziesii/Mahonia nervosa/Calamagrostis rubescens	**PSEMEN/MAHNER/CALRUB**

	Forest	
6	Northern Rocky Mountain Douglas-fir-Pine Forest Group	
7	Pseudotsuga menziesii-(Pinus contorta var. latifolia) Forest Alliance	
	Pinus contorta/Paxistima myrsinites/Calamagrostis rubescens Forest	**PINCON/PAXMYR/CALRUB**
	Pinus contorta/Vaccinium membranaceum Woodland	**PINCON/VACMEM**
	Pseudotsuga menziesii/Vaccinium caespitosum Forest	**PSEMEN/VACCAE**
	Pseudotsuga menziesii/Vaccinium membranaceum Forest	**PSEMEN/VACMEM**
7	Pseudotsuga menziesii-(Pinus ponderosa) Forest Alliance	
	Pseudotsuga menziesii-(Pinus ponderosa)/Symphoricarpos albus Forest	**PSEMEN-(PINPON)/SYMALB**
	Pseudotsuga menziesii/Holodiscus discolor/Calamagrostis rubescens Forest	**PSEMEN/HOLDIS/CALRUB**
	Pseudotsuga menziesii/Paxistima myrsinites-Spiraea betulifolia Woodland	**PSEMEN/PAXMYR-SPIBET**
		PINPON-PSEMEN/PAXMYR-ARCUVA
	Pseudotsuga menziesii-Pinus ponderosa/Arctostaphylos nevadensis Woodland	**PSEMEN-PINPON/ARCNEV**
5	Rocky Mountain Subalpine & High Montane Conifer Forest Macrogroup	
6	Northern Rocky Mountain Whitebark-Limber Pine Woodland Group	
7	Abies lasiocarpa-Pinus albicaulis Woodland Alliance	
	Pinus albicaulis-(Abies lasiocarpa)/Vaccinium scoparium-Luzula glabrata var. hitchcockii Woodland	**PINALB-(ABILAS)/VACSCO/LUZGLA**
	Pinus albicaulis/Juniperus communis Woodland	**PINALB/JUNCOM**
7	Larix lyallii-(Abies lasiocarpa, Picea engelmannii) Woodland Alliance	
	Larix lyallii/Cassiope mertensiana-Luetkea pectinata Woodland	**LARLYA/CASMER-LUEPEC**
	Larix lyallii/Vaccinium deliciosum Woodland	**LARLYA/VACDEL**
	Larix lyallii/Vaccinium scoparium/Luzula glabrata var. hitchcockii Woodland	**LARLYA/LUZGLA**
7	Pinus albicaulis Krummholz Alliance	
6	Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Group	
7	Populus tremuloides/(Acer circinatum-Cornus nuttallii) Forest Alliance	
	Populus tremuloides Shrubland	**POPTRE shrub**
	Populus tremuloides/Cornus nuttallii Forest	**POPTRE/CORNUT**
6	Rocky Mountain Subalpine Dry-Mesic Spruce-Fire Forest and Woodland Group	
7	Abies lasiocarpa - Picea engelmannii / Carex geyeri Forest Alliance	
	Abies lasiocarpa-(Pseudotsuga menziesii)/Vaccinium membranaceum/Calamagrostis rubescens Forest	**ABILAS-(PSEMEN)/VACMEM/CALRUB**
6	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland Group	
7	Abies lasiocarpa - Picea engelmannii / Ribes spp. Forest Alliance	
5	Vancouverian Lowland and Montane Rainforest Macrogroup	
6	North Pacific Hypermaritime Sitka Spruce Forest Group	
7	Picea sitchensis-(Tsuga heterophylla) Forest Alliance	
	Picea sitchensis/Gaultheria shallon Forest	**PICSIT/GAUSHA**
	Picea sitchensis/Maianthemum dilatatum Forest	**PICSIT/MAIDIL**
	Picea sitchensis-Tsuga heterophylla/Polystichum munitum Forest	**PICSIT-TSUHET/POLMUN**
	Picea sitchensis-Tsuga heterophylla/Polystichum munitum-Oxalis oregana Forest	**PICSIT-TSUHET/POLMUN-OXAORE**
6	North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest Group	
7	Tsuga heterophylla-Thuja plicata Hypermaritime Forest Alliance	
	Thuja plicata-Tsuga heterophylla/Vaccinium ovatum Forest	**THUPLI-TSUHET/VACOVA**
	Tsuga heterophylla/Gaultheria shallon/Polystichum munitum-Blechnum spicant Forest	**TSUHET/GAUSHA/POLMUN-BLESPI**
	Tsuga heterophylla/Polystichum munitum-Blechnum spicant Forest	**TSUHET/POLMUN-BLESPI**
	Tsuga heterophylla/Polystichum munitum-Oxalis oregana Forest	**TSUHET/POLMUN-OXAORE**

	Tsuga heterophylla/Vaccinium alaskaense/Oxalis oregana Forest	**TSUHET/VACALA/OXAORE**
6	North Pacific Maritime Douglas-fir-Western Hemlock Forest Group	
7	Taxus brevifolia Shrubland Alliance	
	Taxus brevifolia/Paxistima myrsinites Shrubland	**TAXBRE/PAXMYR**
7	Tsuga heterophylla - Pseudotsuga menziesii / (Cornus unalaschkensis) Forest Alliance	
	Pseudotsuga menziesii-(Thuja plicata-Abies grandis)/Vaccinium membranaceum Forest	**PSEMEN-(THUPLI-ABIGRA)/VACMEM**
	Pseudotsuga menziesii/Acer circinatum/Mahonia nervosa Forest	**PSEMEN/ACECIR/MAHNER**
	Pseudotsuga menziesii/Achlys triphylla Forest	**PSEMEN/ACHTRI**
	Pseudotsuga menziesii/Gaultheria shallon-Vaccinium parvifolium Forest	**PSEMEN/GAUSHA-VACPAR**
	Pseudotsuga menziesii/Mahonia nervosa/Achlys triphylla Forest	**PSEMEN/MAHNER/ACHTRI**
	Pseudotsuga menziesii-Abies grandis/Mahonia nervosa-Gaultheria shallon/Polystichum munitum Forest	**PSEMEN-ABIGRA/MAHNER-GAUSHA/POLMUN**
	Pseudotsuga menziesii-Tsuga heterophylla/Achlys triphylla Forest	**PSEMEN-TSUHET/ACHTRI**
	Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon/Polystichum munitum Forest	**PSEMEN-TSUHET/GAUSHA/POLMUN**
	Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon-Vaccinium parvifolium Forest	**PSEMEN-TSUHET/GAUSHA-VACPAR**
	Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa Forest	**PSEMEN-TSUHET/MAHNER**
	Pseudotsuga menziesii-Tsuga heterophylla/Paxistima myrsinites/Linnaea borealis Forest	**PSEMEN-TSUHET/PAXMYR/LINBOR**
	Pseudotsuga menziesii-Tsuga heterophylla/Rhododendron macrophyllum/Polystichum munitum Forest	**PSEMEN-TSUHET/RHOMAC/POLMUN**
	Tsuga heterophylla-(Pseudotsuga menziesii)/Vaccinium alaskaense/Cornus unalaschkensis Forest	**TSUHET-(PSEMEN)/VACALA/CORUNA**
	Tsuga heterophylla-(Pseudotsuga menziesii)/Vaccinium alaskaense-Mahonia nervosa-(Gaultheria shallon) Forest	**TSUHET-(PSEMEN)/VACALA-MAHNER-(GAUSHA)**
	Tsuga heterophylla-Pseudotsuga menziesii/Mahonia nervosa-Chimaphila menziesii Forest	**TSUHET-PSEMEN/MAHNER-CHIMEN**
	Tsuga heterophylla-Pseudotsuga menziesii/Vaccinium alaskaense/Oxalis oregana Forest	**TSUHET-PSEMEN/VACALA/OXAORE**
	Tsuga heterophylla-Thuja plicata/Taxus brevifolia Forest	**TSUHET-THUPLI/TAXBRE**
7	Tsuga heterophylla - Pseudotsuga menziesii / (Holodiscus discolor) Forest Alliance	
	Betula papyrifera-(Thuja plicata)/Acer circinatum/Mahonia nervosa Forest	**BETPAP-(THUPLI)/ACECIR/MAHNER**
	Pinus contorta var. contorta-Pseudotsuga menziesii/Gaultheria shallon Forest	**PINCON-PSEMEN/GAUSHA**
	Pseudotsuga menziesii-(Pinus contorta)/Arctostaphylos uva-ursi/Racomitrium canescens Woodland	**PSEMEN-(PINCON)/ARCUVA/RACCAN**
		PSEMEN/ARCNEV Dep.
		PSEMEN/VACMEM/HYLSPL
	Pseudotsuga menziesii/Gaultheria shallon-Mahonia nervosa/Polystichum munitum Forest	**PSEMEN/GAUSHA-MAHNER/POLMUN**
	Pseudotsuga menziesii-Tsuga heterophylla/Depauperate undergrowth Forest	**PSEMEN-(TSUHET)/Dep.**
	Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon/Xerophyllum tenax Forest	**PSEMEN-TSUHET/GAUSHA/XERTEN**
	Pseudotsuga menziesii-Tsuga heterophylla/Gaultheria shallon-Mahonia nervosa Forest	**PSEMEN-TSUHET/GAUSHA-MAHNER**
	Pseudotsuga menziesii-Tsuga heterophylla/Rhododendron macrophyllum Forest	**PSEMEN-TSUHET/RHOMAC**
	Pseudotsuga menziesii-Tsuga heterophylla/Vaccinium alaskaense/Xerophyllum tenax Forest	**PSEMEN-TSUHET/VACALA/XERTEN**
7	Tsuga heterophylla - Pseudotsuga menziesii / (Rubus spectabilis) Forest Alliance	
	Pseudotsuga menziesii-(Alnus rubra-Tsuga heterophylla)/Rubus spectabilis Forest	**PSEMEN-(ALNRUB-TSUHET)/RUBSPE**
	Pseudotsuga menziesii-Tsuga heterophylla/(Acer circinatum)/Polystichum munitum Forest	**PSEMEN-TSUHET/(ACECIR)/POLMUN**
	Pseudotsuga menziesii-Tsuga heterophylla/Mahonia nervosa-Polystichum munitum Forest	**PSEMEN-TSUHET/MAHNER-POLMUN**
	Pseudotsuga menziesii-Tsuga heterophylla/Polystichum munitum-Oxalis oregana Forest	**PSEMEN-TSUHET/POLMUN-OXAORE**

	Tsuga heterophylla-(Pseudotsuga menziesii)/Tiarella trifoliata-Gymnocarpium dryopteris Forest	**TSUHET-(PSEMEN)/TIATRI-GYMDRY**
	Tsuga heterophylla-(Pseudotsuga menziesii)/Vaccinium alaskaense/Polystichum munitum Forest	**TSUHET-(PSEMEN)/VACALA/POLMUN**
6	North Pacific Mesic Silver Fir-Western Hemlock Forest Group	
7	Abies amabilis - Tsuga heterophylla / (Blechnam spicant) Forest Alliance	
	Tsuga heterophylla-Abies amabilis-(Thuja plicata)/Vaccinium alaskaense/Blechnum spicant Forest	**TSUHET-ABIAMA-(THUPLI)/VACALA/BLESPI**
	Tsuga heterophylla-Abies amabilis/Blechnum spicant-Tiarella trifoliata-Polystichum munitum Forest	**TSUHET-ABIAMA/BLESPI-TIATRI-POLMUN**
	Tsuga heterophylla-Abies amabilis/Oxalis oregana-Blechnum spicant Forest	**TSUHET-ABIAMA/OXAORE-BLESPI**
	Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Rubus pedatus Forest	**TSUHET-ABIAMA/VACALA/RUBPED**
	Tsuga heterophylla-Abies amabilis/Vaccinium alaskaense/Tiarella trifoliata var. unifoliata Forest	**TSUHET-ABIAMA/VACALA/TIATRI**
7	Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Achlys triphylla) Forest Alliance	
	Abies amabilis-(Pseudotsuga menziesii)/Achlys triphylla-Tiarella trifoliata var. unifoliata Forest	**ABIAMA-(PSEMEN)/ACHTRI-TIATRI**
	Abies amabilis-(Pseudotsuga menziesii-Tsuga heterophylla)/Rhododendron macrophyllum Forest	**ABIAMA-(PSEMEN-TSUHET)/RHOMAC**
	Abies amabilis-Pseudotsuga menziesii/Achlys triphylla Forest	**ABIAMA-PSEMEN/ACHTRI**
	Abies amabilis-Tsuga heterophylla/Depauperate undergrowth Forest	**ABIAMA-TSUHET/Dep.**
	Abies amabilis-Tsuga heterophylla/Rubus pedatus-Tiarella trifoliata var. unifoliata Forest	**ABIAMA-TSUHET/RUBPED-TIATRI**
	Tsuga heterophylla-Abies amabilis-(Pseudotsuga menziesii)/Vaccinium alaskaense Forest	**TSUHET-ABIAMA-(PSEMEN)/VACALA**
	Tsuga heterophylla-Abies amabilis-Pseudotsuga menziesii/Gaultheria shallon Forest	**TSUHET-ABIAMA-PSEMEN/GAUSHA**
	Tsuga heterophylla-Abies amabilis-Pseudotsuga menziesii/Mahonia nervosa Forest	**TSUHET-ABIAMA-PSEMEN/MAHNER**
7	Abies amabilis - Tsuga heterophylla - (Pseudotsuga menziesii) / (Rhododendron albiflorum) Forest Alliance	
	Abies amabilis-(Pseudotsuga menziesii)/Vaccinium membranaceum/Achlys triphylla Forest	**ABIAMA-(PSEMEN)/VACMEM/ACHTRI**
	Abies amabilis-(Pseudotsuga menziesii-Abies procera)/Vaccinium membranaceum/Xerophyllum tenax Forest	**ABIAMA-(PSEMEN-ABIPRO)/VACMEM/XERTEN**
	Abies amabilis-(Tsuga heterophylla)/Vaccinium membranaceum Forest	**ABIAMA-(TSUHET)/VACMEM**
	Abies amabilis-(Tsuga heterophylla)/Vaccinium membranaceum-Vaccinium alaskaense Forest	**ABIAMA-(TSUHET)/VACMEM-VACALA**
	Abies amabilis/Menziesia ferruginea Forest	**ABIAMA/MENFER**
	Abies amabilis/Rhododendron albiflorum Forest	**ABIAMA/RHOALB**
	Abies amabilis/Vaccinium membranaceum /Rubus lasiococcus Forest	**ABIAMA/VACMEM/RUBLAS**
7	Acer macrophyllum-(Pseudotsuga menziesii) Forest Alliance	
	Acer macrophyllum-(Pseudotsuga menziesii)/Polystichum munitum Forest	**ACEMAC-(PSEMEN)/POLMUN**
	Acer macrophyllum/Paxistima myrsinites Shrubland	**ACEMAC/PAXMYR**
	Acer macrophyllum/Symphoricarpos albus Forest	**ACEMAC/SYMALB**
7	Alnus rubra-(Picea sitchensis-Tsuga heterophylla) Forest and Woodland Alliance	
	Alnus rubra/Alnus viridis ssp. sinuata Forest	**ALNRUB/ALNVIR**
	Alnus rubra/Polystichum munitum Forest	**ALNRUB/POLMUN**
7	Populus balsamifera ssp. trichocarpa-Tsuga heterophylla Forest Alliance	
	Populus balsamifera ssp. trichocarpa/Gaultheria shallon/Polystichum munitum Forest	**POPBAL/GAUSHA/POLMUN**
	Populus balsamifera ssp. trichocarpa-Alnus rubra/Rubus ursinus-Equisetum arvense Forest	**POPBAL-ALNRUB/RUBURS-EQUARV**
5	Vancouverian Subalpine Forest Macrogroup	
6	North Pacific Mountain Hemlock - Silver Fir Forest and Tree Island Group	
7	Abies lasiocarpa - (Picea engelmannii) / (Rubus lasiococcus) Forest Alliance	
	Abies lasiocarpa-(Pinus contorta)/Lupinus (arcticus, latifolius) Woodland	**ABILAS-(PINCON)/LUPARC**
	Abies lasiocarpa/Vaccinium scoparium/Valeriana sitchensis Woodland	**ABILAS/VACSCO/VALSIT**

7	Abies amabilis-Abies lasiocarpa Forest and Woodland Alliance	
	Abies lasiocarpa-(Abies amabilis)/Menziesia ferruginea Forest	**ABILAS-(ABIAMA)/MENFER**
	Abies lasiocarpa-(Abies amabilis)/Vaccinium membranaceum/Valeriana sitchensis Forest	**ABILAS-(ABIAMA)/VACMEM/VALSIT**
		ABILAS-(PSEMEN)/VACMEM
	Abies lasiocarpa-(Abies amabilis)/Vaccinium membranaceum/Xerophyllum tenax Forest	**ABILAS-(ABIAMA)/VACMEM/XERTEN**
	Abies lasiocarpa/Erythronium montanum Forest	**ABILAS/ERYMON**
	Abies lasiocarpa/Rhododendron albiflorum/Rubus lasiococcus Forest	**ABILAS/RHOALB/RUBLAS**
		ABILAS/RHOALB/PHYEMP
	Abies lasiocarpa/Vaccinium membranaceum/Lupinus (arcticus ssp. subalpinus,latifolius) Woodland	**ABILAS/VACMEM/LUPARC**
	Abies lasiocarpa/Vaccinium ovalifolium (alaskaense)/Lupinus (arcticus, latifolius) Woodland	**ABILAS/VACALA/LUPARC**
	Abies lasiocarpa/Valeriana sitchensis Forest	**ABILAS/VALSIT**
	Abies lasiocarpa/Veratrum viride Woodland	**ABILAS/VERVIR**
	Abies lasiocarpa-Cupressus nootkatensis/Mahonia nervosa/Valeriana sitchensis Forest	**ABILAS-CUPNOO/MAHNER/VALSIT**
	Abies lasiocarpa-Pseudotsuga menziesii/Mahonia nervosa Forest	**ABILAS-PSEMEN/MAHNER**
7	Abies lasiocarpa-Tsuga mertensiana-Abies amabilis-Cupressus nootkatensis Krummholz Alliance	
	Abies lasiocarpa Krummholz Shrubland	**KRUMM ABILAS**
		KRUMM CUPNOO
	Tsuga mertensiana Krummholz Shrubland	**KRUMM TSUMER**
7	Cupressus nootkatensis Forest and Woodland Alliance	
	Cupressus nootkatensis/Ribes lacustre Forest	**CUPNOO/RIBLAC**
	Cupressus nootkatensis/Streptopus lanceolatus var. curvipes Forest	**CUPNOO/STRLAN**
	Cupressus nootkatensis/Valeriana sitchensis Forest	**CUPNOO/VALSIT**
	Cupressus nootkatensis-Pseudotsuga menziesii/Acer circinatum Forest	**CUPNOO-PSEMEN/ACECIR**
7	Tsuga mertensiana-Abies amabilis Forest and Woodland Alliance	
	Abies amabilis-Tsuga mertensiana/Menziesia ferruginea Forest	**ABIAMA-TSUMER/MENFER**
	Abies amabilis-Tsuga mertensiana/Streptopus lanceolatus var. curvipes Forest	**ABIAMA-TSUMER/STRLAN**
	Abies amabilis-Tsuga mertensiana/Vaccinium membranaceum/Rubus lasiococcus Forest	**ABIAMA-TSUMER/VACMEM/RUBLAS**
	Abies lasiocarpa-Tsuga mertensiana/Vaccinium scoparium Woodland	**ABILAS-TSUMER/VACSCO**
	Tsuga mertensiana-(Abies amabilis-Abies lasiocarpa)/Luzula glabrata var. hitchcockii Woodland	**TSUMER-(ABIAMA-ABILAS)/LUZGLA**
		ABILAS-ABIAMA/LUZGLA
	Tsuga mertensiana-Abies amabilis/Depauperate undergrowth Forest	**TSUMER-ABIAMA/Dep.**
	Tsuga mertensiana-Abies amabilis/Rhododendron albiflorum Forest	**TSUMER-ABIAMA/RHOALB**
	Tsuga mertensiana-Abies amabilis/Vaccinium alaskaense/Rubus pedatus Forest	**TSUMER-ABIAMA/VACALA/RUBPED**
		TSUMER-ABIAMA/ERYMON
	Tsuga mertensiana-Abies amabilis/Vaccinium membranaceum/Valeriana sitchensis Woodland	**TSUMER-ABIAMA/VACMEM/VALSIT**
	Tsuga mertensiana-Abies amabilis/Vaccinium membranaceum/Xerophyllum tenax Forest	**TSUMER-ABIAMA/VACMEM/XERTEN**
	Tsuga mertensiana-Abies lasiocarpa/Alnus viridis ssp. Sinuata Woodland	**TSUMER-ABILAS/ALNVIR**
7	Tsuga mertensiana-Abies lasiocarpa Forest and Woodland Alliance	
7	Tsuga mertensiana-Abies lasiocarpa-Cupressus nootkatensis Tree Island Alliance	
	Abies lasiocarpa-(Tsuga mertensiana)/Festuca viridula Woodland	**ABILAS-(TSUMER)/FESVIR**
	Abies lasiocarpa/Polemonium pulcherrimum-Pedicularis racemosa Woodland	**ABILAS/POLPUL-PEDRAC**
	Abies lasiocarpa/Vaccinium deliciosum Woodland	**ABILAS/VACDEL**
	Cupressus nootkatensis/Vaccinium deliciosum Woodland	**CUPNOO/VACDEL**
	Tsuga mertensiana/Phyllodoce empetriformis-Vaccinium deliciosum Woodland	**TSUMER/PHYEMP-VACDEL**

	Tsuga mertensiana-Abies lasiocarpa/Vaccinium deliciosum-Phyllodoce empetriformis Woodland	**TSUMER-ABILAS/VACDEL-PHYEMP**
3	1.C.3 Temperate Flooded & Swamp Forest Formation	
4	1.C.3.b Western North America Flooded & Swamp Forest Division	
5	Rocky Mountain and Great Basin Flooded & Swamp Forest Macrogroup	
6	Rocky Mountain Subalpine-Montane Riparian Woodland Group	
7	Picea engelmannii-(Abies lasiocarpa) Riparian Forest Alliance	
5	Vancouverian Flooded & Swamp Forest Macrogroup	
6	North Pacific Hardwood-Conifer Swamp Group	
7	(Tsuga - Abies - Picea) / (Rubus - Oplopanax) Swamp Forest Alliance	
7	(Tsuga heterophylla - Picea sitchensis-Thuja plicata- Abies) / Lysichiton americanus Coniferous Swamp Woodland Alliance	
	Picea sitchensis/Rubus spectabilis/Carex obnupta-Lysichiton americanus Forest	**PICSIT/RUBSPE/CAROBN-LYSAME**
	Tsuga heterophylla-(Thuja plicata-Alnus rubra)/Lysichiton americanus-Athyrium filix-femina Forest	**TSUHET-(THUPLI-ALNRUB)/LYSAME-ATHFIL**
	Tsuga heterophylla-Thuja plicata/Gaultheria shallon/Lysichiton americanus Forest	**TSUHET-THUPLI/GAUSHA/LYSAME**
7	(Alnus - Fraxinus - Populus) / Lysichiton americanus Deciduous Swamp Woodland Alliance	
	Alnus rubra/Athyrium filix-femina-Lysichiton americanus Forest	**ALNRUB/ATHFIL-LYSAME**
	Alnus rubra/Glyceria striata Forest	**ALNRUB/GLYSTR**
6	North Pacific Lowland Riparian Forest and Woodland Group	
7	(Acer macrophyllum, Alnus rubra) Riparian Forest Alliance	
	Acer macrophyllum/Maianthemum stellatum Forest	**ACEMAC/MAISTE**
	Acer macrophyllum/Oxalis oregana Forest	**ACEMAC/OXAORE**
	Acer macrophyllum/Polystichum munitum-Tolmiea menziesii Forest	**ACEMAC/POLMUN-TOLMEN**
	Acer macrophyllum/Rubus spectabilis Forest	**ACEMAC/RUBSPE**
	Alnus rubra/Acer circinatum/Claytonia sibirica Forest	**ALNRUB/ACECIR/CLASIB**
	Alnus rubra/Elymus glaucus Forest	**ALNRUB/ELYGLA**
	Alnus rubra/Oplopanax horridus-Rubus spectabilis Forest	**ALNRUB/OPLHOR-RUBSPE**
	Alnus rubra/Rubus spectabilis Forest	**ALNRUB/RUBSPE**
	Alnus rubra/Stachys chamissonis var. cooleyae-Tolmiea menziesii Forest	**ALNRUB/STACHA-TOLMEN**
7	(Picea sitchensis, Abies grandis, Tsuga heterophylla, Thuja) - (Alnus, Acer) Riparian Forest Alliance	
	Abies grandis/Bromus vulgaris-Polystichum munitum Forest	**ABIGRA/BROVUL-POLMUN**
	Alnus rubra/Oxalis (oregana, trilliifolia) Forest	**ALNRUB/OXAORE**
	Picea sitchensis-(Alnus rubra)/Rubus spectabilis/Polystichum munitum Forest	**PICSIT-(ALNRUB)/RUBSPE/POLMUN**
	Picea sitchensis/Scirpus microcarpus Woodland	**PICSIT/SCIMIC**
	Tsuga heterophylla-(Pseudotsuga menziesii-Thuja plicata)/Polystichum munitum-Athyrium filix-femina Forest	**TSUHET-(PSEMEN-THUPLI)/POLMUN-ATHFIL**
7	Populus balsamifera ssp. trichocarpa – (Acer, Alnus) Riparian Forest Alliance	
7	Populus balsamifera ssp. trichocarpa – (Pseudotsuga, Picea, Tsuga) Riparian Forest Allliance	
	Populus balsamifera ssp. trichocarpa-Alnus rubra/Carex obnupta Forest	**POPBAL-ALNRUB/CAROBN**
	Populus balsamifera ssp. trichocarpa-Picea sitchensis-(Acer macrophyllum)/Oxalis oregana Forest	**POPBAL-PICSIT-(ACEMAC)/OXAORE**
	Pseudotsuga menziesii-Pinus ponderosa-Populus balsamifera/Acer circinatum Forest	**PSEMEN-PINPON-POPBAL/ACECIR**
6	North Pacific Lowland - Montane Riparian and Wet Slope Shrubland Group	
7	Acer circinatum Shrubland Alliance	
	Acer circinatum Shrubland	**ACECIR**
	Acer circinatum/Athyrium filix-femina-Tolmiea menziesii Shrubland	**ACECIR/ATHFIL-TOLMEN**
7	Alnus viridis ssp. sinuata Shrubland Alliance	
	Alnus viridis ssp. sinuata Shrubland	**ALNVIR**

	Alnus viridis ssp. sinuata-Acer circinatum Shrubland	**ALNVIR-ACECIR**
	Alnus viridis ssp. sinuata-Oplopanax horridus Shrubland	**ALNVIR-OPLHOR**
	Alnus viridis ssp. sinuata-Rubus spectabilis/Athyrium filix-femina Shrubland	**ALNVIR-RUBSPE/ATHFIL**
7	Cornus sericea Shrubland Alliance	
	Cornus sericea Shrubland	**CORSER**
7	Oplopanax horridus Shrubland Alliance	
	Oplopanax horridus Shrubland	**OPLHOR**
7	Rubus spectabilis-Ribes bracteosum Shrubland Alliance	
	Rubus spectabilis-Ribes bracteosum Shrubland	**RUBSPE-RIBBRA**
7	Salix commutata Shrubland Alliance	
7	Salix sitchensis Riparian Shrubland Alliance	
	Salix sitchensis/Equisetum arvense-Petasites frigidus Shrubland	**SALSIT/EQUARV-PETFRI**
7	Symphoricarpos albus Shrubland Alliance	
	Symphoricarpos albus-Malus fusca Shrubland	**SYMALB-MALFUS**
6	North Pacific Montane Riparian Woodland Group	
7	Abies amabilis-Tsuga heterophylla-(Pseudotsuga menziesii) Riparian Forest Alliance	
	Abies amabilis/Rubus spectabilis-Vaccinium alaskaense Forest	**ABIAMA/RUBSPE-VACALA**
	Abies amabilis-Tsuga heterophylla/Oplopanax horridus Forest	**ABIAMA-TSUHET/OPLHOR**
		ABIAMA-POPBAL/OPLHOR
7	Abies lasiocarpa-(Rubus spectabilis) Riparian Forest and Woodland Alliance	
	Abies lasiocarpa/Rubus spectabilis Forest	**ABILAS/RUBSPE**
1	2 Shrubland & Grassland Class	
2	2.C Temperate & Boreal Shrubland & Grassland Subclass	
3	2.C.1 Temperate Grassland, Meadow & Shrubland Formation	
4	2.C.1.a Vancouverian & Rocky Mountain Grassland & Shrubland Division	
5	Northern Rocky Mountain-Vancouverian Mesic Grassland & Forb Meadows Macrogroup	
6	Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group	
7	Bromus sitchensis-Carex phaeocephala Meadow Alliance	
	Bromus sitchensis-Carex phaeocephala Herbaceous Vegetation	**BROSIT-CARPHA**
7	Hydrophyllum fendleri Herbaceous Vegetation Alliance	
	Hydrophyllum fendleri Herbaceous Vegetation	**HYDFEN**
7	Phacelia hastata Herbaceous Vegetation Alliance	
	Artemisia ludoviciana-Lomatium martindalei Herbaceous Vegetation	**ARTLUD-LOMMAR**
	Eucephalus paucicapitatus Herbaceous Vegetation	**EUCPAU**
	Phacelia hastata Lithomorphic Vegetation	**PHAHAS**
	Polygonum davisiae Herbaceous Vegetation	**POLDAV**
6	Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Herbaceous Meadow Group	
7	Antennaria lanata -(Juncus parry) Meadow Alliance	
	Antennaria lanata Herbaceous Vegetation	**ANTLAN**
	Juncus parryi-(Polygonum bistortoides) Herbaceous Vegetation	**JUNPAR-(POLBIS)**
7	Carex spectabilis Meadow Alliance	
	Carex spectabilis-(Lupinus (arcticus, latifolius)-Polygonum bistortoides Herbaceous Vegetation	**CARSPE-(LUPARC-POLBIS)**
7	Cascadian Mesic Tall Forb Meadow Alliance	
	Heracleum maximum Herbaceous Vegetation	**HERMAX**
	Lupinus (arcticus ssp. subalpinus, latifolius) Herbaceous Vegetation	**LUPARC**
		LUPARC lithomorphic
	Pteridium aquilinum Herbaceous Vegetation	**PTEAQU**

	Saussurea americana-(Heracleum maximum) Herbaceous Vegetation	**SAUAME-(HERMAX)**
7	Festuca brachyphylla-(Carex breweri, Carex nardina) Meadow Alliance	
7	Festuca viridula Meadow Alliance	
	Carex scirpoidea ssp. pseudoscirpoidea Herbaceous Vegetation	**CARPSE**
	Festuca viridula-Eucephalus ledophyllus Herbaceous Vegetation	**FESVIR-EUCLED**
		ELMRAC
	Festuca viridula-Lupinus (arcticus, latifolius) Herbaceous Vegetation	**FESVIR-LUPARC**
7	Luetkea pectinata Herbaceous Vegetation Alliance	
	Luetkea pectinata Herbaceous Vegetation	**LUEPEC**
7	Phlox diffusa Herbaceous Vegetation Alliance	
	Carex spectabilis-Phlox diffusa Herbaceous Vegetation	**CARSPE-PHLDIF**
	Phlox diffusa-(Lomatium martindalei- Carex phaeocephala) Herbaceous Vegetation	**PHLDIF-(LOMMAR-CARPHA)**
7	Pseudoroegernia spicata - Danthonia intermeida Herbaceous Vegetation (Providisional) Alliance	
	Danthonia intermedia-Racomitrium canescens Herbaceous Vegetation	**DANINT**
	Pseudoroegneria spicata/Selaginella wallacei Herbaceous Vegetation	**PSESPI**
7	Valeriana sitchensis Meadow Alliance	
	Luzula glabrata-(Lupinus (arcticus ssp. subalpinus, latifolius)) Herbaceous Vegetation	**LUZGLA-(LUPARC)**
	Valeriana sitchensis-Athyrium filix-femina Herbaceous Vegetation	**VALSIT-ATHFIL**
	Valeriana sitchensis-Carex spectabilis Herbaceous Vegetation	**VALSIT-CARSPE**
	Valeriana sitchensis-Ligusticum grayi Herbaceous Vegetation	**VALSIT-LIGGRA**
	Valeriana sitchensis-Veratrum viride Herbaceous Vegetation	**VALSIT-VERVIR**
7	Xerophyllum tenax Meadows Alliance	
5	Northern Rocky Mountain - Vancouverian Montane Shrubland Macrogroup	
6	Northern Rocky Mountain-Vancouverian Subalpine-Montane Mesic Shrubland Group	
7	Amelanchier alnifolia Shrubland Alliance	
	Amelanchier alnifolia/Calamagrostis rubescens Shrubland	**AMEALN/CALRUB**
7	Juniperus communis Dwarf-shrubland Alliance	
	Juniperus communis-(Phlox diffusa) Dwarf-shrubland	**JUNCOM-(PHLDIF)**
7	Paxistima myrsinites Dwarf Shrubland Alliance	
	Paxistima myrsinites-Phlox diffusa Dwarf-Shrubland	**PAXMYR/PHLDIF**
7	Rubus parviflorus Shrubland Alliance	
	Rubus parviflorus/Chamerion angustifolium Shrubland	**RUBPAR/CHAANG**
	Rubus parviflorus-Rubus spectabilis Shrubland	**RUBPAR-RUBSPE**
7	Spiraea splendens Shrubland Alliance	
	Spiraea splendens Shrubland	**SPISPL**
7	Symphoricarpos albus Shrubland Alliance	
7	Symphoricarpos hesperius Dwarf-shrubland Alliance	
	Symphoricarpos hesperius Dwarf-Shrubland	**SYMHES**
7	Vaccinium (caespitosum, membranaceum, scoparium) Dwarf-shrubland Alliance	
	Vaccinium caespitosum/Festuca viridula Dwarf-shrubland	**VACCAE/FESVIR**
	Vaccinium caespitosum-Xerophyllum tenax Dwarf-shrubland	**VACCAE/XERTEN**
	Vaccinium deliciosum-Festuca viridula Dwarf-shrubland	**VACDEL/FESVIR**
	Vaccinium scoparium Dwarf-shrubland	**VACSCO**
		VACSCO/FESVIR
7	Vaccinium membranaceum/Phlox diffusa Dwarf-shrubland Alliance	
	Vaccinium membranaceum/Phlox diffusa Dwarf-shrubland	**VACMEM/PHLDIF**
7	Vaccinium membranaceum Shrubland Alliance	
	Vaccinium membranaceum Shrubland	**VACMEM**

	Vaccinium membranaceum/Calamagrostis rubescens Shrubland	**VACMEM/CALRUB**
	Vaccinium membranaceum/Xerophyllum tenax Shrubland	**VACMEM/XERTEN**
5	Vancouverian Lowland Grassland & Shrubland Macrogroup	
6	North Pacific Herbaceous Bald and Bluff Group	
7	Arctostaphylos uva-ursi Dwarf-shrubland Alliance	
	Arctostaphylos (nevadensis, uva-ursi)-Juniperus communis Dwarf-shrubland	**ARC(NEV, UVA)-JUNCOM**
	Arctostaphylos (nevadensis, uva-ursi)-Paxistima myrsinites Dwarf-shrubland	**ARC(NEV, UVA)/PAXMYR**
	Arctostaphylos uva-ursi-Fragaria virginiana-(Festuca roemeri) Dwarf-shrubland	**ARCUVA-FRAVIR-(FESROE)**
7	Bromus vulgaris Herbaceous Vegetation Alliance	
	Bromus vulgaris-Festuca subulata Herbaceous Vegetation	**BROVUL-FESSUB**
7	Festuca roemeri - Agrostis pallens - Koeleria macrantha Herbaceous Vegetation Alliance	
	Festuca roemeri-Cerastium arvense-Koeleria macrantha Herbaceous Vegetation	**FESROE-CERARV-KOEMAC**
	Festuca roemeri-Plectritis congesta Herbaceous Vegetation	**FESROE-PLECON**
	Koeleria macrantha-(Agrostis pallens) Herbaceous Vegetation	**KOLMAC-(AGRPAL)**
	Lomatium martindalei Lithomorphic Vegetation	**LOMMAR lithomorphic**
6	North Pacific Hypermaritime Shrub and Herbaceous Headland Group	
7	Blechnum spicant Herbaceous Vegetation Alliance	
	Blechnum spicant Herbaceous Vegetation	**BLESPI**
7	Calamagrostis nutkaensis-Elymus glaucus Herbaceous Vegetation Alliance	
6	Gaultheria shallon Shrubland Alliance	
4	2.C.1.x Western North America Interior Sclerophyllous Chaparral Shrubland Division	
5	Cool Semi-Desert Chaparral Macrogroup	
6	Western Cordillerian Montane Sclerophyll Scrub Group	
7	Arctostaphylos columbiana Dwarf-shrubland Alliance	
	Arctostaphylos columbiana Shrubland	**ARCCOL**
7	Ceanothus velutinus Shrubland Alliance	
	Ceanothus velutinus Shrubland	**CEAVEL**
3	2.C.4 Temperate & Boreal Bog & Fen Formation	
4	2.C.4.a North American Bog & Fen Division	
5	North Pacific Bog & Fen Macrogroup	
6	North Pacific Lowland Bog & Poor Fen Group	
7	Ledum groenlandicum-Kalmia microphylla Shrubland Alliance	
	Ledum groenlanicum-Kalmia microphylla/Sphagnum spp. Shrubland	**LEDGRO-KALMIC/SPHAGN**
7	Pinus contorta var. contorta-Sphagnum spp. Woodland Alliance	
7	Tsuga heterophylla-(Thuja plicata)-Sphagnum spp. Woodland Alliance	
	Tsuga heterophylla-(Thuja plicata)/Ledum groenlandicum/Sphagnum spp. Woodland	**TSUHET-(THUPLI)/LEDGRO/SPHAGN**
6	North Pacific Montane Fen Group	
7	Kalmia microphylla Dwarf-shrubland Alliance	
	Kalmia microphylla-Carex nigricans Dwarf-shrubland	**KALMIC-CARNIG**
		CUPNOO-TSUMER/CALLEP
7	Tsuga mertensiana Treed Fen Alliance	
3	2.C.5 Temperate & Boreal Freshwater Marsh Formation	
4	2.C.5.b Western North America Freshwater Marsh Division	
5	Western North America Wet Meadow & Low Shrub Carr Macrogroup	
6	North Pacific Montane Riparian Shrubland and Low Carr Group	
7	Salix commutata Shrubland Alliance	
	Salix commutata Shrubland	**SALCOM**

		SPIDOU
		SPIDOU/CARAQUD
		SPISPL/CARLEN
6	Temperate Pacific Subalpine-Montane Wet Meadow Group	
7	Carex (spp.) Herbaceous Vegetation Alliance	
	Carex mertensii Herbaceous Vegetation	**CARMER**
	Carex nigricans Herbaceous Vegetation	**CARNIG**
	Carex spectabilis-Carex nigricans-(Potentilla flabellifolia) Herbaceous Vegetation	**CARSPE-CARNIG-(POTFLA)**
1	3 Semi-Desert Class	
2	3.B Cool Semi-Desert Scrub & Grassland Subclass	
3	3.B.1 Cool Semi-Desert Scrub & Grassland Formation	
4	3.B.1.a Great Basin Cool-Desert Division	
5	Northern Great Basin Shrub Steppe & Grassland Macrogroup	
6	Inter-Mountain Basins Big Sagebrush Steppe Group	
7	Artemisia vaseyana-Purshia tridentata Shrubland Alliance	
1	4 Polar & High Montane Vegetation Class	
2	4.B Temperate & Boreal Alpine Vegetation Subclass	
3	4.B.1 Alpine Scrub, Forb Meadow & Grassland Formation	
4	4.B.1.b Western North America Alpine Scrub, Forb Meadow & Grassland Division	
5	Vancouverian Alpine-Subalpine Dwarf Shrub, Forb Meadow & Grassland Macrogroup	
6	North Pacific Alpine-Subalpine Dwarf-shrubland and Heath Group	
7	Dasiphora fruticosa Dwarf-shrubland Alliance	
	Arctostaphylos uva-ursi-(Dasiphora fruticosa) Dwarf-shrubland	**ARCUVA-(DASFLO)**
7	Empetrum nigrum Dwarf Shrubland Alliance	
	Empetrum nigrum-Lupinus sellulus var. lobbii Dwarf-shrubland	**EMPNIG-LUPSEL**
7	Phyllodoce empetriformis-Cassiope mertensiana-(Vaccinium deliciosum) Dwarf Shrubland Alliance	
	Cassiope mertensiana-Phyllodoce empetriformis Alpine Dwarf-shrubland	**CASMER-PHYEMP**
	Phyllodoce empetriformis-(Vaccinium deliciosum)-Lupinus (arcticus, latifolius) Dwarf-shrubland	**PHYEMP-(VACDEL)/LUPARC**
	Phyllodoce empetriformis-Vaccinium deliciosum-(Cassiope mertensiana) Subalpine Dwarf-shrubland	**PHYEMP-VACDEL-CASMER**
		PHYEMP-CASMER lithomorphic
	Phyllodoce glanduliflora-(Cassiope mertensiana) Dwarf-shrubland	**PHYGLA-(CASMER)**
	Sorbus sitchensis/Phyllodoce empetriformis-Vaccinium deliciosum Shrubland	**SORSIT/PHYEMP-VACDEL**
	Vaccinium membranaceum/Phyllodoce empetriformis Shrubland	**VACMEM-PHYEMP**
7	Salix cascadensis-Festuca brachyphylla Dwarf-shrubland Alliance	
7	Vaccinium (deliciosum, membranaceum) Dwarf Shrubland Alliance	
	Vaccinium deliciosum Dwarf-shrubland	**VACDEL**
	Vaccinium membranaceum/Vaccinium deliciosum Shrubland	**VACMEM/VACDEL**
6	North Pacific Alpine Herbaceous Meadow Group	
7	Festuca (brachyphylla, roemeri, saximontana) Meadow Alliance	
	Carex breweri Herbaceous Vegetation	**CARBRE**
	Carex phaeocephala Herbaceous Vegetation	**CARPHA**
	Festuca (brachyphylla, saximontana) Herbaceous Vegetation	**FESBRA**
	Festuca roemeri-(Phlox diffusa-Arenaria capillaris) Herbaceous Vegetation	**FESROE-(PHLDIF-ARECAP)**
	Phlox diffusa-Lupinus sellulus var. lobbii-(Pedicularis contorta) Herbaceous Vegetation	**PHLDIF-LUPSEL-(PEDCON)**
	Selaginella wallacei-Festuca (roemeri, saximontana, brachyphylla) Herbaceous Vegetation	**SELWAL-(FESROE,FESBRA)**
1	6 Nonvascular & Sparse Vascular Rock Vegetation Class	

2	6.B Mediterranean Cliff, Scree, & Rock Vegetation Subclass	
3	6.B.2 Temperate & Boreal Cliff, Scree, & Rock Vegetation Formation	
4	6.B.2.b Western North America Temperate Cliff, Scree, & other Rock Vegetation Division	
5	Vancouverian Cliff, Scree & Other Rock Vegetation Macrogroup	
6	North Pacific Montane Massive Bedrock, Cliff and Talus Group	
7	Acer circinatum-(Holodiscus discolor) Lithomorphic Vegetation Alliance	
	Acer circinatum-(Holodiscus discolor) Lithomorphic Vegetation	**ACECIR-(HOLDIS) lithomorphic**
2	6.D Polar & High Montane Nonvascular & Sparse Vegetation Subclass	
3	6.D.2 Polar & Alpine Cliff, Scree, & Rock Vegetation Formation	
4	6.D.2.b North American Alpine Cliff, Scree, & Rock Vegetation Division	
5	Vancouverian Alpine Cliff, Scree & Other Rock Vegetation Macrogroup	
6	North Pacific Alpine and Subalpine Bedrock and Scree Group	
7	Campanula piperi Lithomorphic Vegetation Alliance	
	Campanula piperi Lithomorphic Vegetation	**CAMPIP lithomorphic**
7	Carex spectabilis - Dwarf-shrub Lithomorphic Vegetation Alliance	
	Athyrium americanum-Cryptogramma acrostichoides Lithomorphic Vegetation	**ATHAME-CRYACR**
	Carex spectabilis Lithomorphic Vegetation	**CARSPE lithomorphic**
	Carex spectabilis-(Phyllodoce glanduliflora-Lupinus sellulus var. lobbii) Fellfield Lithomorphic Vegetation	**CARSPE-(PHYGLA-LUPSEL)**
	Elmera racemosa-(Senecio neowebsteri) Lithomorphic Vegetation	**ELMRAC-(SENNEO) lithomorphic**
	Vaccinium deliciosum Lithomorphic Vegetation	**VACDEL lithomorphic**
7	Delphinum glareosum Lithomorphic Vegetation Alliance	
	Delphinium glareosum Lithomorphic Vegetation	**DELGLA**
7	Eriogonum pyrolifolium Lithomorphic Vegetation Alliance	
	Eriogonum pyrolifolium Lithomorphic Vegetation	**ERIPYR lithomorphic**
7	Lupinus sellulus ssp. sellulus var. lobbii Lithomorphic Vegetation Alliance	
	Lupinus sellulus var. lobbii-(Erigeron aureus-Minuartia obtusiloba) Lithomorphic Vegetation	**LUPSEL-(ERIAUR-MINOBT)**
7	Phlox diffusa - Lomatium martindalei Lithomorphic Vegetation Alliance	
	Arnica X diversifolia Lithomorphic Vegetation	**ARNXDIV lithomorphic**
	Astragalus cottonii Lithomorphic Vegetation	**ASTCOT lithomorphic**
	Dasiphora fruticosa Lithomorphic Vegetation	**DASFLO lithomorphic**
	Dasiphora fruticosa-(Phlox diffusa) Dwarf-shrubland	**DASFLO-(PHLDIF)**
	Juniperus communis Lithomorphic Vegetation	**JUNCOM lithomorphic**
	Luina hypoleuca Lithomorphic Vegetation	**LUIHYP**
	Paxistima myrsinites/Sedum divergens Lithomorphic Vegetation	**PAXMYR/SEDDIV lithomorphic**
	Penstemon davidsonii Lithomorphic Vegetation	**PENDAV lithomorphic**
	Petrophyton hendersonii Lithomorphic Vegetation	**PETHEN**
	Phlox diffusa-Allium crenulatum Lithomorphic Vegetation	**PHLDIF-ALLCRE lithomorphic**
	Phlox diffusa Lithomorphic Vegetation	**PHLDIF lithomorphic**
	Saxifraga bronchialis Lithomorphic Vegetation	**SAXBRO lithomorphic**
7	Poa stenantha Lithomorphic Vegetation Alliance	
	Poa stenantha-Cerastium arvense Lithomorphic Vegetation	**POASTE-CERARV**
7	Racomitrium elongatum Lithomorphic Vegetation Alliance	
	Polygonum minimum-Racomitrium elongatum Lithomorphic Vegetation	**POLMIN-RACELO lithomorphic**
7	Saxifraga tolmiei Lithomorphic Vegetation Alliance	
	Saxifraga tolmiei-Luzula piperi Lithomorphic Vegetation	**SAXTOL-(LUZPIP) lithomorphic**

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland through Northern Rocky Mountain Douglas-fir-Pine Forest Groups.

Species / Association	PSEMEN/ GAUSHA-HOLDIS	PSEMEN/ HOLDIS-ROSGYM/ FESOCC	PSEMEN-(ABIGRA)/ ACECIR-PAXMYR	PSEMEN-(TSUHET)/ ACECIR-PAXMYR	PSEMEN/ MAHNER/ CALRUB
plots	3	18	4	3	6
TREES					
Abies amabilis			0.25 - 3.00		
Abies grandis	0.33 - 3.00	0.22 - 1.50	0.25 - 10.00	0.67 - 41.50	
Abies lasiocarpa					0.17 - 1.00
Abies procera					
Acer macrophyllum	0.33 - 13.00	0.28 - 14.20	0.75 - 9.00		0.33 - 5.00
Alnus rubra					
Arbutus menziesii	0.67 - 8.00				
Betula papyrifera					0.17 - 3.00
Chamaecyparis nootkatensis					
Cornus nuttallii				0.33 - 33.00	
Larix lyallii					
Picea engelmannii					
Picea sitchensis					
Pinus albicaulis					
Pinus contorta			0.25 - 8.00		0.17 - 3.00
Pinus monticola				0.33 - 6.00	0.17 - 1.00
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 48.33	1.00 - 65.74	1.00 - 41.50	0.67 - 25.00	1.00 - 63.83
Taxus brevifolia		0.22 - 16.00	0.25 - 3.00		
Thuja plicata	0.33 - 1.00	0.06 - 1.00		1.00 - 27.33	0.17 - 3.00
Tsuga heterophylla	0.67 - 2.00	0.22 - 1.50		0.67 - 1.00	0.33 - 1.00
Tsuga mertensiana					
SHRUBS					
Acer circinatum		0.11 - 12.00	1.00 - 31.50	1.00 - 46.00	0.33 - 1.00
Acer glabrum		0.39 - 16.43	0.25 - 3.00	0.33 - 8.00	0.50 - 1.67
Amelanchier alnifolia	0.33 - 1.00	0.56 - 2.40	0.50 - 1.00	0.67 - 3.00	1.00 - 2.00
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi	0.33 - 3.00	0.06 - 1.00	0.25 - 13.00		0.17 - 8.00
Chimaphila menziesii	0.33 - 1.00	0.44 - 1.00	0.25 - 1.00		0.17 - 1.00
Chimaphila umbellata	0.67 - 1.75	0.61 - 3.27	0.50 - 10.50	0.67 - 1.00	0.83 - 9.00
Gaultheria shallon	1.00 - 62.00	0.11 - 2.00			0.17 - 3.00
Holodiscus discolor	1.00 - 5.00	1.00 - 16.94	0.75 - 5.67	0.33 - 3.00	0.67 - 4.75
Linnaea borealis	1.00 - 1.67	0.61 - 3.59		0.33 - 8.00	0.50 - 4.00
Lonicera ciliosa	0.33 - 1.00	0.39 - 1.00		0.33 - 3.00	0.83 - 2.60
Mahonia aquifolium		0.39 - 1.29			0.50 - 8.00
Mahonia nervosa	1.00 - 12.67	0.94 - 33.53	0.25 - 1.00	0.67 - 3.00	1.00 - 23.00
Menziesia ferruginea		0.06 - 1.00			
Oplopanax horridus				0.33 - 1.00	
Paxistima myrsinites		0.17 - 1.00	1.00 - 20.25	1.00 - 33.33	1.00 - 2.67
Philadelphus lewisii		0.06 - 1.00			
Prunus emarginata	0.33 - 3.00	0.11 - 11.50			0.33 - 3.00
Rhododendron albiflorum					
Rhododendron macrophyllum					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland through Northern Rocky Mountain Douglas-fir-Pine Forest Groups.

Species / Association	PSEMEN/ GAUSHA-HOLDIS	PSEMEN/ HOLDIS-ROSGYM/ FESOCC	PSEMEN-(ABIGRA)/ ACECIR-PAXMYR	PSEMEN-(TSUHET)/ ACECIR-PAXMYR	PSEMEN/ MAHNER/ CALRUB
Ribes lacustre		0.11 - 1.00	0.25 - 1.00		
Rosa gymnocarpa	1.00 - 2.00	1.00 - 7.00	0.25 - 8.00	0.67 - 2.00	1.00 - 6.33
Rubus parviflorus		0.17 - 1.67	0.25 - 3.00	0.67 - 1.00	
Rubus spectabilis					
Rubus ursinus	0.67 - 1.55	0.39 - 1.29			0.17 - 1.00
Salix scouleriana			0.25 - 10.00	0.33 - 3.00	0.17 - 1.00
Sambucus racemosa		0.06 - 3.00			0.17 - 1.00
Spiraea betulifolia		0.06 - 3.00	0.25 - 3.00	0.67 - 2.00	0.83 - 3.60
Symphoricarpos albus	0.33 - 0.10	0.44 - 1.88	0.25 - 1.00		0.17 - 1.00
Vaccinium alaskense					
Vaccinium caespitosum					
Vaccinium membranaceum		0.06 - 3.00		0.67 - 2.00	0.50 - 8.00
Vaccinium ovalifolium					
Vaccinium parvifolium	0.33 - 1.00	0.17 - 2.33			0.17 - 1.00
HERBACEOUS					
Achlys triphylla	0.67 - 1.00	0.56 - 7.40			
Adenocaulon bicolor	0.67 - 0.55	0.67 - 4.25			
Arnica cordifolia					0.33 - 2.00
Balsamorhiza sagittata					
Blechnum spicant					
Bromus vulgaris	0.33 - 1.00	0.56 - 1.80			
Calamagrostis rubescens					0.67 - 8.50
Carex geyeri					
Ceanothus velutinus		0.06 - 3.00			
Clintonia uniflora		0.11 - 1.00	0.25 - 1.00	0.67 - 1.00	
Elymus glaucus		0.11 - 2.00			0.50 - 2.33
Erythronium grandiflorum					
Festuca brachyphylla					
Festuca occidentalis	0.67 - 2.00	0.67 - 1.11		0.33 - 1.00	0.50 - 5.67
Fragaria virginiana	0.33 - 1.00	0.17 - 1.00			0.50 - 1.00
Goodyera oblongifolia	0.67 - 1.00	0.72 - 1.15	0.25 - 1.00	0.67 - 1.00	1.00 - 1.33
Hieracium albiflorum	0.33 - 1.00	0.50 - 3.11	0.25 - 1.00	0.33 - 3.00	0.83 - 2.80
Luzula (comosa, multiflora)	0.66 - 1.00				
Maianthemum dilatatum					
Maianthemum racemosum		0.22 - 6.25	0.25 - 1.00	0.67 - 1.00	
Melica subulata		0.33 - 1.22		0.33 - 1.00	
Moehringia macrophylla	0.33 - 1.00	0.39 - 1.57			0.33 - 2.00
Orthilia secunda		0.11 - 1.00		0.67 - 1.00	0.50 - 1.67
Osmorhiza berteroi		0.61 - 2.32		0.33 - 1.00	
Oxalis oregana					
Polystichum munitum	0.33 - 3.00	0.78 - 3.50		0.33 - 1.00	
Pseudoroegneria spicata					
Rubus lasiococcus					
Shepherdia canadensis					
Symphoricarpos hesperius	0.33 - 1.00	0.56 - 1.90			
Valeriana sitchensis					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland through Northern Rocky Mountain Douglas-fir-Pine Forest Groups.

Species / Association	PINCON/ PAXMYR/ CALRUB	PINCON/ VACMEM	PSEMEN/ VACCAE	PSEMEN/ VACMEM	PSEMEN-(PINPON)/ SYMALB
plots	1	2	1	5	3
TREES					
Abies amabilis				0.40 - 1.00	
Abies grandis					
Abies lasiocarpa		1.00 - 7.00		0.40 - 4.50	
Abies procera					
Acer macrophyllum					0.33 - 3.00
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis					
Cornus nuttallii					0.33 - 1.00
Larix lyallii					
Picea engelmannii					
Picea sitchensis					
Pinus albicaulis					
Pinus contorta	1.00 - 80.00	1.00 - 29.50	1.00 - 30.00	0.40 - 5.50	
Pinus monticola			1.00 - 3.00	0.20 - 8.00	
Pinus ponderosa					0.33 - 10.00
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 2.00	1.00 - 4.50	1.00 - 21.00	1.00 - 40.80	1.00 - 51.00
Taxus brevifolia			1.00 - 1.00		
Thuja plicata			1.00 - 8.00	0.20 - 1.00	
Tsuga heterophylla	1.00 - 1.00			0.20 - 1.00	
Tsuga mertensiana					
SHRUBS					
Acer circinatum	1.00 - 1.00				
Acer glabrum	1.00 - 1.00			0.60 - 5.67	0.67 - 2.00
Amelanchier alnifolia	1.00 - 1.00	1.00 - 8.00	1.00 - 1.00	1.00 - 3.20	0.67 - 5.50
Arctostaphylos nevadensis		1.00 - 30.00		0.20 - 1.00	
Arctostaphylos uva-ursi	1.00 - 1.00		1.00 - 20.00	0.20 - 3.00	
Chimaphila menziesii					0.33 - 1.00
Chimaphila umbellata	1.00 - 8.00			0.80 - 3.75	
Gaultheria shallon					
Holodiscus discolor	1.00 - 1.00			0.20 - 3.00	0.33 - 3.00
Linnaea borealis	1.00 - 1.00		1.00 - 3.00	0.40 - 16.50	
Lonicera ciliosa					0.33 - 1.00
Mahonia aquifolium				0.20 - 1.00	0.33 - 3.00
Mahonia nervosa	1.00 - 3.00			0.20 - 1.00	0.33 - 1.00
Menziesia ferruginea					
Oplopanax horridus					
Paxistima myrsinites	1.00 - 50.00	1.00 - 8.00	1.00 - 3.00	1.00 - 18.40	1.00 - 21.00
Philadelphus lewisii					
Prunus emarginata	1.00 - 2.00				0.33 - 3.00
Rhododendron albiflorum					
Rhododendron macrophyllum					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland through Northern Rocky Mountain Douglas-fir-Pine Forest Groups.

Species / Association	PINCON/ PAXMYR/ CALRUB	PINCON/ VACMEM	PSEMEN/ VACCAE	PSEMEN/ VACMEM	PSEMEN-(PINPON)/ SYMALB
Ribes lacustre				0.20 - 3.00	
Rosa gymnocarpa	1.00 - 1.00			0.20 - 30.00	0.33 - 8.00
Rubus parviflorus	1.00 - 3.00			0.20 - 3.00	
Rubus spectabilis					
Rubus ursinus					0.33 - 8.00
Salix scouleriana	1.00 - 3.00			0.20 - 8.00	0.33 - 3.00
Sambucus racemosa					
Spiraea betulifolia		0.50 - 3.00	1.00 - 3.00	0.60 - 8.00	1.00 - 17.67
Symphoricarpos albus					1.00 - 8.67
Vaccinium alaskense					
Vaccinium caespitosum			1.00 - 8.00		
Vaccinium membranaceum	1.00 - 3.00	1.00 - 20.00	1.00 - 13.00	1.00 - 23.20	
Vaccinium ovalifolium					
Vaccinium parvifolium					
HERBACEOUS					
Achlys triphylla					
Adenocaulon bicolor					0.33 - 3.00
Arnica cordifolia				0.60 - 1.00	
Balsamorhiza sagittata					0.33 - 3.00
Blechnum spicant					
Bromus vulgaris					
Calamagrostis rubescens	1.00 - 1.00	0.50 - 13.00		1.00 - 16.80	0.67 - 16.50
Carex geyeri					
Ceanothus velutinus		0.50 - 1.00			
Clintonia uniflora	1.00 - 1.00				
Elymus glaucus					0.67 - 1.00
Erythronium grandiflorum				0.60 - 1.67	
Festuca brachyphylla					
Festuca occidentalis					
Fragaria virginiana				0.20 - 1.00	0.33 - 1.00
Goodyera oblongifolia				0.80 - 1.50	0.67 - 1.00
Hieracium albiflorum	1.00 - 1.00	0.50 - 1.00		0.40 - 3.00	0.67 - 4.50
Luzula (comosa, multiflora)					
Maianthemum dilatatum					
Maianthemum racemosum				0.40 - 2.00	0.67 - 2.00
Melica subulata					0.67 - 3.00
Moehringia macrophylla					0.67 - 3.00
Orthilia secunda				0.40 - 1.00	
Osmorhiza berteroi				0.20 - 1.00	0.67 - 2.00
Oxalis oregana					
Polystichum munitum					
Pseudoroegneria spicata					
Rubus lasiococcus				0.40 - 8.00	
Shepherdia canadensis	1.00 - 3.00				
Symphoricarpos hesperius					
Valeriana sitchensis					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland through Northern Rocky Mountain Douglas-fir-Pine Forest Groups.

Species / Association	PSEMEN/ HOLDIS/ CALRUB	PSEMEN/ PAXMYR-SPIBET	PSEMEN-PINPON/ ARCNEV	PINPON-PSEMEN/ PAXMYR-ARCUVA
plots	4	1	4	1
TREES				
Abies amabilis				
Abies grandis				
Abies lasiocarpa				
Abies procera				
Acer macrophyllum				
Alnus rubra				
Arbutus menziesii				
Betula papyrifera				
Chamaecyparis nootkatensis				
Cornus nuttallii				
Larix lyallii				
Picea engelmannii				
Picea sitchensis				
Pinus albicaulis				
Pinus contorta	1.00 - 4.00		0.50 - 3.50	
Pinus monticola				
Pinus ponderosa	0.25 - 3.00	1.00 - 41.00	0.75 - 16.67	1.00 - 30.00
Populus balsamifera ssp. trichocarpa				
Populus tremuloides				
Pseudotsuga menziesii	1.00 - 60.50	1.00 - 43.00	1.00 - 30.25	1.00 - 9.00
Taxus brevifolia				
Thuja plicata				
Tsuga heterophylla				
Tsuga mertensiana	0.25 - 8.00			
SHRUBS				
Acer circinatum	0.25 - 1.00			
Acer glabrum	0.75 - 1.67			
Amelanchier alnifolia	1.00 - 5.00	1.00 - 8.00	0.50 - 1.00	1.00 - 8.00
Arctostaphylos nevadensis			1.00 - 35.00	
Arctostaphylos uva-ursi	0.50 - 16.50	1.00 - 1.00		1.00 - 8.00
Chimaphila menziesii				
Chimaphila umbellata	0.75 - 1.67		0.25 - 3.00	
Gaultheria shallon	0.25 - 1.00			
Holodiscus discolor	1.00 - 22.75	1.00 - 3.00		1.00 - 1.00
Linnaea borealis	0.50 - 8.00			
Lonicera ciliosa	0.75 - 3.33	1.00 - 3.00		1.00 - 3.00
Mahonia aquifolium	0.75 - 4.00	1.00 - 3.00		
Mahonia nervosa	0.75 - 4.67			
Menziesia ferruginea				
Oplopanax horridus				
Paxistima myrsinites	1.00 - 1.50	1.00 - 20.00	1.00 - 5.50	1.00 - 8.00
Philadelphus lewisii		1.00 - 1.00		
Prunus emarginata	0.50 - 4.50	1.00 - 1.00		1.00 - 3.00
Rhododendron albiflorum				
Rhododendron macrophyllum				

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland through Northern Rocky Mountain Douglas-fir-Pine Forest Groups.

Species / Association	PSEMEN/ HOLDIS/ CALRUB	PSEMEN/ PAXMYR-SPIBET	PSEMEN-PINPON/ ARCNEV	PINPON-PSEMEN/ PAXMYR-ARCUVA
Ribes lacustre	0.25 - 1.00			
Rosa gymnocarpa	1.00 - 6.25	1.00 - 20.00		
Rubus parviflorus				
Rubus spectabilis				
Rubus ursinus				
Salix scouleriana			0.50 - 1.00	
Sambucus racemosa				
Spiraea betulifolia	1.00 - 6.75	1.00 - 13.00	1.00 - 5.50	1.00 - 1.00
Symphoricarpos albus	0.25 - 1.00			
Vaccinium alaskense				
Vaccinium caespitosum				
Vaccinium membranaceum	0.50 - 1.00		0.25 - 1.00	
Vaccinium ovalifolium				
Vaccinium parvifolium				
HERBACEOUS				
Achlys triphylla				
Adenocaulon bicolor				
Arnica cordifolia	0.25 - 1.00		0.50 - 1.00	
Balsamorhiza sagittata				1.00 - 8.00
Blechnum spicant				
Bromus vulgaris			0.25 - 1.00	
Calamagrostis rubescens	1.00 - 6.00		0.75 - 31.00	1.00 - 3.00
Carex geyeri				1.00 - 3.00
Ceanothus velutinus			1.00 - 2.00	1.00 - 3.00
Clintonia uniflora	0.25 - 3.00			
Elymus glaucus				
Erythronium grandiflorum				
Festuca brachyphylla				1.00 - 3.00
Festuca occidentalis	0.50 - 2.00			1.00 - 3.00
Fragaria virginiana	0.50 - 1.00	1.00 - 1.00		1.00 - 1.00
Goodyera oblongifolia	0.75 - 1.00		0.75 - 1.00	
Hieracium albiflorum	0.25 - 1.00	1.00 - 1.00		
Luzula (comosa, multiflora)				1.00 - 1.00
Maianthemum dilatatum				
Maianthemum racemosum	0.25 - 1.00			
Melica subulata	0.25 - 1.00			
Moehringia macrophylla	0.50 - 1.00	1.00 - 1.00	0.25 - 1.00	
Orthilia secunda	0.25 - 1.00			
Osmorhiza berteroi				
Oxalis oregana				
Polystichum munitum	0.25 - 1.00			
Pseudoroegneria spicata				1.00 - 8.00
Rubus lasiococcus				
Shepherdia canadensis				
Symphoricarpos hesperius				
Valeriana sitchensis				

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: Northern Rocky Mountain Whitebark Pine Woodland through Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Groups.

Species / Association	PINALB-(ABILAS)/ VACSCO/ LUZGLA	PINALB/ JUNCOM	LARLYA/ CASMER-LUEPEC	LARLYA/ LUZGLA	LARLYA/ VACDEL
plots	2	1	3	5	3
TREES					
Abies amabilis			0.33 - 1.00		
Abies grandis					
Abies lasiocarpa	1.00 - 13.50	1.00 - 30.00	1.00 - 11.33	1.00 - 22.00	1.00 - 27.33
Abies procera					
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis					
Cornus nuttallii					
Larix lyallii			1.00 - 14.00	1.00 - 26.40	1.00 - 9.33
Picea engelmannii	0.50 - 1.00			0.60 - 13.33	0.33 - 3.00
Picea sitchensis					
Pinus albicaulis	1.00 - 11.00	1.00 - 20.00		0.80 - 2.75	0.33 - 1.00
Pinus contorta					
Pinus monticola					
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	0.50 - 4.00				
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla					
Tsuga mertensiana			0.67 - 11.50		0.33 - 11.00
SHRUBS					
Acer circinatum					
Amelanchier alnifolia					
Arctostaphylos nevadensis					
Cassiope mertensiana			1.00 - 17.00	0.20 - 1.00	0.67 - 16.50
Chimaphila umbellata					
Gaultheria shallon					
Juniperus communis	0.50 - 8.00	1.00 - 20.00		0.20 - 1.00	
Linnaea borealis					
Luetkea pectinata			0.67 - 26.50	0.20 - 10.00	0.67 - 10.50
Mahonia nervosa					
Paxistima myrsinites	1.00 - 11.50				
Phyllodoce empetriformis			1.00 - 34.33	0.80 - 2.50	1.00 - 21.00
Rhododendron albiflorum	0.50 - 1.00		0.33 - 8.00		
Ribes lacustre					
Rosa gymnocarpa					
Rubus parviflorus					
Symphoricarpos albus					
Vaccinium caespitosum				0.60 - 12.00	
Vaccinium deliciosum	0.50 - 3.00		0.67 - 3.00	0.40 - 2.00	1.00 - 40.00
Vaccinium membranaceum	0.50 - 3.00		0.33 - 20.00	0.20 - 1.00	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: Northern Rocky Mountain Whitebark Pine Woodland through Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Groups.

Species / Association	PINALB-(ABILAS)/ VACSCO/ LUZGLA	PINALB/ JUNCOM	LARLYA/ CASMER-LUEPEC	LARLYA/ LUZGLA	LARLYA/ VACDEL
plots	2	1	3	5	3
Vaccinium ovalifolium	1.00 - 35.00	1.00 - 3.00		0.60 - 19.33	
HERBACEOUS					
Antennaria alpina		1.00 - 1.00			
Antennaria lanata	0.50 - 1.00			0.40 - 10.50	1.00 - 4.00
Arenaria capillaris	1.00 - 7.00			0.60 - 5.67	0.67 - 1.00
Arnica latifolia	0.50 - 8.00			0.40 - 9.00	0.67 - 2.00
Asarum caudatum					
Calamagrostis rubescens					
Carex phaeocephala		1.00 - 3.00			
Castilleja miniata	1.00 - 1.00			0.40 - 1.00	
Chamerion angustifolium	0.50 - 3.00				
Clintonia uniflora					
Erigeron peregrinus	0.50 - 1.00			0.80 - 2.00	
Eucephalus ledophyllus		1.00 - 1.00			
Festuca brachyphylla		1.00 - 3.00			
Festuca viridula	0.50 - 3.00			0.60 - 6.33	
Galium triflorum					
Gentiana calycosa				0.60 - 1.67	
Hieracium gracile	0.50 - 1.00		0.33 - 1.00	0.60 - 1.00	0.33 - 1.00
Juncus effusus				0.60 - 2.33	0.67 - 2.00
Ligusticum grayi				0.60 - 1.00	0.33 - 1.00
Lomatium brandegeei	0.50 - 3.00			0.20 - 1.00	
Lomatium martindalei	0.50 - 13.00				
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 3.00			0.80 - 1.50	0.67 - 2.00
Luzula glabrata	1.00 - 1.00	1.00 - 1.00	0.67 - 6.50	1.00 - 18.20	1.00 - 6.33
Minuartia obtusiloba		1.00 - 3.00			
Osmorhiza berteroi					
Pedicularis bracteosa	0.50 - 3.00			0.40 - 1.00	0.33 - 1.00
Pedicularis racemosa	0.50 - 3.00			0.40 - 4.50	0.33 - 8.00
Penstemon confertus		1.00 - 1.00			
Phlox diffusa	1.00 - 4.50	1.00 - 1.00		0.60 - 2.33	
Potentilla flabellifolia				0.60 - 1.00	0.33 - 1.00
Prosartes hookeri					
Pteridium aquilinum					
Pyrola asarifolia					
Rubus lasiococcus					0.67 - 4.50
Saxifraga bronchialis		1.00 - 3.00			
Sedum divergens		1.00 - 1.00			
Senecio integerrimus	1.00 - 2.00			0.60 - 1.00	
Solidago multiradiata		1.00 - 1.00			
Trillium ovatum					
Valeriana dioica			0.33 - 50.00		
Valeriana sitchensis				0.80 - 2.50	0.67 - 3.00
Veratrum viride				0.60 - 1.67	
Viola glabella					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: Northern Rocky Mountain Whitebark Pine Woodland through Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Groups.

Species / Association	POPTRE shrub	POPTRE/ CORNUT	ABILAS-(PSEMEN)/ VACMEM/ CALRUB
plots	1	1	3
TREES			
Abies amabilis			0.33 - 1.00
Abies grandis		1.00 - 9.00	
Abies lasiocarpa	1.00 - 1.00		1.00 - 36.00
Abies procera			
Acer macrophyllum		1.00 - 13.00	
Alnus rubra			
Arbutus menziesii			
Betula papyrifera			
Chamaecyparis nootkatensis			
Cornus nuttallii		1.00 - 30.00	
Larix lyallii			
Picea engelmannii			0.33 - 10.00
Picea sitchensis			
Pinus albicaulis			0.67 - 8.00
Pinus contorta			0.67 - 9.50
Pinus monticola			0.33 - 10.00
Pinus ponderosa			
Populus balsamifera ssp. trichocarpa		1.00 - 3.00	
Populus tremuloides	1.00 - 80.00	1.00 - 83.00	
Pseudotsuga menziesii			0.67 - 22.00
Taxus brevifolia			
Thuja plicata		1.00 - 4.00	0.33 - 10.00
Tsuga heterophylla			
Tsuga mertensiana			
SHRUBS			
Acer circinatum	1.00 - 8.00	1.00 - 3.00	
Amelanchier alnifolia		1.00 - 1.00	0.33 - 1.00
Arctostaphylos nevadensis			0.33 - 40.00
Cassiope mertensiana			
Chimaphila umbellata			0.33 - 10.00
Gaultheria shallon			
Juniperus communis			
Linnaea borealis			0.33 - 3.00
Luetkea pectinata			
Mahonia nervosa			
Paxistima myrsinites	1.00 - 8.00		1.00 - 16.67
Phyllodoce empetriformis			
Rhododendron albiflorum			
Ribes lacustre	1.00 - 1.00		
Rosa gymnocarpa		1.00 - 1.00	
Rubus parviflorus		1.00 - 8.00	
Symphoricarpos albus		1.00 - 3.00	
Vaccinium caespitosum			
Vaccinium deliciosum			0.33 - 3.00
Vaccinium membranaceum			1.00 - 26.67

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: Northern Rocky Mountain Whitebark Pine Woodland through Rocky Mountain Subalpine and Montane Aspen Forest and Woodland Groups.

Species / Association	POPTRE shrub	POPTRE/ CORNUT	ABILAS-(PSEMEN)/ VACMEM/ CALRUB
plots	1	1	3
Vaccinium ovalifolium			
HERBACEOUS			
Antennaria alpina			
Antennaria lanata			
Arenaria capillaris			
Arnica latifolia			0.33 - 3.00
Asarum caudatum		1.00 - 1.00	
Calamagrostis rubescens			0.67 - 10.00
Carex phaeocephala			
Castilleja miniata			
Chamerion angustifolium			
Clintonia uniflora		1.00 - 3.00	
Erigeron peregrinus			
Eucephalus ledophyllus			
Festuca brachyphylla			
Festuca viridula			0.33 - 10.00
Galium triflorum		1.00 - 1.00	
Gentiana calycosa			
Hieracium gracile			
Juncus effusus			
Ligusticum grayi			
Lomatium brandegeei			
Lomatium martindalei			
Lupinus (arcticus ssp. subalpinus, latifolius)			0.33 - 3.00
Luzula glabrata			0.33 - 10.00
Minuartia obtusiloba			
Osmorhiza berteroi		1.00 - 1.00	
Pedicularis bracteosa			
Pedicularis racemosa			0.67 - 1.00
Penstemon confertus			
Phlox diffusa			
Potentilla flabellifolia			
Prosartes hookeri		1.00 - 1.00	
Pteridium aquilinum	1.00 - 13.00	1.00 - 3.00	
Pyrola asarifolia		1.00 - 1.00	
Rubus lasiococcus			
Saxifraga bronchialis			
Sedum divergens			
Senecio integerrimus			
Solidago multiradiata			
Trillium ovatum		1.00 - 3.00	
Valeriana dioica			
Valeriana sitchensis			
Veratrum viride			
Viola glabella		1.00 - 3.00	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hypermaritime Sitka Spruce Forest through North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest Groups.

Species / Association	PICSIT/ GAUSHA	PICSIT/ MAIDIL	PICSIT-TSUHET/ POLMUN	PICSIT-TSUHET/ POLMUN-OXAORE	THUPLI-TSUHET/ VACOVA
plots	3	3	11	35	17
TREES					
Abies amabilis				0.03 - 10.30	
Abies grandis					
Abies lasiocarpa					
Abies procera					
Acer macrophyllum				0.31 - 37.69	
Alnus rubra			0.36 - 15.25	0.11 - 6.33	0.06 - 3.00
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis					
Cornus nuttallii					
Larix lyallii					
Picea engelmannii					
Picea sitchensis	1.00 - 50.33	1.00 - 53.33	1.00 - 58.82	1.00 - 39.27	0.12 - 6.00
Pinus albicaulis					
Pinus contorta					
Pinus monticola					
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii				0.17 - 26.33	
Taxus brevifolia					0.12 - 10.50
Thuja plicata	0.33 - 30.00	0.67 - 3.00	0.27 - 8.00	0.17 - 14.88	0.94 - 32.13
Tsuga heterophylla	0.67 - 23.00	1.00 - 23.00	0.91 - 22.60	0.91 - 45.78	1.00 - 32.82
Tsuga mertensiana					
SHRUBS					
Acer circinatum				0.83 - 27.34	
Gaultheria shallon	1.00 - 46.00	1.00 - 1.00	0.82 - 4.78	0.06 - 1.00	1.00 - 18.06
Lonicera involucrata	0.33 - 1.00	0.67 - 1.00	0.27 - 1.67		
Mahonia nervosa					
Malus fusca			0.09 - 3.00		0.41 - 9.57
Menziesia ferruginea	0.67 - 2.00	0.33 - 1.00	0.27 - 1.67	0.06 - 1.00	0.82 - 5.64
Oplopanax horridus				0.03 - 0.30	
Rubus spectabilis	1.00 - 8.67		0.82 - 7.78	0.54 - 4.87	0.24 - 4.00
Vaccinium alaskense	0.33 - 30.00		0.09 - 1.00	0.46 - 6.27	0.65 - 4.27
Vaccinium membranaceum					
Vaccinium ovalifolium		0.33 - 1.00	0.09 - 8.00	0.20 - 2.90	
Vaccinium ovatum	0.67 - 2.00	0.67 - 2.00	0.36 - 1.50		1.00 - 52.59
Vaccinium parvifolium	0.67 - 2.00	0.33 - 1.00	0.64 - 1.29	0.80 - 7.90	0.88 - 3.67
HERBACEOUS					
Achlys triphylla				0.37 - 10.97	
Adenocaulon bicolor				0.43 - 3.57	
Asarum caudatum				0.06 - 1.00	
Athyrium filix-femina	0.33 - 1.00		0.64 - 1.29	0.57 - 3.87	
Blechnum spicant	0.67 - 1.00	0.67 - 3.00	1.00 - 2.36	0.60 - 3.10	0.88 - 18.87
Boykinia occidentalis				0.26 - 1.96	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hypermaritime Sitka Spruce Forest through North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest Groups.

Species / Association	PICSIT/ GAUSHA	PICSIT/ MAIDIL	PICSIT-TSUHET/ POLMUN	PICSIT-TSUHET/ POLMUN-OXAORE	THUPLI-TSUHET/ VACOVA
plots	3	3	11	35	17
Bromus sitchensis				0.09 - 15.00	
Carex deweyana			0.09 - 1.00	0.43 - 4.93	
Carex obnupta	0.33 - 1.00				0.06 - 1.00
Circaea alpina				0.37 - 8.77	
Claytonia sibirica			0.55 - 2.83	0.49 - 2.58	
Clintonia uniflora		0.33 - 1.00	0.09 - 1.00	0.17 - 1.98	0.06 - 1.00
Cornus unalaschkensis	0.33 - 1.00			0.23 - 9.88	0.53 - 1.22
Dryopteris expansa	0.33 - 1.00	0.33 - 1.00	0.64 - 1.29	0.03 - 1.00	
Elymus glaucus				0.09 - 25.00	
Elymus hirsutus				0.09 - 8.00	
Bromus	0.33 - 1.00				
Galium triflorum			0.18 - 1.00	0.40 - 2.28	
Glyceria striata				0.06 - 11.50	
Goodyera oblongifolia					
Gymnocarpium disjunctum					
Gymnocarpium dryopteris				0.34 - 5.66	
Heracleum maximum					
Hydrophyllum tenuipes				0.06 - 1.00	
Luzula (fastigiata, parviflora)			0.55 - 1.00	0.69 - 1.60	
Lysichiton americanus	0.33 - 3.00	0.33 - 3.00			0.47 - 2.63
Maianthemum dilatatum	0.67 - 8.00	1.00 - 76.67	0.91 - 2.60	0.60 - 2.04	0.29 - 5.60
Maianthemum racemosum					
Maianthemum stellatum					0.06 - 1.00
Melica subulata				0.09 - 1.43	
Moneses uniflora	0.33 - 1.00		0.18 - 1.00	0.49 - 0.69	0.24 - 1.00
Mycelis muralis				0.49 - 3.04	
Orthilia secunda					
Osmorhiza berteroi				0.06 - 1.65	
Oxalis oregana			0.09 - 3.00	1.00 - 27.57	
Poa trivialis				0.14 - 13.12	
Polypodium glycyrrhiza			0.09 - 1.00	0.26 - 0.94	0.12 - 1.00
Polypodium scouleri		0.67 - 1.00	0.18 - 1.00		0.12 - 1.00
Polystichum munitum	0.67 - 20.00	1.00 - 1.67	1.00 - 47.82	1.00 - 18.30	
Prosartes hookeri			0.09 - 1.00	0.03 - 1.00	
Prosartes smithii				0.29 - 1.25	
Pteridium aquilinum	0.33 - 1.00	0.33 - 1.00	0.18 - 2.00	0.14 - 34.60	0.12 - 16.50
Ranunculus uncinatus				0.06 - 1.50	
Rubus pedatus	0.33 - 3.00			0.51 - 7.02	0.06 - 3.00
Rumex crispus				0.17 - 3.88	
Stachys chamissonis var. cooleyae	0.33 - 1.00		0.09 - 1.00	0.17 - 1.60	
Streptopus amplexifolius	0.67 - 1.00	0.33 - 1.00	0.27 - 1.00	0.11 - 0.90	0.12 - 1.00
Tellima grandiflora	0.33 - 1.00			0.03 - 2.00	
Tiarella trifoliata	0.33 - 1.00		0.27 - 1.67	0.94 - 13.38	0.18 - 1.67
Tolmiea menziesii				0.29 - 5.06	
Trisetum canescens				0.54 - 3.29	
Viola glabella				0.14 - 1.80	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hypermaritime Sitka Spruce Forest through North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest Groups.

Species / Association	TSUHET/ GAUSHA/ POLMUN-BLESPI	TSUHET/ POLMUN-BLESPI	TSUHET/ POLMUN-OXAORE	TSUHET/ VACALA/ OXAORE
plots	2	1	13	3
TREES				
Abies amabilis			0.15 - 2.15	0.33 - 13.00
Abies grandis				
Abies lasiocarpa				
Abies procera				
Acer macrophyllum			0.08 - 25.00	
Alnus rubra			0.15 - 2.65	
Arbutus menziesii				
Betula papyrifera				
Chamaecyparis nootkatensis				
Cornus nuttallii				
Larix lyallii				
Picea engelmannii				
Picea sitchensis	0.50 - 3.00		0.77 - 5.92	0.67 - 4.50
Pinus albicaulis				
Pinus contorta				
Pinus monticola				
Pinus ponderosa				
Populus balsamifera ssp. trichocarpa				
Populus tremuloides				
Prunus emarginata				
Pseudotsuga menziesii			0.69 - 18.40	0.33 - 8.00
Taxus brevifolia				
Thuja plicata	1.00 - 2.00		0.62 - 24.40	0.33 - 20.00
Tsuga heterophylla	1.00 - 71.00	1.00 - 98.00	1.00 - 74.87	1.00 - 87.33
Tsuga mertensiana				
SHRUBS				
Acer circinatum	0.50 - 3.00	1.00 - 1.00	0.77 - 8.46	0.33 - 3.00
Gaultheria shallon	1.00 - 26.50		0.23 - 1.20	0.33 - 13.00
Lonicera involucrata				
Mahonia nervosa				
Malus fusca				
Menziesia ferruginea	0.50 - 1.00		0.38 - 3.20	0.67 - 4.50
Oplopanax horridus				
Rubus spectabilis	0.50 - 8.00		0.46 - 3.17	1.00 - 3.33
Vaccinium alaskense	0.50 - 1.00		0.38 - 1.40	1.00 - 27.67
Vaccinium membranaceum				
Vaccinium ovalifolium			0.46 - 1.72	0.33 - 2.00
Vaccinium ovatum				
Vaccinium parvifolium	1.00 - 3.00	1.00 - 1.00	1.00 - 9.00	1.00 - 8.67
HERBACEOUS				
Achlys triphylla		1.00 - 1.00	0.62 - 12.74	
Adenocaulon bicolor			0.38 - 4.66	
Asarum caudatum				
Athyrium filix-femina			0.54 - 1.76	1.00 - 1.00
Blechnum spicant	1.00 - 3.00	1.00 - 60.00	0.85 - 4.57	1.00 - 4.67
Boykinia occidentalis			0.23 - 1.77	0.67 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hypermaritime Sitka Spruce Forest through North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest Groups.

Species / Association	TSUHET/ GAUSHA/ POLMUN-BLESPI	TSUHET/ POLMUN-BLESPI	TSUHET/ POLMUN-OXAORE	TSUHET/ VACALA/ OXAORE
plots	2	1	13	3
Bromus sitchensis				
Carex deweyana			0.15 - 1.15	
Carex obnupta				
Circaea alpina			0.15 - 4.00	
Claytonia sibirica		1.00 - 1.00	0.15 - 3.00	
Clintonia uniflora		1.00 - 1.00	0.62 - 6.91	0.33 - 0.30
Cornus unalaschkensis			0.38 - 10.20	
Dryopteris expansa	0.50 - 1.00			
Elymus glaucus				
Elymus hirsutus				
Bromus				
Galium triflorum	0.50 - 1.00		0.23 - 1.43	
Glyceria striata				
Goodyera oblongifolia	0.50 - 1.00	1.00 - 1.00	0.08 - 0.30	
Gymnocarpium disjunctum		1.00 - 8.00		
Gymnocarpium dryopteris			0.31 - 13.50	
Heracleum maximum				
Hydrophyllum tenuipes				
Luzula (fastigiata, parviflora)	0.50 - 1.00		0.62 - 1.49	
Lysichiton americanus				
Maianthemum dilatatum			0.54 - 1.23	0.67 - 4.15
Maianthemum racemosum				
Maianthemum stellatum			0.15 - 0.30	
Melica subulata				
Moneses uniflora	0.50 - 1.00		0.62 - 0.83	
Mycelis muralis			0.31 - 2.00	
Orthilia secunda				
Osmorhiza berteroi				
Oxalis oregana	0.50 - 3.00		1.00 - 28.23	1.00 - 41.67
Poa trivialis				
Polypodium glycyrrhiza			0.15 - 0.65	
Polypodium scouleri				
Polystichum munitum	1.00 - 8.00	1.00 - 20.00	0.92 - 23.67	1.00 - 15.33
Prosartes hookeri				0.33 - 1.00
Prosartes smithii			0.54 - 1.70	0.33 - 0.30
Pteridium aquilinum			0.23 - 6.33	
Ranunculus uncinatus				
Rubus pedatus			0.85 - 3.36	0.67 - 0.65
Rumex crispus				
Stachys chamissonis var. cooleyae				
Streptopus amplexifolius		1.00 - 1.00	0.08 - 0.30	0.33 - 0.30
Tellima grandiflora				
Tiarella trifoliata		1.00 - 2.00	1.00 - 15.02	1.00 - 8.33
Tolmiea menziesii			0.15 - 4.50	
Trisetum canescens			0.62 - 4.08	
Viola glabella				

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	TAXBRE /PAXMYR	PSEMEN-(THUPLI-ABIGRA) /VACMEM	PSEMEN /ACECIR /MAHNER	PSEMEN /ACHTRI	PSEMEN /GAUSHA-VACPAR
plots	1	3	13	3	10
TREES					
Abies amabilis		0.33 - 4.00	0.08 - 1.00		
Abies grandis		0.33 - 8.00	0.08 - 6.00		
Abies lasiocarpa		0.67 - 2.00		0.33 - 2.00	0.30 - 1.20
Abies procera					
Acer macrophyllum			0.31 - 8.75		0.20 - 5.50
Alnus rubra			0.08 - 3.00		
Arbutus menziesii					
Betula papyrifera			0.15 - 18.00		
Chamaecyparis nootkatensis				0.33 - 1.00	
Larix lyallii					
Picea engelmannii					
Picea sitchensis					
Pinus albicaulis					
Pinus contorta		0.33 - 11.00	0.15 - 3.00		
Pinus monticola		0.33 - 1.00	0.08 - 1.00	0.33 - 1.00	0.50 - 0.90
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii		1.00 - 39.00	1.00 - 63.62	1.00 - 51.00	1.00 - 60.43
Taxus brevifolia	1.00 - 80.00	0.33 - 6.00	0.08 - 1.00	0.33 - 4.00	0.40 - 5.58
Thuja plicata		0.67 - 12.00	0.46 - 4.67		
Tsuga heterophylla		1.00 - 5.33	0.54 - 4.14	0.33 - 1.00	0.90 - 5.10
Tsuga mertensiana				0.33 - 1.00	
SHRUBS					
Acer circinatum		0.33 - 11.00	1.00 - 33.08	1.00 - 13.67	0.20 - 17.50
Acer glabrum			0.46 - 5.50		0.30 - 3.10
Amelanchier alnifolia		0.67 - 2.00	0.85 - 1.55	0.67 - 2.00	
Arctostaphylos columbiana					0.10 - 0.30
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi		0.33 - 3.00			0.30 - 8.43
Chimaphila menziesii			0.31 - 1.00		0.10 - 0.30
Corylus cornuta		0.33 - 1.00	0.46 - 5.67		
Gaultheria ovatifolia			0.08 - 1.00		
Gaultheria shallon			0.15 - 1.00		1.00 - 46.50
Linnaea borealis		1.00 - 12.00	0.31 - 8.00	0.33 - 8.00	0.80 - 2.13
Lonicera ciliosa			0.38 - 1.40		0.10 - 1.00
Mahonia nervosa		0.67 - 2.00	1.00 - 31.85	0.67 - 2.00	1.00 - 10.20
Menziesia ferruginea					
Oplopanax horridus					
Paxistima myrsinites	1.00 - 20.00	0.67 - 24.00	0.92 - 10.67	0.33 - 0.30	0.40 - 0.65
Rhododendron macrophyllum					0.20 - 3.00
Rosa gymnocarpa		0.67 - 1.00	1.00 - 3.00	0.67 - 1.50	0.70 - 1.76
Rubus parviflorus			0.15 - 1.00		
Rubus spectabilis			0.08 - 1.00		
Rubus ursinus			0.38 - 1.00	0.33 - 1.00	0.20 - 1.00
Sorbus scopulina	1.00 - 1.00	0.67 - 1.00			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	TAXBRE /PAXMYR	PSEMEN-(THUPLI-ABIGRA) /VACMEM	PSEMEN /ACECIR /MAHNER	PSEMEN /ACHTRI	PSEMEN /GAUSHA-VACPAR
plots	1	3	13	3	10
Spiraea betulifolia		0.33 - 1.00	0.62 - 2.13		
Vaccinium alaskense					
Vaccinium membranaceum		1.00 - 26.67	0.31 - 1.00	0.33 - 1.00	
Vaccinium ovalifolium					
Vaccinium parvifolium		1.00 - 14.67	0.38 - 4.20	0.67 - 3.00	0.60 - 1.55
HERBACEOUS					
Achlys triphylla			0.08 - 1.00	1.00 - 3.33	0.40 - 10.33
Adenocaulon bicolor			0.23 - 1.00		
Asarum caudatum					
Athyrium filix-femina					
Blechnum spicant					
Bromus vulgaris					0.10 - 1.00
Clintonia uniflora		0.33 - 1.00			
Cornus unalaschkensis				0.33 - 3.00	
Dryopteris expansa					
Festuca occidentalis			0.15 - 2.00		0.60 - 1.22
Festuca subulata					
Fragaria vesca					
Galium triflorum			0.08 - 1.00		
Goodyera oblongifolia		1.00 - 1.00	0.69 - 1.22	0.33 - 1.00	0.30 - 1.00
Gymnocarpium dryopteris					
Hieracium albiflorum		1.00 - 1.00	0.46 - 1.33	0.67 - 0.65	0.60 - 0.77
Luzula (fastigiata, parviflora)					
Maianthemum dilatatum					
Maianthemum stellatum				0.33 - 3.00	
Moehringia macrophylla			0.15 - 1.00	0.67 - 1.00	
Mycelis muralis					0.10 - 1.00
Orthilia secunda		0.33 - 1.00	0.31 - 1.00		0.20 - 0.65
Oxalis oregana					
Polystichum munitum			0.23 - 3.33		0.50 - 1.26
Prosartes hookeri			0.38 - 1.40		0.10 - 3.00
Pteridium aquilinum		0.33 - 13.00	0.46 - 2.83	0.33 - 3.00	0.40 - 0.30
Pyrola asarifolia		0.33 - 1.00	0.08 - 1.00		0.10 - 0.30
Pyrola picta		0.67 - 1.00	0.31 - 1.00	0.33 - 1.00	0.40 - 0.65
Rubus pedatus					
Streptopus amplexifolius					
Streptopus lanceolatus					
Symphoricarpos hesperius				0.33 - 1.00	0.10 - 1.00
Tiarella trifoliata					
Trientalis borealis ssp. latifolia					0.10 - 1.00
Trifolium latifolium				0.33 - 0.30	0.20 - 0.65
Trillium ovatum					
Trisetum canescens				0.33 - 0.30	
Vicia americana					0.10 - 1.00
Viola sempervirens			0.08 - 1.00		0.20 - 0.65
Xerophyllum tenax				0.67 - 1.65	0.30 - 4.00
Viola glabella					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN /MAHNER /ACHTRI	PSEMEN-ABIGRA /MAHNER-GAUSHA /POLMUN	PSEMEN-TSUHET /ACHTRI	PSEMEN-TSUHET /GAUSHA /POLMUN	PSEMEN-TSUHET /GAUSHA-VACPAR
plots	9	1	18	9	21
TREES					
Abies amabilis	0.33 - 1.00		0.44 - 1.75	0.22 - 3.00	0.24 - 4.00
Abies grandis	0.22 - 2.00	1.00 - 38.00	0.22 - 11.50		
Abies lasiocarpa	0.11 - 3.00		0.06 - 4.00		0.05 - 0.30
Abies procera	0.22 - 2.00		0.06 - 3.00		
Acer macrophyllum	0.11 - 30.00		0.06 - 3.00	0.11 - 20.00	
Alnus rubra			0.06 - 1.00	0.11 - 3.00	0.14 - 3.33
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis			0.06 - 3.00		0.05 - 1.00
Larix lyallii					
Picea engelmannii					
Picea sitchensis					
Pinus albicaulis					
Pinus contorta					
Pinus monticola	0.22 - 1.00		0.06 - 1.00		0.38 - 3.63
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					0.05 - 3.00
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 74.00	1.00 - 50.00	0.94 - 39.12	1.00 - 39.44	0.90 - 32.26
Taxus brevifolia	0.22 - 30.00	1.00 - 1.00	0.17 - 1.00		0.19 - 1.33
Thuja plicata			0.39 - 23.57	0.78 - 16.90	0.57 - 22.63
Tsuga heterophylla	0.89 - 2.63	1.00 - 3.00	1.00 - 30.46	1.00 - 51.70	1.00 - 41.42
Tsuga mertensiana					0.10 - 1.00
SHRUBS					
Acer circinatum	0.44 - 2.00		0.67 - 20.17	0.56 - 9.60	0.33 - 2.43
Acer glabrum	0.33 - 21.33		0.06 - 3.00	0.11 - 30.00	
Amelanchier alnifolia	0.11 - 1.00		0.11 - 1.00		0.10 - 0.55
Arctostaphylos columbiana					
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi	0.22 - 1.00				
Chimaphila menziesii	0.33 - 1.00		0.33 - 0.88	0.11 - 0.30	0.33 - 0.64
Corylus cornuta	0.11 - 1.00		0.06 - 3.00		
Gaultheria ovatifolia	0.33 - 1.67				
Gaultheria shallon	0.44 - 2.00		0.50 - 1.67	1.00 - 13.00	1.00 - 54.29
Linnaea borealis	0.78 - 10.86	1.00 - 1.00	0.72 - 6.62	0.78 - 7.76	0.52 - 2.33
Lonicera ciliosa	0.11 - 3.00		0.06 - 1.00	0.11 - 1.00	
Mahonia nervosa	1.00 - 37.33	1.00 - 70.00	0.61 - 9.36	0.89 - 9.25	0.48 - 1.58
Menziesia ferruginea			0.17 - 2.00	0.11 - 1.00	0.19 - 4.25
Oplopanax horridus			0.06 - 1.00		
Paxistima myrsinites	0.56 - 1.40		0.06 - 0.10		0.24 - 1.22
Rhododendron macrophyllum					
Rosa gymnocarpa	0.78 - 1.86		0.39 - 7.07	0.22 - 1.65	0.19 - 2.25
Rubus parviflorus			0.28 - 0.86	0.22 - 1.00	
Rubus spectabilis	0.11 - 1.00		0.17 - 1.67	0.11 - 1.00	
Rubus ursinus	0.78 - 2.29		0.28 - 0.68	0.33 - 1.00	0.19 - 0.70
Sorbus scopulina					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN /MAHNER /ACHTRI	PSEMEN-ABIGRA /MAHNER-GAUSHA /POLMUN	PSEMEN-TSUHET /ACHTRI	PSEMEN-TSUHET /GAUSHA /POLMUN	PSEMEN-TSUHET /GAUSHA-VACPAR
plots	9	1	18	9	21
Spiraea betulifolia					
Vaccinium alaskense			0.22 - 2.50	0.33 - 2.77	0.24 - 1.66
Vaccinium membranaceum	0.33 - 1.00		0.28 - 1.00	0.11 - 1.00	0.14 - 2.73
Vaccinium ovalifolium					0.05 - 2.00
Vaccinium parvifolium	0.78 - 2.14		0.50 - 2.67	1.00 - 11.33	0.81 - 3.12
HERBACEOUS					
Achlys triphylla	1.00 - 10.44	1.00 - 8.00	1.00 - 29.22	0.44 - 1.25	0.14 - 1.07
Adenocaulon bicolor	0.22 - 1.00	1.00 - 3.00	0.39 - 0.90	0.11 - 1.00	0.10 - 0.20
Asarum caudatum			0.06 - 1.00		
Athyrium filix-femina			0.22 - 3.00	0.11 - 0.30	
Blechnum spicant			0.11 - 1.00	0.33 - 1.43	0.05 - 1.00
Bromus vulgaris	0.44 - 1.00	1.00 - 1.00	0.11 - 3.00		
Clintonia uniflora	0.11 - 1.00		0.39 - 3.00	0.22 - 2.00	0.14 - 0.53
Cornus unalaschkensis			0.67 - 3.17	0.22 - 3.50	0.14 - 1.00
Dryopteris expansa					
Festuca occidentalis	0.33 - 1.00				
Festuca subulata	0.11 - 1.00	1.00 - 1.00	0.06 - 3.00		
Fragaria vesca	0.11 - 1.00		0.11 - 2.00		
Galium triflorum	0.22 - 1.00			0.11 - 1.00	
Goodyera oblongifolia	0.44 - 1.00	1.00 - 1.00	0.39 - 1.19	0.11 - 1.00	0.43 - 0.68
Gymnocarpium dryopteris					
Hieracium albiflorum	0.67 - 1.67		0.06 - 1.00		0.14 - 0.47
Luzula (fastigiata, parviflora)				0.22 - 1.00	
Maianthemum dilatatum			0.11 - 1.50	0.11 - 1.00	
Maianthemum stellatum	0.33 - 1.00		0.33 - 1.50	0.11 - 1.00	
Moehringia macrophylla		1.00 - 1.00	0.06 - 1.00		0.05 - 0.10
Mycelis muralis	0.11 - 1.00	1.00 - 1.00	0.06 - 1.00	0.11 - 1.00	
Orthilia secunda	0.11 - 1.00		0.22 - 1.00		0.14 - 0.40
Oxalis oregana					
Polystichum munitum	0.33 - 2.33	1.00 - 8.00	0.61 - 1.76	1.00 - 12.78	0.29 - 0.65
Prosartes hookeri			0.33 - 1.22	0.11 - 1.00	
Pteridium aquilinum	0.89 - 5.00		0.28 - 6.80	0.22 - 2.00	0.33 - 0.84
Pyrola asarifolia	0.22 - 1.00	1.00 - 1.00	0.11 - 0.65	0.22 - 0.65	0.14 - 0.70
Pyrola picta	0.11 - 1.00		0.17 - 1.00		0.10 - 1.00
Rubus pedatus			0.06 - 1.00		0.10 - 0.55
Streptopus amplexifolius			0.17 - 1.00	0.22 - 0.65	
Streptopus lanceolatus	0.11 - 1.00		0.06 - 3.00		
Symphoricarpos hesperius	0.44 - 1.00		0.11 - 1.00		
Tiarella trifoliata	0.11 - 1.00		0.56 - 5.43	0.44 - 7.58	
Trientalis borealis ssp. latifolia					
Trifolium latifolium			0.06 - 1.00	0.22 - 0.30	
Trillium ovatum			0.33 - 0.85	0.89 - 0.65	0.10 - 0.65
Trisetum canescens			0.06 - 3.00		
Vicia americana	0.11 - 3.00				
Viola sempervirens	0.33 - 1.67	1.00 - 1.00	0.56 - 2.10	0.11 - 1.00	
Xerophyllum tenax	0.44 - 3.75		0.06 - 1.00		0.14 - 0.77
Viola glabella	0.11 - 3.00		0.11 - 1.00	0.11 - 0.30	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-TSUHET /MAHNER	PSEMEN-TSUHET /PAXMYR /LINBOR	PSEMEN-TSUHET /RHOMAC /POLMUN	TSUHET-(PSEMEN) /VACALA /CORUNA	TSUHET-(PSEMEN) /VACALA-MAHNER-(GAUSHA)
plots	20	6	1	12	15
TREES					
Abies amabilis	0.15 - 3.33			0.75 - 6.29	0.47 - 5.57
Abies grandis	0.05 - 2.00	0.17 - 1.00			
Abies lasiocarpa	0.10 - 3.50	0.50 - 1.67			
Abies procera					
Acer macrophyllum					
Alnus rubra	0.05 - 3.00			0.08 - 1.00	
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis				0.08 - 21.00	
Larix lyallii					
Picea engelmannii	0.05 - 3.00	0.33 - 6.50		0.08 - 1.00	
Picea sitchensis				0.08 - 8.00	0.07 - 0.30
Pinus albicaulis					
Pinus contorta	0.05 - 60.00	0.50 - 2.33			
Pinus monticola	0.10 - 12.00	0.67 - 12.75		0.17 - 0.90	0.33 - 1.30
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 35.90	1.00 - 32.33	1.00 - 40.00	0.67 - 16.13	0.93 - 18.07
Taxus brevifolia	0.40 - 6.75	0.33 - 3.00			0.27 - 2.50
Thuja plicata	0.85 - 26.00	1.00 - 5.67		0.42 - 19.46	0.80 - 18.08
Tsuga heterophylla	1.00 - 43.42	1.00 - 42.17	1.00 - 99.00	1.00 - 66.78	1.00 - 66.35
Tsuga mertensiana					
SHRUBS					
Acer circinatum	0.50 - 11.10		1.00 - 3.00	0.17 - 3.50	0.40 - 10.38
Acer glabrum	0.35 - 4.57	0.17 - 3.00			
Amelanchier alnifolia	0.40 - 2.00	0.50 - 1.00			0.07 - 1.00
Arctostaphylos columbiana					
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi	0.05 - 1.00	0.33 - 11.50			
Chimaphila menziesii	0.40 - 2.41	0.17 - 1.00		0.17 - 0.65	0.13 - 0.65
Corylus cornuta	0.10 - 3.00				
Gaultheria ovatifolia	0.15 - 4.00	0.17 - 10.00		0.08 - 1.00	0.07 - 3.00
Gaultheria shallon	0.35 - 1.57			0.50 - 0.88	0.93 - 43.07
Linnaea borealis	0.90 - 4.74	0.83 - 8.60	1.00 - 2.00	0.42 - 8.40	0.40 - 7.50
Lonicera ciliosa	0.15 - 1.00	0.17 - 1.00			
Mahonia nervosa	1.00 - 17.25	0.67 - 2.00		0.17 - 1.65	0.47 - 9.61
Menziesia ferruginea	0.10 - 11.50			0.42 - 2.40	0.27 - 2.25
Oplopanax horridus	0.05 - 3.00			0.17 - 4.50	
Paxistima myrsinites	0.65 - 14.92	1.00 - 12.67			0.20 - 1.33
Rhododendron macrophyllum	0.05 - 0.30		1.00 - 6.00		
Rosa gymnocarpa	0.60 - 1.50	0.33 - 2.00	1.00 - 4.00	0.08 - 3.00	0.27 - 3.25
Rubus parviflorus	0.10 - 5.50	0.17 - 1.00		0.08 - 1.00	
Rubus spectabilis	0.05 - 1.00		1.00 - 1.00	0.33 - 3.25	0.07 - 1.00
Rubus ursinus	0.15 - 1.00				0.13 - 4.00
Sorbus scopulina	0.05 - 3.00	0.33 - 1.00			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-TSUHET /MAHNER	PSEMEN-TSUHET /PAXMYR /LINBOR	PSEMEN-TSUHET /RHOMAC /POLMUN	TSUHET-(PSEMEN) /VACALA /CORUNA	TSUHET-(PSEMEN) /VACALA-MAHNER-(GAUSHA)
plots	20	6	1	12	15
Spiraea betulifolia	0.15 - 3.33	0.33 - 1.00			
Vaccinium alaskense	0.10 - 2.00	0.17 - 1.00		1.00 - 23.50	1.00 - 17.40
Vaccinium membranaceum	0.40 - 3.00	0.83 - 1.80	1.00 - 0.30	0.25 - 3.67	0.20 - 1.00
Vaccinium ovalifolium					
Vaccinium parvifolium	0.70 - 2.38	0.33 - 1.00	1.00 - 2.00	0.92 - 10.82	0.87 - 13.46
HERBACEOUS					
Achlys triphylla	0.15 - 1.67		1.00 - 1.00	0.33 - 16.75	0.07 - 2.00
Adenocaulon bicolor			1.00 - 3.00	0.08 - 3.00	
Asarum caudatum	0.20 - 1.00			0.08 - 1.00	
Athyrium filix-femina				0.08 - 3.00	0.07 - 1.00
Blechnum spicant				0.25 - 3.33	0.13 - 0.65
Bromus vulgaris	0.05 - 0.30				
Clintonia uniflora	0.30 - 5.17	0.17 - 1.00		0.50 - 3.67	0.20 - 1.43
Cornus unalaschkensis	0.35 - 2.14			0.67 - 10.88	0.27 - 1.75
Dryopteris expansa				0.08 - 1.00	
Festuca occidentalis					
Festuca subulata			1.00 - 3.00		
Fragaria vesca	0.05 - 1.00				
Galium triflorum	0.10 - 1.00		1.00 - 1.00	0.08 - 1.00	
Goodyera oblongifolia	0.75 - 2.75	0.83 - 1.00	1.00 - 1.00	0.17 - 1.00	0.33 - 0.86
Gymnocarpium dryopteris	0.05 - 1.00			0.08 - 1.00	
Hieracium albiflorum	0.05 - 1.00	0.17 - 1.00			
Luzula (fastigiata, parviflora)				0.08 - 1.00	
Maianthemum dilatatum	0.05 - 1.00		1.00 - 0.30	0.17 - 2.50	
Maianthemum stellatum	0.05 - 8.00		1.00 - 2.00		
Moehringia macrophylla					
Mycelis muralis					
Orthilia secunda	0.15 - 4.00	0.17 - 1.00	1.00 - 1.00	0.25 - 1.67	0.33 - 1.00
Oxalis oregana				0.08 - 2.00	
Polystichum munitum	0.30 - 1.33		1.00 - 10.00	0.33 - 1.25	0.20 - 0.77
Prosartes hookeri	0.05 - 3.00				
Pteridium aquilinum	0.10 - 2.00	0.17 - 1.00			0.07 - 1.00
Pyrola asarifolia	0.40 - 1.75	0.83 - 2.80			0.20 - 1.00
Pyrola picta	0.25 - 3.40	0.50 - 1.00			0.07 - 1.00
Rubus pedatus	0.10 - 1.00			0.42 - 7.60	
Streptopus amplexifolius	0.05 - 1.00			0.17 - 1.50	
Streptopus lanceolatus	0.10 - 1.00			0.25 - 1.00	
Symphoricarpos hesperius	0.05 - 3.00				
Tiarella trifoliata	0.20 - 3.33			0.50 - 5.55	0.07 - 1.00
Trientalis borealis ssp. latifolia					
Trifolium latifolium				0.08 - 8.00	0.07 - 1.00
Trillium ovatum	0.20 - 0.83			0.33 - 1.50	0.13 - 0.65
Trisetum canescens					
Vicia americana					
Viola sempervirens	0.10 - 1.00				0.07 - 1.00
Xerophyllum tenax	0.10 - 2.00			0.08 - 0.30	0.07 - 0.30
Viola glabella	0.05 - 1.00			0.08 - 1.00	0.07 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	TSUHET-PSEMEN /MAHNER-CHIMEN	TSUHET-PSEMEN /VACALA /OXAORE	TSUHET-THUPLI /TAXBRE	BETPAP-(THUPLI) /ACECIR /MAHNER	PINCON-PSEMEN /GAUSHA
plots	20	7	1	6	10
TREES					
Abies amabilis	0.50 - 2.26	0.14 - 10.00			
Abies grandis	0.15 - 5.33				
Abies lasiocarpa					
Abies procera	0.05 - 3.00				
Acer macrophyllum				0.50 - 11.67	
Alnus rubra				0.17 - 8.00	
Arbutus menziesii					
Betula papyrifera				1.00 - 51.17	
Chamaecyparis nootkatensis	0.05 - 1.00				
Larix lyallii					
Picea engelmannii	0.05 - 20.00				
Picea sitchensis		0.86 - 6.48			
Pinus albicaulis					
Pinus contorta					1.00 - 41.20
Pinus monticola	0.10 - 5.50				0.70 - 18.14
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa	0.10 - 11.50			0.17 - 3.00	
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 31.50	1.00 - 35.84		1.00 - 22.67	1.00 - 15.30
Taxus brevifolia	0.30 - 2.83		1.00 - 30.00	0.17 - 1.00	
Thuja plicata	0.90 - 20.06	0.14 - 3.00	1.00 - 30.00	0.67 - 26.25	
Tsuga heterophylla	0.95 - 50.61	1.00 - 67.23	1.00 - 99.00	0.67 - 7.75	0.70 - 2.86
Tsuga mertensiana					
SHRUBS					
Acer circinatum	0.25 - 1.20	0.29 - 22.00	1.00 - 1.00	1.00 - 31.17	0.20 - 1.00
Acer glabrum	0.05 - 1.00			0.67 - 16.00	
Amelanchier alnifolia	0.10 - 1.00			0.33 - 6.00	0.10 - 1.00
Arctostaphylos columbiana					0.10 - 3.00
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi					0.20 - 3.00
Chimaphila menziesii	0.40 - 0.91		1.00 - 3.00	0.33 - 1.00	0.10 - 1.00
Corylus cornuta				0.17 - 1.00	
Gaultheria ovatifolia			1.00 - 1.00		0.30 - 6.33
Gaultheria shallon	0.30 - 1.67	0.14 - 1.00			1.00 - 68.00
Linnaea borealis	0.40 - 1.08	0.14 - 3.00	1.00 - 3.00	0.33 - 4.50	0.10 - 3.00
Lonicera ciliosa				0.67 - 1.50	
Mahonia nervosa	1.00 - 2.15			1.00 - 40.17	0.30 - 1.67
Menziesia ferruginea	0.05 - 1.00	0.29 - 1.65			
Oplopanax horridus			1.00 - 1.00		
Paxistima myrsinites	0.25 - 1.00			0.67 - 5.00	0.30 - 3.33
Rhododendron macrophyllum	0.10 - 1.00				
Rosa gymnocarpa	0.15 - 0.77			0.83 - 2.80	0.10 - 1.00
Rubus parviflorus				0.67 - 3.75	
Rubus spectabilis		0.57 - 1.50			
Rubus ursinus	0.10 - 1.00			0.50 - 3.33	
Sorbus scopulina					

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	TSUHET-PSEMEN /MAHNER-CHIMEN	TSUHET-PSEMEN /VACALA /OXAORE	TSUHET-THUPLI /TAXBRE	BETPAP-(THUPLI) /ACECIR /MAHNER	PINCON-PSEMEN /GAUSHA
plots	20	7	1	6	10
Spiraea betulifolia				0.50 - 1.00	0.10 - 8.00
Vaccinium alaskense	0.05 - 1.00	0.86 - 13.33			
Vaccinium membranaceum	0.20 - 1.00				0.10 - 3.00
Vaccinium ovalifolium		0.57 - 8.50	1.00 - 1.00	0.17 - 1.00	
Vaccinium parvifolium	0.65 - 1.05	0.86 - 17.17	1.00 - 8.00		0.60 - 3.00
HERBACEOUS					
Achlys triphylla	0.10 - 1.00	0.29 - 25.00			
Adenocaulon bicolor				0.33 - 1.00	
Asarum caudatum	0.05 - 1.00				
Athyrium filix-femina		0.43 - 2.00			
Blechnum spicant		0.86 - 5.38	1.00 - 3.00		
Bromus vulgaris					
Clintonia uniflora	0.25 - 1.26	0.71 - 4.66	1.00 - 3.00	0.33 - 2.00	
Cornus unalaschkensis	0.20 - 1.00	0.43 - 15.00	1.00 - 3.00	0.17 - 8.00	
Dryopteris expansa	0.05 - 1.00				
Festuca occidentalis					
Festuca subulata					
Fragaria vesca					
Galium triflorum	0.10 - 1.00	0.14 - 3.00			
Goodyera oblongifolia	0.50 - 0.93		1.00 - 3.00	0.67 - 1.00	
Gymnocarpium dryopteris		0.14 - 2.00			
Hieracium albiflorum					0.20 - 1.00
Luzula (fastigiata, parviflora)		0.86 - 0.53			
Maianthemum dilatatum		1.00 - 5.04			
Maianthemum stellatum	0.10 - 1.00	0.14 - 1.00		0.33 - 2.00	
Moehringia macrophylla					
Mycelis muralis	0.05 - 1.00				
Orthilia secunda	0.10 - 1.00		1.00 - 3.00	0.67 - 1.00	
Oxalis oregana		1.00 - 35.00			
Polystichum munitum	0.25 - 1.20	1.00 - 8.57			
Prosartes hookeri	0.15 - 1.00			0.33 - 1.00	
Pteridium aquilinum	0.05 - 1.00	0.29 - 14.00		0.33 - 3.00	0.20 - 7.00
Pyrola asarifolia	0.20 - 1.00			0.33 - 1.00	
Pyrola picta	0.35 - 0.90			0.17 - 1.00	0.40 - 2.00
Rubus pedatus		0.86 - 5.83			
Streptopus amplexifolius	0.05 - 1.00	0.14 - 1.00		0.17 - 3.00	
Streptopus lanceolatus					
Symphoricarpos hesperius					
Tiarella trifoliata	0.05 - 0.30	1.00 - 12.33			
Trientalis borealis ssp. latifolia				0.83 - 1.80	
Trifolium latifolium					
Trillium ovatum	0.20 - 0.83	0.29 - 0.65	1.00 - 3.00		
Trisetum canescens		0.57 - 1.15			
Vicia americana					
Viola sempervirens	0.05 - 1.00				
Xerophyllum tenax					
Viola glabella	0.15 - 1.00	0.14 - 2.00			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-(PINCON) /ARCUVA /RACCAN	PSEMEN /ARCNEV Dep.	PSEMEN /VACMEM /HYLSPL	PSEMEN /GAUSHA-MAHNER /POLMUN	PSEMEN-(TSUHET) /Dep.
plots	12	1	1	5	22
TREES					
Abies amabilis			1.00 - 1.00		0.36 - 3.29
Abies grandis	0.17 - 2.50			0.20 - 3.00	
Abies lasiocarpa	0.17 - 5.65				0.05 - 0.30
Abies procera					0.14 - 8.00
Acer macrophyllum				0.80 - 29.32	
Alnus rubra					0.09 - 14.00
Arbutus menziesii					
Betula papyrifera					0.05 - 10.00
Chamaecyparis nootkatensis					0.05 - 3.00
Larix lyallii					
Picea engelmannii					0.05 - 13.00
Picea sitchensis					0.05 - 3.00
Pinus albicaulis					
Pinus contorta	0.58 - 22.86				
Pinus monticola	0.58 - 1.80		1.00 - 1.00		0.09 - 0.75
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					0.14 - 6.33
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 32.00	1.00 - 51.00	1.00 - 63.00	1.00 - 68.20	0.91 - 28.05
Taxus brevifolia	0.08 - 20.00				0.14 - 3.33
Thuja plicata	0.17 - 5.50	1.00 - 3.00	1.00 - 1.00	0.40 - 3.00	0.50 - 23.09
Tsuga heterophylla	0.67 - 5.33	1.00 - 3.00		0.80 - 2.50	0.91 - 62.50
Tsuga mertensiana			1.00 - 1.00		0.09 - 5.50
SHRUBS					
Acer circinatum	0.08 - 1.00			0.40 - 29.00	0.05 - 1.00
Acer glabrum	0.17 - 3.50			0.20 - 1.00	
Amelanchier alnifolia	0.42 - 1.60			0.20 - 1.00	0.05 - 1.00
Arctostaphylos columbiana	0.50 - 4.00				
Arctostaphylos nevadensis		1.00 - 3.00			
Arctostaphylos uva-ursi	1.00 - 42.75				
Chimaphila menziesii		1.00 - 1.00	1.00 - 1.00		0.41 - 1.22
Corylus cornuta					
Gaultheria ovatifolia	0.33 - 3.00				0.05 - 0.30
Gaultheria shallon	0.50 - 3.50			0.20 - 20.00	0.18 - 1.13
Linnaea borealis	0.42 - 3.00	1.00 - 1.00	1.00 - 1.00	0.40 - 2.00	0.41 - 1.12
Lonicera ciliosa	0.08 - 1.00				
Mahonia nervosa	0.67 - 2.13	1.00 - 1.00		1.00 - 34.00	0.05 - 1.00
Menziesia ferruginea					0.09 - 1.00
Oplopanax horridus					0.05 - 1.00
Paxistima myrsinites	0.58 - 2.00	1.00 - 1.00			0.23 - 1.12
Rhododendron macrophyllum					
Rosa gymnocarpa	0.58 - 2.00			1.00 - 6.40	0.05 - 0.50
Rubus parviflorus				0.20 - 2.00	0.05 - 1.00
Rubus spectabilis					
Rubus ursinus	0.08 - 0.30			1.00 - 1.20	
Sorbus scopulina					0.05 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-(PINCON) /ARCUVA /RACCAN	PSEMEN /ARCNEV Dep.	PSEMEN /VACMEM /HYLSPL	PSEMEN /GAUSHA-MAHNER /POLMUN	PSEMEN-(TSUHET) /Dep.
plots	12	1	1	5	22
Spiraea betulifolia	0.33 - 1.00				
Vaccinium alaskense					
Vaccinium membranaceum	0.33 - 4.00	1.00 - 1.00	1.00 - 3.00		0.18 - 0.83
Vaccinium ovalifolium	0.08 - 1.00				0.05 - 1.00
Vaccinium parvifolium	0.50 - 1.22	1.00 - 1.00	1.00 - 3.00		0.55 - 1.44
HERBACEOUS					
Achlys triphylla	0.08 - 1.00			1.00 - 8.60	
Adenocaulon bicolor				0.60 - 2.33	0.05 - 1.00
Asarum caudatum					
Athyrium filix-femina				0.20 - 1.00	0.14 - 0.77
Blechnum spicant					0.09 - 1.00
Bromus vulgaris	0.08 - 1.00			0.80 - 2.25	
Clintonia uniflora					0.23 - 1.00
Cornus unalaschkensis					0.05 - 1.00
Dryopteris expansa					
Festuca occidentalis	0.42 - 2.60			0.40 - 1.00	
Festuca subulata				0.60 - 0.77	
Fragaria vesca	0.08 - 20.00			0.60 - 1.67	
Galium triflorum				0.60 - 1.33	0.09 - 1.00
Goodyera oblongifolia	0.42 - 1.00	1.00 - 1.00	1.00 - 1.00	1.00 - 0.86	0.41 - 0.90
Gymnocarpium dryopteris					0.05 - 1.00
Hieracium albiflorum	0.75 - 1.14	1.00 - 1.00	1.00 - 1.00	0.20 - 0.30	0.09 - 1.00
Luzula (fastigiata, parviflora)					
Maianthemum dilatatum					0.05 - 1.00
Maianthemum stellatum					0.09 - 1.00
Moehringia macrophylla	0.25 - 1.00	1.00 - 1.00	1.00 - 1.00	0.20 - 1.00	
Mycelis muralis				0.60 - 2.33	0.09 - 2.00
Orthilia secunda	0.08 - 1.00				0.27 - 0.88
Oxalis oregana					
Polystichum munitum	0.17 - 1.00			1.00 - 39.00	0.32 - 1.19
Prosartes hookeri				0.60 - 1.00	0.05 - 1.00
Pteridium aquilinum	0.08 - 1.00			0.20 - 1.00	0.05 - 1.00
Pyrola asarifolia					0.09 - 1.00
Pyrola picta	0.33 - 0.83			0.20 - 1.00	0.09 - 1.00
Rubus pedatus					
Streptopus amplexifolius				0.20 - 1.00	
Streptopus lanceolatus					0.05 - 1.00
Symphoricarpos hesperius	0.17 - 1.00			0.60 - 1.43	
Tiarella trifoliata				0.20 - 1.00	0.23 - 1.20
Trientalis borealis ssp. latifolia					
Trifolium latifolium				0.20 - 0.30	
Trillium ovatum					0.18 - 1.00
Trisetum canescens	0.08 - 6.00				0.05 - 1.00
Vicia americana				0.60 - 1.00	
Viola sempervirens				0.60 - 1.67	
Xerophyllum tenax					
Viola glabella					0.05 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-TSUHET /GAUSHA /XERTEN	PSEMEN-TSUHET /GAUSHA-MAHNER	PSEMEN-TSUHET /RHOMAC	PSEMEN-TSUHET /VACALA /XERTEN	PSEMEN-(ALNRUB-TSUHET) /RUBSPE
plots	1	18	25	5	9
TREES					
Abies amabilis		0.28 - 2.60	0.16 - 2.23	0.80 - 6.38	0.22 - 5.00
Abies grandis		0.11 - 1.00			
Abies lasiocarpa			0.36 - 1.43	0.20 - 1.00	
Abies procera				0.20 - 3.00	
Acer macrophyllum					0.11 - 1.00
Alnus rubra					0.44 - 14.25
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis			0.08 - 2.50	0.40 - 12.00	
Larix lyallii					
Picea engelmannii		0.06 - 3.00			
Picea sitchensis					0.22 - 7.00
Pinus albicaulis					
Pinus contorta		0.06 - 16.00			
Pinus monticola	1.00 - 1.00	0.28 - 5.26	0.36 - 5.32	0.60 - 2.50	
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	1.00 - 30.00	1.00 - 37.46	0.96 - 30.76	1.00 - 10.20	
Taxus brevifolia		0.33 - 2.00	0.04 - 1.00		
Thuja plicata	1.00 - 11.00	0.56 - 10.63	0.52 - 14.61		0.22 - 2.50
Tsuga heterophylla	1.00 - 43.00	1.00 - 43.07	1.00 - 55.43	1.00 - 57.00	1.00 - 47.67
Tsuga mertensiana		0.06 - 3.00	0.04 - 13.00	0.20 - 1.00	
SHRUBS					
Acer circinatum	1.00 - 1.00	0.44 - 10.50	0.24 - 3.93		0.11 - 8.00
Acer glabrum		0.11 - 1.00	0.04 - 3.00	0.20 - 0.30	
Amelanchier alnifolia		0.17 - 1.00	0.08 - 0.30		
Arctostaphylos columbiana					
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi		0.06 - 1.00	0.16 - 17.50		
Chimaphila menziesii		0.39 - 0.80	0.20 - 0.44	0.20 - 0.30	
Corylus cornuta					
Gaultheria ovatifolia		0.17 - 1.00	0.16 - 2.58	0.60 - 2.93	
Gaultheria shallon	1.00 - 80.00	1.00 - 45.06	0.76 - 46.91	0.20 - 8.00	0.67 - 11.67
Linnaea borealis		0.83 - 5.33	0.60 - 5.42	0.40 - 1.00	
Lonicera ciliosa		0.06 - 1.00			
Mahonia nervosa		0.94 - 13.53	0.72 - 6.57		
Menziesia ferruginea		0.06 - 1.00	0.20 - 2.86	0.60 - 4.83	0.56 - 4.60
Oplopanax horridus					
Paxistima myrsinites		0.11 - 3.00	0.04 - 4.00	0.40 - 1.00	
Rhododendron macrophyllum		0.06 - 2.00	1.00 - 47.72		
Rosa gymnocarpa		0.33 - 1.83	0.24 - 2.55		0.11 - 13.00
Rubus parviflorus					0.11 - 3.00
Rubus spectabilis					1.00 - 34.00
Rubus ursinus		0.44 - 0.91	0.08 - 1.65		0.11 - 1.00
Sorbus scopulina		0.06 - 1.00			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-TSUHET /GAUSHA /XERTEN	PSEMEN-TSUHET /GAUSHA-MAHNER	PSEMEN-TSUHET /RHOMAC	PSEMEN-TSUHET /VACALA /XERTEN	PSEMEN-(ALNRUB-TSUHET) /RUBSPE
plots	1	18	25	5	9
Spiraea betulifolia		0.11 - 2.00			
Vaccinium alaskense		0.17 - 1.67	0.12 - 4.33	0.60 - 12.00	0.78 - 4.14
Vaccinium membranaceum	1.00 - 3.00	0.17 - 1.67	0.08 - 0.65	0.40 - 2.00	
Vaccinium ovalifolium		0.06 - 0.30		0.20 - 8.00	0.11 - 1.00
Vaccinium parvifolium	1.00 - 13.00	0.94 - 6.06	0.68 - 5.07	0.40 - 6.50	1.00 - 5.56
HERBACEOUS					
Achlys triphylla		0.39 - 1.90	0.12 - 0.53		0.11 - 13.00
Adenocaulon bicolor		0.11 - 0.65			0.11 - 1.00
Asarum caudatum		0.11 - 0.65			
Athyrium filix-femina					0.89 - 3.25
Blechnum spicant		0.06 - 0.30			1.00 - 7.22
Bromus vulgaris		0.06 - 1.00			0.11 - 3.00
Clintonia uniflora		0.11 - 1.00	0.08 - 1.00		0.11 - 1.00
Cornus unalaschkensis		0.17 - 11.00	0.04 - 3.00		0.22 - 4.50
Dryopteris expansa					0.56 - 1.40
Festuca occidentalis		0.06 - 1.00			
Festuca subulata					
Fragaria vesca					
Galium triflorum					0.33 - 1.00
Goodyera oblongifolia		0.56 - 0.86	0.20 - 1.38	0.20 - 1.00	
Gymnocarpium dryopteris					0.56 - 1.40
Hieracium albiflorum			0.12 - 0.53		
Luzula (fastigiata, parviflora)					0.78 - 1.00
Maianthemum dilatatum					0.78 - 7.14
Maianthemum stellatum		0.06 - 1.00			
Moehringia macrophylla					
Mycelis muralis					
Orthilia secunda		0.11 - 1.00	0.16 - 2.00	0.40 - 1.50	
Oxalis oregana					0.67 - 10.83
Polystichum munitum		0.28 - 0.86	0.12 - 2.10		0.67 - 15.00
Prosartes hookeri					
Pteridium aquilinum		0.39 - 1.00	0.16 - 4.08		0.11 - 3.00
Pyrola asarifolia		0.17 - 1.00	0.20 - 1.66	0.20 - 0.30	
Pyrola picta		0.11 - 1.00	0.12 - 0.30		
Rubus pedatus					0.44 - 2.00
Streptopus amplexifolius					0.22 - 1.00
Streptopus lanceolatus					
Symphoricarpos hesperius		0.06 - 1.00	0.04 - 0.30		
Tiarella trifoliata		0.17 - 1.43	0.04 - 1.00		0.67 - 2.83
Trientalis borealis ssp. latifolia					
Trifolium latifolium		0.11 - 2.15	0.08 - 0.65		
Trillium ovatum		0.28 - 0.72	0.04 - 1.00		0.11 - 1.00
Trisetum canescens					
Vicia americana					
Viola sempervirens		0.17 - 1.00	0.04 - 1.00		
Xerophyllum tenax	1.00 - 3.00		0.40 - 5.36	1.00 - 28.60	
Viola glabella					0.11 - 3.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-TSUHET /(ACECIR) /POLMUN	PSEMEN-TSUHET /MAHNER-POLMUN	PSEMEN-TSUHET /POLMUN-OXAORE	TSUHET-(PSEMEN) /TIATRI-GYMDRY	TSUHET-(PSEMEN) /VACALA /POLMUN	TSUHET-(PSEMEN-THUPLI)/ OPLHOR/ POLMUN
plots	**1**	**20**	**11**	**15**	**2**	7
TREES						
Abies amabilis		0.10 - 5.00		0.20 - 2.67	0.50 - 0.30	0.43 - 6.67
Abies grandis		0.20 - 10.65	0.09 - 41.00	0.27 - 22.88		0.43 - 12.00
Abies lasiocarpa						
Abies procera						
Acer macrophyllum		0.20 - 15.07	0.27 - 12.00	0.07 - 21.00		
Alnus rubra		0.05 - 1.00	0.09 - 3.00	0.07 - 12.00		0.14 - 7.00
Arbutus menziesii						
Betula papyrifera						
Chamaecyparis nootkatensis						
Larix lyallii						
Picea engelmannii						0.14 - 13.00
Picea sitchensis			0.36 - 5.05	0.13 - 3.50		
Pinus albicaulis						
Pinus contorta						
Pinus monticola						
Pinus ponderosa						
Populus balsamifera ssp. trichocarpa			0.09 - 8.00			0.14 - 3.00
Populus tremuloides						
Pseudotsuga menziesii	1.00 - 60.00	0.90 - 51.78	1.00 - 36.03	0.80 - 27.08	0.50 - 33.00	0.29 - 15.15
Taxus brevifolia	1.00 - 14.00	0.15 - 4.67		0.20 - 3.00		
Thuja plicata	1.00 - 33.00	0.85 - 29.61	0.82 - 26.78	0.80 - 32.86		1.00 - 27.57
Tsuga heterophylla	1.00 - 41.00	1.00 - 53.93	0.91 - 40.83	0.93 - 46.66	1.00 - 90.00	1.00 - 56.71
Tsuga mertensiana						
SHRUBS						
Acer circinatum		0.55 - 31.18	0.82 - 24.44	0.53 - 12.50	0.50 - 1.00	0.57 - 11.00
Acer glabrum	1.00 - 1.00	0.05 - 10.00		0.13 - 1.65		0.14 - 1.00
Amelanchier alnifolia				0.20 - 1.00		
Arctostaphylos columbiana						
Arctostaphylos nevadensis						
Arctostaphylos uva-ursi						
Chimaphila menziesii		0.10 - 0.55		0.20 - 1.00	1.00 - 0.65	
Corylus cornuta		0.10 - 2.50				0.14 - 1.00
Gaultheria ovatifolia						
Gaultheria shallon	1.00 - 1.00	0.40 - 2.16	0.18 - 0.65	0.07 - 8.00	1.00 - 4.50	0.14 - 1.00
Linnaea borealis	1.00 - 1.00	0.75 - 6.27	0.18 - 1.15	0.60 - 9.33	0.50 - 0.30	
Lonicera ciliosa		0.05 - 1.00		0.13 - 1.00		
Mahonia nervosa		1.00 - 17.25	0.64 - 7.43	0.47 - 1.43	0.50 - 5.00	0.57 - 1.50
Menziesia ferruginea		0.15 - 1.00	0.27 - 0.77	0.27 - 1.50	0.50 - 3.00	0.29 - 1.00
Oplopanax horridus		0.20 - 1.33	0.27 - 1.00	0.53 - 2.50		1.00 - 29.71
Paxistima myrsinites		0.10 - 2.00		0.13 - 1.00		
Rhododendron macrophyllum		0.05 - 1.00				
Rosa gymnocarpa	1.00 - 1.00	0.45 - 2.70	0.18 - 0.65	0.53 - 1.38		0.43 - 1.67
Rubus parviflorus		0.15 - 1.27	0.09 - 1.00	0.27 - 1.00		0.14 - 20.00
Rubus spectabilis		0.05 - 1.00	0.18 - 1.00	0.40 - 1.00		0.71 - 5.00
Rubus ursinus	1.00 - 1.00	0.25 - 1.40	0.18 - 2.15			
Sorbus scopulina				0.20 - 1.00		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Maritime Douglas-fir-Western Hemlock Forest Group.

Species / Association	PSEMEN-TSUHET /(ACECIR) /POLMUN	PSEMEN-TSUHET /MAHNER-POLMUN	PSEMEN-TSUHET /POLMUN-OXAORE	TSUHET-(PSEMEN) /TIATRI-GYMDRY	TSUHET-(PSEMEN) /VACALA /POLMUN	TSUHET-(PSEMEN-THUPLI)/ OPLHOR/ POLMUN
plots	1	20	11	15	2	7
Spiraea betulifolia						
Vaccinium alaskense	1.00 - 3.00	0.20 - 1.25	0.18 - 0.65	0.33 - 2.60	1.00 - 6.50	0.29 - 1.00
Vaccinium membranaceum		0.05 - 1.00		0.27 - 0.88		
Vaccinium ovalifolium			0.09 - 1.00			0.29 - 10.50
Vaccinium parvifolium	1.00 - 3.00	0.75 - 2.50	0.64 - 4.29	0.80 - 4.08	1.00 - 10.00	0.86 - 4.05
HERBACEOUS						
Achlys triphylla	1.00 - 3.00	0.70 - 2.37	0.64 - 32.29	0.60 - 3.78		0.57 - 7.33
Adenocaulon bicolor		0.10 - 0.75	0.64 - 2.76	0.47 - 4.29		0.29 - 1.00
Asarum caudatum		0.10 - 1.50		0.33 - 2.50		0.43 - 2.33
Athyrium filix-femina		0.05 - 3.00	0.45 - 1.86	0.53 - 4.29	0.50 - 1.00	0.57 - 5.00
Blechnum spicant		0.20 - 2.33	0.27 - 3.00	0.20 - 3.33	0.50 - 13.00	0.43 - 9.00
Bromus vulgaris				0.07 - 3.00		
Clintonia uniflora		0.15 - 4.00		0.73 - 3.91	1.00 - 0.65	0.86 - 3.55
Cornus unalaschkensis		0.15 - 1.67	0.09 - 6.00	0.53 - 5.25		0.29 - 1.50
Dryopteris expansa		0.15 - 0.70		0.27 - 2.00	0.50 - 1.00	0.57 - 1.50
Festuca occidentalis						
Festuca subulata		0.05 - 0.10				
Fragaria vesca						
Galium triflorum	1.00 - 1.00	0.25 - 0.66	0.55 - 1.77	0.40 - 1.67		0.43 - 1.67
Goodyera oblongifolia	1.00 - 1.00	0.55 - 0.76	0.45 - 0.86	0.60 - 0.84	0.50 - 0.30	0.57 - 1.00
Gymnocarpium dryopteris		0.10 - 8.00	0.27 - 34.00	0.73 - 10.91		0.43 - 8.00
Hieracium albiflorum			0.09 - 0.30			
Luzula (fastigiata, parviflora)			0.36 - 1.23	0.07 - 1.00		0.14 - 3.00
Maianthemum dilatatum		0.05 - 1.00	0.09 - 1.00	0.27 - 3.25		0.29 - 1.00
Maianthemum stellatum		0.25 - 1.40	0.18 - 4.50	0.40 - 3.17		0.71 - 20.60
Moehringia macrophylla		0.05 - 0.10				
Mycelis muralis		0.20 - 0.65	0.18 - 1.65	0.07 - 3.00		0.29 - 1.00
Orthilia secunda		0.05 - 1.00		0.13 - 3.00	0.50 - 0.30	
Oxalis oregana		0.05 - 1.00	1.00 - 35.09	0.07 - 2.00		0.29 - 21.50
Polystichum munitum	1.00 - 30.00	1.00 - 8.65	1.00 - 29.45	0.87 - 3.15	1.00 - 8.00	0.71 - 12.40
Prosartes hookeri		0.20 - 0.75	0.18 - 1.00	0.40 - 1.67		
Pteridium aquilinum		0.05 - 3.00	0.09 - 0.30	0.07 - 3.00		0.29 - 12.00
Pyrola asarifolia	1.00 - 1.00	0.15 - 0.70		0.07 - 1.00		
Pyrola picta		0.20 - 1.00		0.07 - 1.00		0.14 - 1.00
Rubus pedatus		0.05 - 3.00		0.40 - 1.52		0.14 - 8.00
Streptopus amplexifolius			0.09 - 2.00	0.33 - 2.80		0.14 - 1.00
Streptopus lanceolatus				0.33 - 2.62		0.14 - 1.00
Symphoricarpos hesperius						
Tiarella trifoliata	1.00 - 1.00	0.35 - 1.57	0.73 - 8.00	1.00 - 9.47	0.50 - 2.00	1.00 - 7.00
Trientalis borealis ssp. latifolia				0.07 - 1.00		0.14 - 1.00
Trifolium latifolium		0.10 - 0.30	0.36 - 1.33	0.13 - 2.15	0.50 - 0.30	
Trillium ovatum	1.00 - 1.00	0.40 - 0.74	0.45 - 0.44	0.53 - 1.33	0.50 - 0.30	1.00 - 1.19
Trisetum canescens			0.18 - 1.65	0.07 - 3.00		
Vicia americana						
Viola sempervirens		0.05 - 1.00		0.33 - 2.40		0.14 - 1.00
Xerophyllum tenax						
Viola glabella		0.20 - 1.00	0.27 - 1.00	0.27 - 1.50		0.29 - 2.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	TSUHET - ABIAMA - (THUPLI) / VACALA / BLESPI	TSUHET - ABIAMA / BLESPI - TIATRI - POLMUN	TSUHET - ABIAMA / OXAORE - BLESPI	TSUHET - ABIAMA / VACALA / RUBPED	TSUHET - ABIAMA / VACALA / TIATRI
plots	3	4	7	12	7
TREES					
Abies amabilis	1.00 - 25.33	1.00 - 16.50	1.00 - 34.84	1.00 - 49.61	1.00 - 41.29
Abies grandis					0.14 - 0.50
Abies lasiocarpa					
Abies procera					
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis				0.17 - 15.00	0.14 - 1.00
Cornus nuttallii					
Larix lyallii					
Picea engelmannii					
Picea sitchensis			0.14 - 11.00		
Pinus albicaulis					
Pinus contorta					
Pinus monticola					
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	0.33 - 3.00	0.25 - 30.00	0.14 - 20.30	0.50 - 11.83	
Taxus brevifolia				0.17 - 1.00	0.14 - 3.00
Thuja plicata	0.67 - 19.50	0.25 - 2.00	0.14 - 3.00	0.42 - 12.20	0.14 - 8.00
Tsuga heterophylla	1.00 - 51.33	1.00 - 72.00	1.00 - 52.29	0.92 - 36.45	1.00 - 43.00
Tsuga mertensiana				0.17 - 7.65	0.14 - 4.00
SHRUBS					
Acer circinatum		0.25 - 8.00		0.33 - 22.25	0.14 - 1.00
Chimaphila menziesii	0.33 - 1.00		0.14 - 0.30	0.25 - 1.00	0.14 - 1.00
Chimaphila umbellata	0.33 - 1.00	0.25 - 1.00		0.25 - 3.33	0.14 - 1.00
Gaultheria ovatifolia				0.17 - 2.00	
Gaultheria shallon	0.67 - 2.00		0.14 - 1.00		0.14 - 3.00
Linnaea borealis	0.33 - 3.00	0.25 - 1.00		0.67 - 3.88	0.14 - 3.00
Mahonia nervosa		0.25 - 1.00	0.29 - 0.65	0.17 - 4.50	0.14 - 1.00
Menziesia ferruginea	0.67 - 3.00		0.14 - 3.00	0.42 - 1.40	0.43 - 2.33
Oplopanax horridus	0.67 - 1.00			0.08 - 1.00	0.29 - 1.00
Paxistima myrsinites				0.08 - 3.00	
Rhododendron albiflorum					
Rhododendron macrophyllum					
Rosa gymnocarpa					
Rubus spectabilis	0.67 - 1.00	0.50 - 4.50	0.43 - 10.77	0.33 - 1.00	0.57 - 5.25
Sorbus sitchensis				0.17 - 1.00	
Vaccinium alaskense	1.00 - 17.00	0.75 - 2.33	0.71 - 10.80	1.00 - 38.25	1.00 - 31.00
Vaccinium deliciosum					
Vaccinium membranaceum		0.25 - 1.00		0.50 - 1.83	
Vaccinium ovalifolium			0.14 - 9.00	0.08 - 1.00	
Vaccinium parvifolium	1.00 - 2.33	1.00 - 1.50	0.71 - 4.40	0.42 - 2.20	0.86 - 1.67

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	TSUHET - ABIAMA - (THUPLI) / VACALA / BLESPI	TSUHET - ABIAMA / BLESPI - TIATRI - POLMUN	TSUHET - ABIAMA / OXAORE - BLESPI	TSUHET - ABIAMA / VACALA / RUBPED	TSUHET - ABIAMA / VACALA / TIATRI
plots	3	4	7	12	7
HERBACEOUS					
Achlys triphylla	1.00 - 1.00	0.50 - 1.00	0.43 - 1.43	0.25 - 1.00	0.71 - 7.60
Actaea rubra					0.14 - 0.10
Athyrium filix-femina	0.67 - 1.00	0.50 - 1.00	0.71 - 2.38	0.17 - 1.00	0.71 - 2.80
Blechnum spicant	1.00 - 15.33	0.75 - 8.00	0.86 - 1.93	0.42 - 1.00	0.57 - 8.00
Boykinia occidentalis	0.67 - 3.00	0.25 - 1.00		0.08 - 1.00	0.14 - 8.00
Bromus sitchensis					
Clintonia uniflora	1.00 - 7.33	0.50 - 1.00	0.71 - 2.66	1.00 - 6.00	1.00 - 4.00
Cornus unalaschkensis	1.00 - 2.33	0.50 - 1.00	0.14 - 3.00	0.75 - 6.67	0.57 - 3.75
Dryopteris expansa		0.50 - 1.00	0.14 - 8.00	0.17 - 1.00	0.43 - 1.00
Erythronium montanum					
Goodyera oblongifolia				0.42 - 1.00	0.14 - 1.00
Gymnocarpium dryopteris	0.33 - 3.00	0.25 - 1.00	0.14 - 1.00	0.08 - 1.00	0.57 - 2.75
Hieracium albiflorum					
Lilium columbianum					
Listera cordata				0.25 - 0.77	0.14 - 1.00
Lupinus (arcticus ssp. subalpinus, latifolius)					
Luzula (fastigiata, parviflora)		0.50 - 1.00	0.71 - 1.18		
Maianthemum dilatatum	0.67 - 2.00	0.50 - 2.00	0.43 - 0.53	0.08 - 1.00	0.57 - 13.00
Mitella breweri		0.25 - 1.00			
Orthilia secunda				0.42 - 2.40	0.14 - 1.00
Osmorhiza purpurea					
Oxalis oregana			1.00 - 35.57		
Pedicularis racemosa					
Polystichum munitum	0.67 - 2.00	0.75 - 22.00	0.86 - 4.60	0.17 - 2.00	0.71 - 1.40
Prosartes smithii			0.57 - 0.30		
Pteridium aquilinum					
Rubus lasiococcus	0.33 - 1.00			0.25 - 3.00	
Rubus pedatus	1.00 - 7.33	0.50 - 1.00	0.29 - 21.50	0.83 - 5.13	1.00 - 2.71
Streptopus lanceolatus	0.67 - 2.00	0.25 - 1.00	0.14 - 0.30	0.08 - 3.00	0.57 - 2.00
Tiarella trifoliata	1.00 - 1.67	0.75 - 2.33	0.71 - 4.92	0.33 - 1.25	1.00 - 4.57
Tiarella trifoliata var. laciniata			0.14 - 3.00		0.14 - 1.00
Trillium ovatum	0.67 - 1.00	0.25 - 1.00	0.57 - 0.48	0.17 - 1.00	0.29 - 0.55
Typha latifolia					
Valeriana sitchensis				0.08 - 3.00	
Viola orbiculata				0.17 - 1.00	
Xerophyllum tenax				0.17 - 5.50	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	ABIAMA - (PSEMEN) / ACHTRI - TIATRI	ABIAMA - (PSEMEN - TSUHET) / RHOMAC	ABIAMA - PSEMEN / ACHTRI	ABIAMA - TSUHET / Dep.	ABIAMA - TSUHET / RUBPED - TIATRI
plots	3	3	10	8	18
TREES					
Abies amabilis	1.00 - 58.00	1.00 - 83.67	1.00 - 27.00	1.00 - 31.75	1.00 - 53.50
Abies grandis					
Abies lasiocarpa					0.06 - 3.00
Abies procera			0.10 - 50.00		0.11 - 29.00
Acer macrophyllum					0.06 - 1.00
Alnus rubra			0.10 - 2.00		
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.33 - 20.00		0.30 - 8.00		0.11 - 6.00
Cornus nuttallii					
Larix lyallii					
Picea engelmannii	0.33 - 3.00		0.10 - 3.00		0.22 - 10.25
Picea sitchensis					
Pinus albicaulis					
Pinus contorta					
Pinus monticola			0.10 - 5.00	0.13 - 10.00	
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	0.33 - 40.00	0.33 - 25.00	0.60 - 37.17	0.50 - 30.25	0.17 - 10.33
Taxus brevifolia			0.20 - 21.50	0.25 - 8.00	0.06 - 1.00
Thuja plicata		0.67 - 7.50	0.30 - 2.00	0.63 - 7.60	0.50 - 14.67
Tsuga heterophylla	0.67 - 22.00	1.00 - 41.10	1.00 - 41.80	1.00 - 52.88	0.83 - 40.80
Tsuga mertensiana			0.20 - 1.00		0.17 - 4.00
SHRUBS					
Acer circinatum			0.70 - 14.57	0.25 - 1.00	0.22 - 3.25
Chimaphila menziesii	0.33 - 1.00	0.33 - 0.30	0.30 - 1.00	0.25 - 1.00	0.22 - 1.00
Chimaphila umbellata			0.20 - 2.00	0.50 - 0.83	0.17 - 1.00
Gaultheria ovatifolia			0.10 - 1.00		
Gaultheria shallon		0.33 - 1.00			0.06 - 1.00
Linnaea borealis	0.33 - 3.00	1.00 - 2.67	0.70 - 3.14	0.50 - 1.50	0.33 - 4.00
Mahonia nervosa		0.33 - 2.00	0.50 - 13.00	0.25 - 1.00	0.22 - 2.50
Menziesia ferruginea	0.33 - 3.00	0.33 - 2.00	0.10 - 1.00		0.17 - 1.00
Oplopanax horridus			0.20 - 2.50	0.13 - 1.00	0.33 - 1.33
Paxistima myrsinites				0.13 - 1.00	
Rhododendron albiflorum					0.22 - 3.00
Rhododendron macrophyllum		1.00 - 5.00	0.10 - 2.00		
Rosa gymnocarpa			0.30 - 1.67		
Rubus spectabilis					0.11 - 6.50
Sorbus sitchensis					0.06 - 1.00
Vaccinium alaskense	0.67 - 2.00	0.33 - 0.30	0.40 - 3.00	0.50 - 1.00	0.22 - 2.50
Vaccinium deliciosum					
Vaccinium membranaceum	0.33 - 10.00	0.33 - 3.00	0.50 - 2.20	0.38 - 1.67	0.50 - 1.67
Vaccinium ovalifolium		0.33 - 0.30			
Vaccinium parvifolium	0.67 - 2.00	1.00 - 1.33	0.50 - 1.80	0.75 - 1.67	0.56 - 9.50

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	ABIAMA - (PSEMEN) / ACHTRI - TIATRI	ABIAMA - (PSEMEN - TSUHET) / RHOMAC	ABIAMA - PSEMEN / ACHTRI	ABIAMA - TSUHET / Dep.	ABIAMA - TSUHET / RUBPED - TIATRI
plots	3	3	10	8	18
HERBACEOUS					
Achlys triphylla	0.67 - 10.50	0.33 - 1.00	1.00 - 13.20		0.17 - 2.33
Actaea rubra			0.20 - 1.00		0.06 - 3.00
Athyrium filix-femina	0.67 - 1.00	0.33 - 0.30	0.30 - 2.00		0.28 - 4.20
Blechnum spicant			0.20 - 2.00	0.13 - 3.00	0.44 - 8.38
Boykinia occidentalis		0.33 - 0.30			
Bromus sitchensis					
Clintonia uniflora	0.33 - 1.00	0.33 - 2.00	0.60 - 4.33	0.13 - 1.00	0.56 - 4.20
Cornus unalaschkensis	0.33 - 3.00		0.50 - 4.80	0.25 - 1.00	0.44 - 4.13
Dryopteris expansa				0.13 - 1.00	0.11 - 3.00
Erythronium montanum					0.06 - 1.00
Goodyera oblongifolia	0.33 - 1.00	0.33 - 0.30	0.50 - 0.68	0.38 - 1.00	0.22 - 1.00
Gymnocarpium dryopteris	0.33 - 30.00		0.10 - 3.00		0.28 - 3.20
Hieracium albiflorum			0.10 - 1.00		
Lilium columbianum					
Listera cordata			0.10 - 1.00	0.13 - 1.00	0.22 - 1.00
Lupinus (arcticus ssp. subalpinus, latifolius)					
Luzula (fastigiata, parviflora)			0.10 - 0.30		0.17 - 1.00
Maianthemum dilatatum	0.33 - 1.00		0.10 - 2.00	0.13 - 1.00	0.17 - 1.00
Mitella breweri		0.33 - 0.30			
Orthilia secunda	0.33 - 1.00	0.33 - 1.00	0.20 - 6.75	0.50 - 1.00	0.17 - 1.00
Osmorhiza purpurea					
Oxalis oregana					0.06 - 1.00
Pedicularis racemosa					
Polystichum munitum		0.33 - 0.30	0.40 - 1.25	0.25 - 1.00	0.33 - 1.67
Prosartes smithii			0.10 - 0.30		
Pteridium aquilinum					0.06 - 1.00
Rubus lasiococcus	0.67 - 2.00		0.20 - 2.00		0.44 - 1.75
Rubus pedatus	0.33 - 10.00	0.67 - 2.50	0.30 - 3.00	0.38 - 1.00	0.94 - 2.59
Streptopus lanceolatus	0.67 - 2.00		0.30 - 1.33		0.22 - 2.50
Tiarella trifoliata	1.00 - 18.67	0.67 - 0.65	0.20 - 1.50	0.13 - 1.00	0.94 - 4.82
Tiarella trifoliata var. laciniata					
Trillium ovatum		0.67 - 1.00	0.50 - 1.00	0.13 - 1.00	0.39 - 1.29
Typha latifolia					
Valeriana sitchensis					0.22 - 1.00
Viola orbiculata			0.20 - 1.00		
Xerophyllum tenax			0.20 - 1.00		0.11 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	TSUHET - ABIAMA - (PSEMEN) / VACALA	TSUHET - ABIAMA - PSEMEN / GAUSHA	TSUHET - ABIAMA - PSEMEN / MAHNER	ABIAMA - (PSEMEN) / VACMEM / ACHTRI	ABIAMA - (PSEMEN - ABIPRO) / VACMEM / XERTEN
plots	20	8	5	2	7
TREES					
Abies amabilis	1.00 - 45.24	1.00 - 35.50	1.00 - 29.00	1.00 - 49.50	1.00 - 32.14
Abies grandis					
Abies lasiocarpa	0.05 - 1.00	0.13 - 1.00	0.20 - 3.00	0.50 - 21.00	0.57 - 10.50
Abies procera			0.20 - 60.00		0.14 - 8.00
Acer macrophyllum					
Alnus rubra		0.13 - 2.00			
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.10 - 3.00				0.71 - 16.60
Cornus nuttallii					
Larix lyallii					
Picea engelmannii					0.29 - 3.00
Picea sitchensis					
Pinus albicaulis					
Pinus contorta					
Pinus monticola	0.05 - 1.00	0.38 - 1.43		1.00 - 1.50	0.29 - 3.50
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	0.45 - 21.11	0.88 - 40.86		1.00 - 57.50	0.43 - 35.33
Taxus brevifolia	0.05 - 1.00	0.13 - 1.00			
Thuja plicata	0.25 - 8.46	0.50 - 15.25			0.14 - 1.00
Tsuga heterophylla	1.00 - 45.01	1.00 - 47.25		0.50 - 47.00	0.29 - 55.50
Tsuga mertensiana					0.29 - 4.50
SHRUBS					
Acer circinatum	0.15 - 1.10	0.50 - 3.75	0.40 - 2.00		0.14 - 3.00
Chimaphila menziesii	0.25 - 0.58	0.13 - 2.00	0.60 - 1.00	0.50 - 0.30	0.14 - 1.00
Chimaphila umbellata	0.20 - 3.58	0.63 - 2.00	0.60 - 3.67	0.50 - 1.00	0.57 - 4.25
Gaultheria ovatifolia	0.10 - 0.75	0.13 - 25.00		0.50 - 2.00	0.43 - 1.00
Gaultheria shallon	0.05 - 0.30	1.00 - 7.75	0.40 - 2.00		
Linnaea borealis	0.20 - 6.00	0.63 - 2.80	0.60 - 14.00	1.00 - 17.50	0.29 - 2.00
Mahonia nervosa	0.10 - 1.50	0.63 - 10.80		1.00 - 5.50	
Menziesia ferruginea	0.40 - 0.83	0.13 - 1.00			0.43 - 1.67
Oplopanax horridus	0.10 - 1.00				
Paxistima myrsinites	0.05 - 1.00	0.13 - 1.00			0.57 - 1.00
Rhododendron albiflorum					0.14 - 1.00
Rhododendron macrophyllum		0.13 - 3.00			
Rosa gymnocarpa				0.50 - 2.00	
Rubus spectabilis	0.10 - 1.00				
Sorbus sitchensis	0.05 - 1.00	0.13 - 2.00		0.50 - 2.00	0.43 - 1.00
Vaccinium alaskense	1.00 - 22.10	0.50 - 29.00			0.29 - 4.50
Vaccinium deliciosum			0.60 - 1.00		
Vaccinium membranaceum	0.20 - 1.33	0.25 - 1.00		1.00 - 10.00	1.00 - 8.00
Vaccinium ovalifolium					
Vaccinium parvifolium	0.85 - 3.98	1.00 - 4.38			0.14 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	TSUHET - ABIAMA - (PSEMEN) / VACALA	TSUHET - ABIAMA - PSEMEN / GAUSHA	TSUHET - ABIAMA - PSEMEN / MAHNER	ABIAMA - (PSEMEN) / VACMEM / ACHTRI	ABIAMA - (PSEMEN - ABIPRO) / VACMEM / XERTEN
plots	20	8	5	2	7
HERBACEOUS					
Achlys triphylla	0.10 - 0.65	0.50 - 5.75	0.40 - 2.00	1.00 - 13.50	0.29 - 2.00
Actaea rubra					
Athyrium filix-femina	0.15 - 1.43	0.13 - 1.00	0.20 - 1.00		
Blechnum spicant	0.25 - 1.16	0.13 - 3.00			
Boykinia occidentalis					
Bromus sitchensis				0.50 - 20.00	
Clintonia uniflora	0.30 - 2.38	0.38 - 1.00	0.40 - 1.00	1.00 - 4.00	0.14 - 1.00
Cornus unalaschkensis	0.25 - 1.66	0.63 - 1.00			0.14 - 1.00
Dryopteris expansa	0.10 - 2.00				
Erythronium montanum					0.14 - 1.00
Goodyera oblongifolia	0.20 - 0.60	0.25 - 1.00	0.60 - 0.77		0.43 - 1.00
Gymnocarpium dryopteris	0.10 - 1.65				
Hieracium albiflorum				0.50 - 0.30	0.57 - 0.83
Lilium columbianum			0.20 - 1.00	1.00 - 0.65	
Listera cordata	0.05 - 0.30	0.25 - 1.00	0.20 - 1.00		
Lupinus (arcticus ssp. subalpinus, latifolius)				0.50 - 2.00	0.43 - 1.67
Luzula (fastigiata, parviflora)	0.10 - 0.30				
Maianthemum dilatatum	0.10 - 0.65	0.25 - 1.00	1.00 - 8.20		
Mitella breweri					
Orthilia secunda	0.20 - 0.83			1.00 - 0.30	0.57 - 1.33
Osmorhiza purpurea				0.50 - 6.00	
Oxalis oregana	0.05 - 1.00				
Pedicularis racemosa				0.50 - 8.00	0.29 - 0.65
Polystichum munitum	0.20 - 0.65	0.25 - 3.00			
Prosartes smithii					
Pteridium aquilinum		0.13 - 1.00		0.50 - 5.00	0.14 - 3.00
Rubus lasiococcus					0.86 - 3.22
Rubus pedatus	0.35 - 1.87			0.50 - 5.00	
Streptopus lanceolatus	0.10 - 0.75				
Tiarella trifoliata	0.20 - 0.65	0.13 - 1.00			0.14 - 1.00
Tiarella trifoliata var. laciniata			0.60 - 39.67		
Trillium ovatum	0.15 - 0.53	0.13 - 1.00			
Typha latifolia			1.00 - 66.40		
Valeriana sitchensis					0.14 - 1.00
Viola orbiculata					0.71 - 1.00
Xerophyllum tenax	0.10 - 1.65	0.13 - 1.00		0.50 - 3.00	1.00 - 26.14

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	ABIAMA - (TSUHET) / VACMEM	ABIAMA - (TSUHET) / VACMEM - VACALA	ABIAMA / MENFER	ABIAMA / RHOALB	ABIAMA / VACMEM / RUBLAS
plots	7	5	6	10	11
TREES					
Abies amabilis	1.00 - 32.43	1.00 - 40.20	1.00 - 47.00	1.00 - 41.06	1.00 - 57.55
Abies grandis	0.14 - 1.00				
Abies lasiocarpa	0.14 - 1.00			0.50 - 26.66	0.18 - 6.00
Abies procera	0.14 - 50.00				
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.14 - 21.00	0.60 - 41.67	0.50 - 19.33	0.60 - 10.22	0.64 - 28.23
Cornus nuttallii					
Larix lyallii					
Picea engelmannii	0.14 - 3.00			0.10 - 20.00	0.18 - 2.00
Picea sitchensis					
Pinus albicaulis					
Pinus contorta					
Pinus monticola	0.14 - 3.00		0.17 - 1.00	0.10 - 5.00	
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Pseudotsuga menziesii	0.71 - 22.60	0.60 - 14.33	0.50 - 8.33	0.10 - 25.00	0.09 - 50.00
Taxus brevifolia	0.14 - 3.00		0.17 - 3.00		
Thuja plicata	0.43 - 24.67	0.20 - 41.00	0.50 - 20.67	0.10 - 30.00	0.09 - 10.00
Tsuga heterophylla	1.00 - 50.14	0.80 - 29.75	1.00 - 49.00	0.20 - 1.50	0.18 - 50.00
Tsuga mertensiana				0.90 - 3.44	0.55 - 3.33
SHRUBS					
Acer circinatum	0.43 - 6.00	0.20 - 8.00	0.33 - 4.50		
Chimaphila menziesii	0.29 - 5.50	0.20 - 1.00	0.17 - 1.00		
Chimaphila umbellata	0.57 - 3.25	0.20 - 1.00	0.33 - 2.00	0.10 - 1.00	0.09 - 1.00
Gaultheria ovatifolia	0.43 - 3.00	0.20 - 1.00	0.17 - 3.00		0.18 - 3.00
Gaultheria shallon			0.17 - 1.00		
Linnaea borealis	0.71 - 11.20	0.40 - 2.50	0.67 - 6.75		0.18 - 2.00
Mahonia nervosa	0.43 - 8.00		0.17 - 3.00		
Menziesia ferruginea	0.29 - 1.00	0.40 - 2.00	1.00 - 15.67	0.20 - 1.00	
Oplopanax horridus			0.17 - 3.00		0.18 - 1.00
Paxistima myrsinites	0.71 - 3.40	0.40 - 2.00	0.50 - 1.00	0.20 - 4.50	0.18 - 16.50
Rhododendron albiflorum				1.00 - 28.20	0.27 - 2.33
Rhododendron macrophyllum					
Rosa gymnocarpa	0.29 - 5.50	0.20 - 1.00	0.17 - 3.00		
Rubus spectabilis	0.14 - 1.00	0.20 - 1.00	0.17 - 3.00		0.18 - 9.00
Sorbus sitchensis			0.17 - 1.00	0.50 - 0.86	0.45 - 4.40
Vaccinium alaskense	0.14 - 3.00	0.80 - 28.25	0.83 - 22.00	0.10 - 1.00	0.09 - 1.00
Vaccinium deliciosum				0.10 - 1.00	0.09 - 20.00
Vaccinium membranaceum	1.00 - 8.00	1.00 - 19.20	0.67 - 6.00	1.00 - 15.30	1.00 - 26.73
Vaccinium ovalifolium		0.20 - 45.00	0.50 - 1.67		0.09 - 13.00
Vaccinium parvifolium	0.43 - 1.67	0.20 - 1.00	0.67 - 4.50		0.09 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mesic Silver Fir-Western Hemlock Forest Group.

Species / Association	ABIAMA - (TSUHET) / VACMEM	ABIAMA - (TSUHET) / VACMEM - VACALA	ABIAMA / MENFER	ABIAMA / RHOALB	ABIAMA / VACMEM / RUBLAS
plots	7	5	6	10	11
HERBACEOUS					
Achlys triphylla	0.14 - 0.30	0.40 - 26.50	0.50 - 2.00		0.09 - 30.00
Actaea rubra		0.20 - 3.00			
Athyrium filix-femina			0.17 - 1.00		0.09 - 3.00
Blechnum spicant			0.17 - 3.00		
Boykinia occidentalis		0.20 - 10.00	0.33 - 1.50		
Bromus sitchensis					
Clintonia uniflora	0.29 - 7.00	0.80 - 4.25	0.83 - 2.40	0.10 - 1.00	0.45 - 2.20
Cornus unalaschkensis	0.14 - 1.00	0.20 - 3.00	0.50 - 10.33		0.18 - 6.50
Dryopteris expansa					
Erythronium montanum		0.20 - 1.00		0.50 - 8.00	0.36 - 5.50
Goodyera oblongifolia	0.71 - 1.00	0.80 - 2.00	0.67 - 1.50	0.30 - 1.00	0.27 - 1.00
Gymnocarpium dryopteris		0.20 - 1.00	0.33 - 5.50		
Hieracium albiflorum	0.14 - 1.00		0.17 - 1.00		
Lilium columbianum	0.14 - 1.00	0.20 - 3.00	0.17 - 1.00		
Listera cordata		0.40 - 2.00	0.67 - 1.50	0.10 - 1.00	0.18 - 1.00
Lupinus (arcticus ssp. subalpinus, latifolius)	0.14 - 1.00		0.17 - 1.00	0.10 - 1.00	0.09 - 1.00
Luzula (fastigiata, parviflora)		0.20 - 1.00			0.27 - 0.77
Maianthemum dilatatum			0.17 - 3.00		
Mitella breweri				0.20 - 1.00	0.45 - 1.80
Orthilia secunda	0.71 - 2.80	0.40 - 1.00	0.17 - 1.00	0.50 - 1.66	0.36 - 1.50
Osmorhiza purpurea					0.09 - 1.00
Oxalis oregana					
Pedicularis racemosa	0.14 - 3.00			0.20 - 1.00	0.09 - 1.00
Polystichum munitum	0.14 - 1.00	0.20 - 1.00	0.17 - 1.00		0.09 - 1.00
Prosartes smithii					0.09 - 2.00
Pteridium aquilinum	0.29 - 2.00				0.09 - 10.00
Rubus lasiococcus	0.57 - 2.00	0.20 - 1.00	0.50 - 4.00	1.00 - 8.40	1.00 - 12.45
Rubus pedatus	0.14 - 1.00	0.60 - 6.33	0.67 - 6.25	0.50 - 3.80	0.45 - 12.00
Streptopus lanceolatus		0.40 - 3.50	0.33 - 2.00		0.18 - 3.00
Tiarella trifoliata	0.14 - 1.00	0.60 - 2.33	0.67 - 3.25	0.30 - 10.33	0.45 - 8.60
Tiarella trifoliata var. laciniata		0.20 - 1.00			
Trillium ovatum	0.29 - 1.00	0.20 - 1.00	0.50 - 1.33		0.27 - 2.33
Typha latifolia					
Valeriana sitchensis		0.40 - 5.50	0.17 - 2.00	0.50 - 5.20	0.45 - 13.20
Viola orbiculata	0.29 - 1.00	0.20 - 1.00	0.33 - 1.00	0.60 - 1.67	0.36 - 1.00
Xerophyllum tenax	0.14 - 1.00		0.17 - 3.00	0.30 - 1.67	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest Group.

Species / Association	ACEMAC-(PSEMEN)/ POLMUN	ACEMAC/ SYMALB	ACEMAC/ PAXMYR	ALNRUB/ ALNVIR	ALNRUB/ POLMUN
plots	9	4	1	3	4
TREES					
Abies amabilis				0.67 - 2.00	
Abies grandis	0.22 - 2.00	0.50 - 1.00			
Abies lasiocarpa					
Abies procera					
Acer macrophyllum	1.00 - 62.56	1.00 - 72.50	1.00 - 90.00		0.25 - 3.00
Alnus rubra	0.44 - 7.00			1.00 - 74.67	1.00 - 82.50
Arbutus menziesii					
Betula papyrifera	0.11 - 30.00				
Chamaecyparis nootkatensis				0.33 - 1.00	
Cornus nuttallii		0.25 - 20.00			
Larix lyallii					
Picea engelmannii					
Picea sitchensis					0.50 - 3.00
Pinus albicaulis					
Pinus contorta					
Pinus monticola					
Pinus ponderosa		0.25 - 1.00			
Populus balsamifera ssp. trichocarpa		0.25 - 1.00		0.33 - 3.00	
Populus tremuloides					
Prunus emarginata	0.11 - 3.00	0.50 - 3.50	1.00 - 1.00		
Pseudotsuga menziesii	0.67 - 44.50	0.75 - 15.00		0.67 - 4.50	0.25 - 6.00
Taxus brevifolia					
Thuja plicata	0.33 - 14.67			0.67 - 4.50	
Tsuga heterophylla	0.44 - 7.88			0.67 - 12.00	0.25 - 3.00
Tsuga mertensiana					
SHRUBS					
Acer circinatum	0.33 - 43.00	0.25 - 8.00	1.00 - 8.00	0.67 - 3.00	0.25 - 8.00
Acer glabrum	0.11 - 6.00			0.67 - 2.00	0.25 - 3.00
Alnus viridis ssp. sinuata				1.00 - 10.33	
Amelanchier alnifolia		0.50 - 11.50	1.00 - 3.00		
Gaultheria shallon				0.33 - 3.00	0.25 - 3.00
Linnaea borealis	0.22 - 0.55			0.33 - 3.00	
Mahonia nervosa	0.67 - 4.50				0.25 - 1.00
Menziesia ferruginea				0.33 - 1.00	
Oplopanax horridus	0.11 - 1.00			0.67 - 2.00	0.25 - 3.00
Paxistima myrsinites		0.75 - 12.00	1.00 - 13.00		
Philadelphus lewisii		0.50 - 4.50			
Ribes lacustre	0.22 - 1.65			1.00 - 5.67	0.25 - 3.00
Rosa gymnocarpa	0.44 - 0.83	0.50 - 4.50			
Rubus leucodermis		0.25 - 1.00		0.67 - 1.00	0.25 - 1.00
Rubus parviflorus	0.22 - 6.65	1.00 - 2.50	1.00 - 1.00	0.33 - 3.00	
Rubus spectabilis	0.11 - 1.00			1.00 - 2.33	1.00 - 19.75
Rubus ursinus	0.67 - 1.42	0.25 - 8.00		0.33 - 1.00	
Salix scouleriana		0.50 - 26.50		0.33 - 13.00	
Sambucus racemosa				1.00 - 2.33	0.50 - 14.00
Symphoricarpos albus	0.22 - 1.00	1.00 - 30.75			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest Group.

Species / Association	ACEMAC-(PSEMEN)/ POLMUN	ACEMAC/ SYMALB	ACEMAC/ PAXMYR	ALNRUB/ ALNVIR	ALNRUB/ POLMUN
plots	9	4	1	3	4
HERBACEOUS					
Achlys triphylla	0.78 - 4.07			0.33 - 1.00	
Adenocaulon bicolor	0.56 - 1.40	0.25 - 1.00			
Adiantum pedatum	0.33 - 3.33				
Asarum caudatum	0.33 - 2.00	0.25 - 1.00		0.67 - 2.00	
Athyrium filix-femina	0.33 - 1.00			0.67 - 2.00	0.75 - 4.00
Blechnum spicant					0.25 - 3.00
Calamagrostis rubescens		0.50 - 2.00			
Carex deweyana					0.25 - 1.00
Chamerion angustifolium		0.25 - 3.00	1.00 - 1.00	1.00 - 1.00	
Circaea alpina	0.33 - 8.67				0.50 - 16.50
Claytonia sibirica	0.33 - 1.33			0.33 - 3.00	1.00 - 8.00
Elymus glaucus	0.11 - 2.00	0.50 - 11.50			
Equisetum arvense	0.11 - 1.00				0.50 - 1.00
Galium aparine	0.33 - 2.00			0.33 - 3.00	0.75 - 1.00
Galium triflorum	0.22 - 1.05	0.50 - 2.00	1.00 - 1.00	1.00 - 1.00	0.50 - 3.00
Gymnocarpium disjunctum					0.25 - 3.00
Heracleum maximum	0.11 - 15.00			0.33 - 1.00	0.75 - 1.00
Hydrophyllum tenuipes	0.11 - 1.00				0.25 - 8.00
Lactuca biennis				0.67 - 1.00	
Maianthemum dilatatum					0.50 - 4.50
Maianthemum racemosum	0.11 - 1.00	1.00 - 5.00	1.00 - 1.00	0.33 - 1.00	
Maianthemum stellatum		0.25 - 1.00	1.00 - 1.00	0.67 - 1.00	
Melica subulata	0.11 - 3.00		1.00 - 1.00		0.25 - 3.00
Mycelis muralis	0.67 - 1.50	0.25 - 3.00	1.00 - 1.00		0.75 - 1.00
Osmorhiza berteroi	0.33 - 4.00	0.75 - 1.67			0.25 - 3.00
Oxalis oregana					
Polypodium glycyrrhiza	0.11 - 1.00				
Polystichum munitum	1.00 - 59.00	0.25 - 1.00		1.00 - 1.67	1.00 - 33.25
Prosartes hookeri	0.56 - 0.86	0.75 - 4.67			
Pteridium aquilinum	0.11 - 1.00	0.75 - 13.67	1.00 - 8.00		
Pyrola asarifolia					
Ranunculus repens	0.11 - 1.00				
Stachys chamissonis	0.11 - 1.00				0.50 - 2.00
Tellima grandiflora	0.22 - 1.00				0.50 - 3.00
Tiarella trifoliata	0.11 - 4.00				
Tolmiea menziesii	0.22 - 1.00				0.50 - 2.00
Trientalis borealis ssp. latifolia	0.56 - 0.82				
Trillium ovatum	0.22 - 1.00	0.25 - 1.00		0.67 - 1.00	
Veratrum viride	0.11 - 1.00			0.67 - 1.00	0.50 - 1.00
Viola glabella	0.11 - 1.00		1.00 - 1.00		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest Group.

Species / Association	POPBAL/ GAUSHA/ POLMUN	POPBAL-ALNRUB/ RUBURS-EQUARV
plots	1	1
TREES		
Abies amabilis	1.00 - 1.00	1.00 - 1.00
Abies grandis		
Abies lasiocarpa		
Abies procera		
Acer macrophyllum		
Alnus rubra	1.00 - 8.00	1.00 - 23.00
Arbutus menziesii		
Betula papyrifera		
Chamaecyparis nootkatensis		
Cornus nuttallii		
Larix lyallii		
Picea engelmannii		
Picea sitchensis		
Pinus albicaulis		
Pinus contorta		
Pinus monticola	1.00 - 3.00	
Pinus ponderosa		
Populus balsamifera ssp. trichocarpa	1.00 - 50.00	1.00 - 40.00
Populus tremuloides		
Prunus emarginata		
Pseudotsuga menziesii		
Taxus brevifolia		
Thuja plicata	1.00 - 23.00	1.00 - 4.00
Tsuga heterophylla	1.00 - 21.00	1.00 - 8.00
Tsuga mertensiana		
SHRUBS		
Acer circinatum		
Acer glabrum		
Alnus viridis ssp. sinuata		
Amelanchier alnifolia		
Gaultheria shallon	1.00 - 30.00	1.00 - 1.00
Linnaea borealis	1.00 - 3.00	1.00 - 1.00
Mahonia nervosa		
Menziesia ferruginea	1.00 - 1.00	
Oplopanax horridus	1.00 - 1.00	1.00 - 1.00
Paxistima myrsinites		
Philadelphus lewisii		
Ribes lacustre		1.00 - 1.00
Rosa gymnocarpa	1.00 - 1.00	1.00 - 1.00
Rubus leucodermis		
Rubus parviflorus		
Rubus spectabilis	1.00 - 3.00	1.00 - 8.00
Rubus ursinus	1.00 - 3.00	1.00 - 30.00
Salix scouleriana		
Sambucus racemosa	1.00 - 1.00	
Symphoricarpos albus		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Red Alder-Bigleaf Maple-Douglas-fir Forest Group.

Species / Association	POPBAL/ GAUSHA/ POLMUN	POPBAL-ALNRUB/ RUBURS-EQUARV
plots	1	1
HERBACEOUS		
Achlys triphylla	1.00 - 1.00	
Adenocaulon bicolor		1.00 - 1.00
Adiantum pedatum		
Asarum caudatum	1.00 - 1.00	1.00 - 1.00
Athyrium filix-femina	1.00 - 3.00	1.00 - 3.00
Blechnum spicant		1.00 - 1.00
Calamagrostis rubescens		
Carex deweyana		
Chamerion angustifolium		
Circaea alpina		1.00 - 8.00
Claytonia sibirica		
Elymus glaucus		
Equisetum arvense	1.00 - 1.00	1.00 - 13.00
Galium aparine	1.00 - 1.00	1.00 - 8.00
Galium triflorum		
Gymnocarpium disjunctum	1.00 - 8.00	1.00 - 1.00
Heracleum maximum		
Hydrophyllum tenuipes		
Lactuca biennis		
Maianthemum dilatatum	1.00 - 1.00	
Maianthemum racemosum		
Maianthemum stellatum		
Melica subulata		
Mycelis muralis		1.00 - 1.00
Osmorhiza berteroi	1.00 - 1.00	1.00 - 1.00
Oxalis oregana		
Polypodium glycyrrhiza		
Polystichum munitum	1.00 - 20.00	1.00 - 13.00
Prosartes hookeri		
Pteridium aquilinum	1.00 - 1.00	
Pyrola asarifolia		1.00 - 30.00
Ranunculus repens		
Stachys chamissonis		
Tellima grandiflora		
Tiarella trifoliata	1.00 - 2.00	1.00 - 2.00
Tolmiea menziesii		
Trientalis borealis ssp. latifolia		
Trillium ovatum		
Veratrum viride	1.00 - 3.00	
Viola glabella	1.00 - 8.00	1.00 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS-(PINCON)/ LUPARC	ABILAS/ VACSCO/ VALSIT	ABILAS-(ABIAMA)/ MENFER	ABILAS-(ABIAMA)/ VACMEM/ VALSIT	ABILAS-(PSEMEN)/ VACMEM
plots	5	3	2	38	1
TREES					
Abies amabilis		0.67 - 2.00	1.00 - 45.50	0.79 - 21.93	1.00 - 3.00
Abies grandis					
Abies lasiocarpa	1.00 - 45.60	1.00 - 52.00	1.00 - 40.50	0.89 - 41.85	1.00 - 38.00
Abies procera					
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.40 - 3.50	0.33 - 11.00		0.24 - 25.81	
Cornus nuttallii					
Larix lyallii					
Picea engelmannii		0.33 - 3.00	0.50 - 38.00	0.45 - 18.71	1.00 - 6.00
Picea sitchensis					
Pinus albicaulis	0.20 - 4.00	0.67 - 8.00		0.05 - 3.50	
Pinus contorta				0.05 - 10.50	1.00 - 3.00
Pinus monticola	0.20 - 16.00			0.13 - 8.80	1.00 - 20.00
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii	0.20 - 3.00			0.18 - 17.86	1.00 - 6.00
Taxus brevifolia				0.03 - 1.00	1.00 - 1.00
Thuja plicata				0.03 - 4.00	1.00 - 3.00
Tsuga heterophylla				0.18 - 7.86	1.00 - 1.00
Tsuga mertensiana	0.20 - 4.00		1.00 - 7.00	0.32 - 2.83	
SHRUBS					
Acer circinatum					
Acer glabrum				0.08 - 6.33	
Alnus viridis ssp. sinuata				0.05 - 6.50	1.00 - 1.00
Amelanchier alnifolia				0.05 - 1.00	1.00 - 1.00
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi	0.20 - 15.00				
Cassiope mertensiana				0.03 - 8.00	
Chimaphila menziesii				0.08 - 1.00	
Chimaphila umbellata				0.21 - 3.13	1.00 - 1.00
Gaultheria ovatifolia				0.08 - 2.00	1.00 - 1.00
Gaultheria shallon					
Juniperus communis	0.20 - 1.00	0.33 - 3.00		0.03 - 1.00	
Linnaea borealis				0.08 - 31.00	1.00 - 40.00
Luetkea pectinata				0.03 - 8.00	
Mahonia nervosa	0.20 - 3.00			0.05 - 2.00	
Menziesia ferruginea		0.33 - 1.00	1.00 - 45.00	0.03 - 3.00	1.00 - 3.00
Paxistima myrsinites	0.60 - 1.67	0.67 - 2.00		0.55 - 5.87	1.00 - 20.00
Phyllodoce empetriformis		0.33 - 1.00	1.00 - 3.00	0.03 - 8.00	
Phyllodoce glanduliflora					
Rhododendron albiflorum				0.18 - 2.86	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS-(PINCON)/ LUPARC	ABILAS/ VACSCO/ VALSIT	ABILAS-(ABIAMA)/ MENFER	ABILAS-(ABIAMA)/ VACMEM/ VALSIT	ABILAS-(PSEMEN)/ VACMEM
Ribes acerifolium				0.11 - 3.25	
Ribes lacustre				0.29 - 3.36	
Rosa gymnocarpa	0.20 - 2.00			0.03 - 8.00	
Sorbus sitchensis	0.40 - 3.00		0.50 - 1.00	0.39 - 4.07	1.00 - 1.00
Spiraea betulifolia					
Spiraea splendens		0.33 - 1.00			
Vaccinium alaskense				0.05 - 0.65	
Vaccinium deliciosum			1.00 - 8.00	0.11 - 2.50	
Vaccinium membranaceum	0.40 - 1.50	0.33 - 3.00	1.00 - 16.50	1.00 - 23.68	1.00 - 40.00
Vaccinium ovalifolium				0.03 - 3.00	
Vaccinium parvifolium				0.03 - 7.00	
Vaccinium scoparium		1.00 - 20.00		0.11 - 7.25	
HERBACEOUS					
Achillea millefolium	0.40 - 7.50	0.33 - 3.00		0.03 - 1.00	
Achlys triphylla				0.11 - 6.00	
Arnica latifolia		0.33 - 3.00	1.00 - 4.50	0.47 - 5.07	
Campanula scouleri				0.05 - 2.50	
Clintonia uniflora				0.29 - 12.45	
Erythronium montanum				0.08 - 14.67	
Festuca occidentalis				0.03 - 1.00	
Festuca viridula		0.67 - 6.50		0.03 - 3.00	
Goodyera oblongifolia				0.29 - 1.36	1.00 - 1.00
Hieracium albiflorum	0.20 - 1.00	0.33 - 1.00		0.29 - 1.48	
Juncus parryi	0.20 - 0.30	0.33 - 3.00			
Ligusticum grayi		0.33 - 3.00		0.13 - 1.80	
Lomatium martindalei	0.40 - 3.00	0.33 - 1.00		0.03 - 1.00	
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 9.60	1.00 - 8.67		0.37 - 2.71	
Luzula glabrata	0.20 - 0.30	1.00 - 7.00		0.37 - 9.86	
Mitella breweri				0.29 - 3.55	
Moehringia macrophylla				0.18 - 2.57	
Nothochelone nemorosa	0.20 - 3.00			0.03 - 2.00	
Orthilia secunda	0.20 - 0.30		1.00 - 2.00	0.61 - 2.96	1.00 - 3.00
Pedicularis bracteosa		0.33 - 1.00		0.11 - 1.50	1.00 - 13.00
Pedicularis racemosa	0.60 - 1.77	0.67 - 4.50		0.37 - 2.00	
Phlox diffusa	0.60 - 8.00	0.33 - 1.00			
Polemonium pulcherrimum	0.60 - 2.33	0.33 - 8.00		0.29 - 1.78	
Polygonum bistortoides		0.33 - 1.00		0.05 - 4.50	
Polystichum lonchitis				0.03 - 1.00	
Polystichum munitum					
Pyrola asarifolia				0.05 - 1.00	1.00 - 3.00
Rubus lasiococcus	0.20 - 0.30	0.33 - 8.00	1.00 - 5.50	0.84 - 20.88	
Senecio triangularis				0.03 - 1.00	
Streptopus lanceolatus			0.50 - 3.00	0.18 - 1.57	1.00 - 1.00
Tiarella trifoliata				0.32 - 6.17	
Valeriana sitchensis	0.40 - 2.00	1.00 - 8.67	1.00 - 5.50	0.79 - 14.73	
Veratrum viride		0.33 - 3.00	0.50 - 1.00	0.34 - 1.25	
Viola glabella			0.50 - 1.00	0.32 - 2.25	
Xerophyllum tenax		0.33 - 13.00		0.05 - 3.00	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS-(ABIAMA)/ VACMEM/ XERTEN	ABILAS/ ERYMON	ABILAS/ RHOALB/ RUBLAS	ABILAS/ RHOALB/ PHYEMP	ABILAS/ VACMEM/ LUPARC
plots	6	4	8	1	5
TREES					
Abies amabilis	0.67 - 2.83	0.25 - 0.30	0.38 - 5.33		0.20 - 1.00
Abies grandis					
Abies lasiocarpa	1.00 - 23.83	1.00 - 57.50	1.00 - 39.63	1.00 - 23.00	1.00 - 45.20
Abies procera			0.13 - 1.00		0.20 - 1.00
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.67 - 10.15	0.50 - 6.00	0.75 - 18.67	1.00 - 14.00	0.60 - 3.33
Cornus nuttallii					
Larix lyallii					
Picea engelmannii	0.17 - 13.00				
Picea sitchensis					
Pinus albicaulis			0.13 - 0.10		0.40 - 2.00
Pinus contorta					
Pinus monticola	0.67 - 1.80		0.25 - 0.65		
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii	0.83 - 23.46				0.20 - 3.00
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla	0.83 - 32.40				
Tsuga mertensiana	0.33 - 3.50	0.50 - 10.00	0.25 - 7.50	1.00 - 16.00	0.20 - 3.00
SHRUBS					
Acer circinatum					
Acer glabrum	0.17 - 6.00				
Alnus viridis ssp. sinuata			0.25 - 4.15		
Amelanchier alnifolia	0.67 - 0.48				
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi	0.33 - 0.65				
Cassiope mertensiana					
Chimaphila menziesii	0.33 - 0.30				
Chimaphila umbellata	0.67 - 3.33				0.40 - 2.00
Gaultheria ovatifolia	0.50 - 0.53				
Gaultheria shallon					
Juniperus communis			0.13 - 0.30		0.40 - 2.00
Linnaea borealis	0.67 - 2.25				
Luetkea pectinata		0.25 - 8.00			0.20 - 1.00
Mahonia nervosa	0.67 - 4.25				
Menziesia ferruginea			0.13 - 13.00	1.00 - 3.00	
Paxistima myrsinites	0.33 - 3.50	0.25 - 1.00	0.75 - 2.58		0.80 - 11.58
Phyllodoce empetriformis	0.17 - 1.00		0.38 - 1.17	1.00 - 70.00	
Phyllodoce glanduliflora					
Rhododendron albiflorum	0.17 - 1.00		1.00 - 31.38	1.00 - 50.00	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS-(ABIAMA)/ VACMEM/ XERTEN	ABILAS/ ERYMON	ABILAS/ RHOALB/ RUBLAS	ABILAS/ RHOALB/ PHYEMP	ABILAS/ VACMEM/ LUPARC
Ribes acerifolium			0.25 - 0.65		
Ribes lacustre	0.17 - 2.00		0.25 - 0.65		
Rosa gymnocarpa	0.50 - 0.87				
Sorbus sitchensis	0.50 - 0.77	0.75 - 3.67	0.38 - 4.53		0.20 - 2.00
Spiraea betulifolia					
Spiraea splendens		0.25 - 3.00			0.20 - 13.00
Vaccinium alaskense				1.00 - 3.00	
Vaccinium deliciosum		0.50 - 2.00	0.13 - 3.00		
Vaccinium membranaceum	0.83 - 9.52	1.00 - 2.00	0.88 - 17.00	1.00 - 20.00	1.00 - 17.80
Vaccinium ovalifolium				1.00 - 3.00	
Vaccinium parvifolium	0.50 - 0.30				
Vaccinium scoparium	0.17 - 8.00		0.13 - 1.00		0.40 - 5.50
HERBACEOUS					
Achillea millefolium			0.13 - 2.00		0.60 - 1.00
Achlys triphylla	0.50 - 0.53				
Arnica latifolia	0.17 - 1.00		0.38 - 3.33		0.40 - 1.00
Campanula scouleri					
Clintonia uniflora	0.50 - 0.53		0.13 - 0.30		
Erythronium montanum	0.17 - 1.00	1.00 - 45.75	0.13 - 3.00	1.00 - 30.00	
Festuca occidentalis					
Festuca viridula					
Goodyera oblongifolia	0.50 - 1.10		0.13 - 1.00		
Hieracium albiflorum	0.33 - 0.30	0.25 - 1.00	0.38 - 0.53		0.80 - 1.33
Juncus parryi		0.25 - 13.00	0.25 - 7.90		0.60 - 5.67
Ligusticum grayi					
Lomatium martindalei			0.38 - 0.37		0.60 - 0.77
Lupinus (arcticus ssp. subalpinus, latifolius)	0.17 - 15.00	0.50 - 2.50	0.25 - 2.00		1.00 - 6.60
Luzula glabrata		0.25 - 1.00	0.25 - 0.65		0.40 - 1.65
Mitella breweri			0.25 - 1.50		
Moehringia macrophylla			0.25 - 0.55		
Nothochelone nemorosa	0.67 - 0.73	0.25 - 3.00	0.13 - 1.00		0.40 - 1.00
Orthilia secunda	1.00 - 2.43		0.50 - 1.58		0.60 - 0.77
Pedicularis bracteosa					
Pedicularis racemosa	0.33 - 0.30		0.25 - 0.65		0.80 - 1.58
Phlox diffusa	0.17 - 1.00		0.38 - 0.60		0.60 - 3.10
Polemonium pulcherrimum			0.13 - 1.00		0.60 - 1.00
Polygonum bistortoides		0.50 - 1.50	0.13 - 0.30		0.40 - 0.65
Polystichum lonchitis			0.25 - 0.65		
Polystichum munitum	0.17 - 0.30				
Pyrola asarifolia	0.33 - 0.30				
Rubus lasiococcus	0.17 - 13.00	0.50 - 22.50	0.75 - 6.00		0.40 - 1.00
Senecio triangularis					
Streptopus lanceolatus					
Tiarella trifoliata			0.13 - 1.00		
Valeriana sitchensis	0.17 - 3.00	0.25 - 8.00	0.38 - 1.77		0.20 - 1.00
Veratrum viride	0.17 - 1.00				
Viola glabella			0.25 - 0.20		0.20 - 1.00
Xerophyllum tenax	1.00 - 17.00	0.25 - 3.00	0.38 - 3.33		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS/ VACALA/ LUPARC	ABILAS/ VALSIT	ABILAS/ VERVIR	ABILAS-CUPNOO/ MAHNER/ VALSIT	ABILAS-PSEMEN/ MAHNER
plots	1	18	4	1	3
TREES					
Abies amabilis		0.33 - 1.88			0.67 - 1.00
Abies grandis					
Abies lasiocarpa	1.00 - 33.00	1.00 - 53.07	1.00 - 37.50	1.00 - 58.00	1.00 - 29.00
Abies procera					
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis		0.28 - 12.40		1.00 - 57.00	0.67 - 2.00
Cornus nuttallii					
Larix lyallii					
Picea engelmannii		0.22 - 34.00	0.25 - 1.00		
Picea sitchensis					
Pinus albicaulis		0.11 - 2.00	0.25 - 3.00		
Pinus contorta					
Pinus monticola					0.67 - 3.00
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii		0.11 - 16.50			1.00 - 59.00
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla					0.33 - 3.00
Tsuga mertensiana		0.22 - 2.15			
SHRUBS					
Acer circinatum					
Acer glabrum		0.06 - 1.00			0.33 - 8.00
Alnus viridis ssp. sinuata		0.06 - 3.00			
Amelanchier alnifolia					0.33 - 1.00
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi					
Cassiope mertensiana					
Chimaphila menziesii		0.06 - 1.00			0.33 - 1.00
Chimaphila umbellata		0.06 - 1.00			0.67 - 8.00
Gaultheria ovatifolia					
Gaultheria shallon					
Juniperus communis	1.00 - 1.00				
Linnaea borealis					1.00 - 29.67
Luetkea pectinata					
Mahonia nervosa				1.00 - 4.00	0.67 - 40.00
Menziesia ferruginea		0.06 - 3.00			
Paxistima myrsinites		0.17 - 1.33		1.00 - 3.00	0.67 - 1.00
Phyllodoce empetriformis		0.11 - 2.00			
Phyllodoce glanduliflora					
Rhododendron albiflorum		0.06 - 3.00			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS/ VACALA/ LUPARC	ABILAS/ VALSIT	ABILAS/ VERVIR	ABILAS-CUPNOO/ MAHNER/ VALSIT	ABILAS-PSEMEN/ MAHNER
Ribes acerifolium		0.06 - 3.00			
Ribes lacustre		0.22 - 3.00			0.67 - 1.00
Rosa gymnocarpa					0.67 - 10.50
Sorbus sitchensis	1.00 - 8.00	0.50 - 1.07			
Spiraea betulifolia					
Spiraea splendens	1.00 - 8.00				
Vaccinium alaskense	1.00 - 8.00				
Vaccinium deliciosum		0.28 - 2.20			
Vaccinium membranaceum	1.00 - 1.00	0.67 - 2.17		1.00 - 1.00	0.67 - 1.00
Vaccinium ovalifolium					
Vaccinium parvifolium					0.33 - 1.00
Vaccinium scoparium		0.17 - 1.00			
HERBACEOUS					
Achillea millefolium		0.22 - 1.00	0.25 - 3.00		
Achlys triphylla		0.06 - 8.00		1.00 - 3.00	0.67 - 30.00
Arnica latifolia		0.61 - 5.18	0.75 - 11.00		
Campanula scouleri		0.11 - 2.00			0.67 - 1.00
Clintonia uniflora		0.11 - 11.50			0.67 - 4.50
Erythronium montanum	1.00 - 1.00	0.17 - 3.10			
Festuca occidentalis					0.67 - 1.00
Festuca viridula		0.17 - 5.00	0.50 - 15.50		
Goodyera oblongifolia		0.11 - 0.65			0.67 - 1.00
Hieracium albiflorum		0.17 - 1.00			0.33 - 1.00
Juncus parryi	1.00 - 1.00	0.06 - 1.00			
Ligusticum grayi		0.33 - 1.67	0.50 - 4.50		
Lomatium martindalei		0.11 - 1.50			
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 3.00	0.67 - 4.00	1.00 - 5.50		0.33 - 8.00
Luzula glabrata		0.56 - 18.70	1.00 - 26.50		
Mitella breweri		0.44 - 3.29	0.50 - 6.50	1.00 - 1.00	
Moehringia macrophylla		0.28 - 1.40			0.33 - 1.00
Nothochelone nemorosa		0.06 - 1.00			0.67 - 1.00
Orthilia secunda		0.39 - 4.14			1.00 - 1.67
Pedicularis bracteosa		0.28 - 1.40	0.25 - 1.00		
Pedicularis racemosa		0.56 - 2.20			
Phlox diffusa		0.11 - 1.00	0.25 - 3.00		
Polemonium pulcherrimum		0.72 - 2.85	0.75 - 9.33		
Polygonum bistortoides	1.00 - 1.00	0.33 - 3.22	0.25 - 1.00		
Polystichum lonchitis		0.06 - 0.30		1.00 - 2.00	
Polystichum munitum					0.67 - 1.00
Pyrola asarifolia					
Rubus lasiococcus		0.72 - 16.77	0.25 - 1.00		
Senecio triangularis		0.17 - 1.67	0.50 - 5.50		
Streptopus lanceolatus		0.11 - 3.00			0.67 - 1.00
Tiarella trifoliata		0.22 - 4.50			0.33 - 20.00
Valeriana sitchensis		0.94 - 21.71	1.00 - 24.25	1.00 - 2.00	0.33 - 8.00
Veratrum viride		0.67 - 2.17	1.00 - 26.25	1.00 - 0.30	
Viola glabella		0.28 - 2.80	0.25 - 3.00		0.33 - 1.00
Xerophyllum tenax		0.06 - 1.00			

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	KRUMM ABILAS	KRUMM CUPNOO	KRUMM TSUMER	CUPNOO/ STRLAN	CUPNOO/ VALSIT
plots	5	3	3	3	5
TREES					
Abies amabilis	0.20 - 1.00	0.33 - 1.00		0.33 - 3.00	0.40 - 0.65
Abies grandis					
Abies lasiocarpa	1.00 - 65.20	1.00 - 35.33	1.00 - 21.00	0.67 - 1.00	0.60 - 8.00
Abies procera					
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.20 - 3.00	1.00 - 43.33	0.33 - 8.00	1.00 - 88.67	1.00 - 81.00
Cornus nuttallii					
Larix lyallii					
Picea engelmannii					
Picea sitchensis					
Pinus albicaulis	0.40 - 3.00				
Pinus contorta					
Pinus monticola	0.20 - 1.00				
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii				0.33 - 1.00	
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla					
Tsuga mertensiana	0.40 - 5.50		1.00 - 54.33		0.20 - 2.00
SHRUBS					
Acer circinatum				0.33 - 3.00	
Acer glabrum					
Alnus viridis ssp. sinuata				0.33 - 3.00	
Amelanchier alnifolia				0.33 - 1.00	
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi					
Cassiope mertensiana	0.40 - 4.50		0.33 - 13.00		
Chimaphila menziesii					
Chimaphila umbellata					
Gaultheria ovatifolia					
Gaultheria shallon					
Juniperus communis	0.60 - 2.33	0.33 - 1.00			
Linnaea borealis					0.20 - 50.00
Luetkea pectinata	0.20 - 1.00		0.67 - 24.00		
Mahonia nervosa					
Menziesia ferruginea					
Paxistima myrsinites	0.20 - 3.00	0.33 - 4.00		0.67 - 3.00	0.20 - 15.00
Phyllodoce empetriformis	0.60 - 27.67		0.67 - 47.50		
Phyllodoce glanduliflora	0.40 - 2.00				
Rhododendron albiflorum			0.33 - 2.00		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	KRUMM ABILAS	KRUMM CUPNOO	KRUMM TSUMER	CUPNOO/ STRLAN	CUPNOO/ VALSIT
Ribes acerifolium					
Ribes lacustre				0.67 - 10.50	0.60 - 7.00
Rosa gymnocarpa					
Sorbus sitchensis	0.20 - 1.00		0.67 - 2.50	0.33 - 1.00	0.20 - 1.00
Spiraea betulifolia					
Spiraea splendens					
Vaccinium alaskense					
Vaccinium deliciosum	0.40 - 21.50		0.33 - 30.00		
Vaccinium membranaceum	0.20 - 1.00		0.33 - 30.00	0.33 - 3.00	0.60 - 1.67
Vaccinium ovalifolium					
Vaccinium parvifolium					
Vaccinium scoparium	0.60 - 3.33	0.33 - 1.00			
HERBACEOUS					
Achillea millefolium	0.20 - 1.00				
Achlys triphylla				0.67 - 1.00	0.20 - 3.00
Arnica latifolia	0.20 - 3.00	0.33 - 1.00			0.20 - 2.00
Campanula scouleri					
Clintonia uniflora				0.67 - 20.50	0.40 - 21.50
Erythronium montanum	0.40 - 5.50		0.67 - 46.50	0.33 - 1.00	
Festuca occidentalis					
Festuca viridula	0.20 - 3.00				
Goodyera oblongifolia				0.67 - 1.00	0.40 - 1.00
Hieracium albiflorum	0.20 - 1.00				0.20 - 1.00
Juncus parryi					
Ligusticum grayi					
Lomatium martindalei	0.20 - 1.00				
Lupinus (arcticus ssp. subalpinus, latifolius)	0.60 - 17.67	0.33 - 1.00			0.40 - 0.65
Luzula glabrata	0.40 - 4.50	0.33 - 3.00	0.33 - 2.00		0.40 - 11.00
Mitella breweri		0.33 - 1.00	0.33 - 2.00		0.40 - 9.00
Moehringia macrophylla		0.33 - 1.00		1.00 - 1.67	0.40 - 1.00
Nothochelone nemorosa					
Orthilia secunda					
Pedicularis bracteosa					
Pedicularis racemosa	0.20 - 3.00				0.20 - 0.30
Phlox diffusa	0.20 - 1.00				
Polemonium pulcherrimum	0.20 - 8.00	0.33 - 3.00			0.40 - 2.00
Polygonum bistortoides	0.40 - 2.00				
Polystichum lonchitis				0.33 - 3.00	0.20 - 1.00
Polystichum munitum				0.67 - 2.00	
Pyrola asarifolia					
Rubus lasiococcus	0.20 - 1.00	0.33 - 1.00		0.33 - 1.00	0.20 - 13.00
Senecio triangularis					
Streptopus lanceolatus				0.67 - 7.00	0.40 - 2.00
Tiarella trifoliata				0.67 - 6.00	0.40 - 10.50
Valeriana sitchensis	0.40 - 2.00	0.33 - 30.00		0.33 - 1.00	1.00 - 10.40
Veratrum viride		0.33 - 3.00			0.40 - 0.65
Viola glabella				0.67 - 2.00	0.20 - 1.00
Xerophyllum tenax	0.20 - 8.00		0.33 - 3.00		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	CUPNOO-PSEMEN/ ACECIR	ABIAMA-TSUMER/ MENFER	ABIAMA-TSUMER/ STRLAN	ABIAMA-TSUMER/ VACMEM/ RUBLAS	ABILAS-TSUMER/ VACSCO
plots	1	7	10	18	1
TREES					
Abies amabilis		1.00 - 56.29	1.00 - 49.80	1.00 - 40.57	1.00 - 20.00
Abies grandis					
Abies lasiocarpa			0.20 - 36.15	0.67 - 24.36	1.00 - 10.00
Abies procera			0.10 - 20.00	0.06 - 3.00	
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	1.00 - 78.00	0.57 - 11.50	0.50 - 17.60	0.50 - 15.89	
Cornus nuttallii					
Larix lyallii					
Picea engelmannii				0.06 - 1.00	
Picea sitchensis					
Pinus albicaulis				0.06 - 1.00	
Pinus contorta					
Pinus monticola			0.10 - 3.00	0.17 - 7.00	
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii			0.10 - 30.00	0.06 - 25.00	
Taxus brevifolia					
Thuja plicata			0.10 - 10.00		
Tsuga heterophylla		0.57 - 3.75		0.11 - 1.50	
Tsuga mertensiana		1.00 - 25.71	1.00 - 21.13	1.00 - 32.18	1.00 - 40.00
SHRUBS					
Acer circinatum	1.00 - 13.00		0.20 - 3.00		
Acer glabrum	1.00 - 3.00				
Alnus viridis ssp. sinuata					
Amelanchier alnifolia			0.10 - 1.00	0.06 - 1.00	
Arctostaphylos nevadensis			0.10 - 1.00		
Arctostaphylos uva-ursi				0.06 - 10.00	
Cassiope mertensiana				0.06 - 1.00	
Chimaphila menziesii	1.00 - 1.00	0.43 - 1.67		0.11 - 1.50	
Chimaphila umbellata		0.14 - 1.00			
Gaultheria ovatifolia					
Gaultheria shallon					
Juniperus communis			0.10 - 3.00		
Linnaea borealis			0.10 - 1.00	0.06 - 2.00	
Luetkea pectinata				0.17 - 3.77	
Mahonia nervosa			0.10 - 1.00	0.06 - 1.00	
Menziesia ferruginea		1.00 - 19.14	0.20 - 4.50	0.11 - 2.00	
Paxistima myrsinites				0.06 - 1.00	
Phyllodoce empetriformis				0.17 - 2.67	1.00 - 1.00
Phyllodoce glanduliflora					
Rhododendron albiflorum		0.14 - 3.00	0.50 - 1.80	0.56 - 2.60	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	CUPNOO-PSEMEN/ ACECIR	ABIAMA-TSUMER/ MENFER	ABIAMA-TSUMER/ STRLAN	ABIAMA-TSUMER/ VACMEM/ RUBLAS	ABILAS-TSUMER/ VACSCO
Ribes acerifolium				0.11 - 1.15	
Ribes lacustre					
Rosa gymnocarpa			0.10 - 3.00	0.06 - 2.00	
Sorbus sitchensis		0.71 - 1.80	0.30 - 1.00	0.44 - 1.91	
Spiraea betulifolia			0.10 - 1.00		
Spiraea splendens					1.00 - 20.00
Vaccinium alaskense		0.57 - 22.25	0.20 - 3.50	0.11 - 3.00	
Vaccinium deliciosum				0.17 - 4.00	
Vaccinium membranaceum		0.86 - 16.83	0.90 - 4.33	1.00 - 17.06	1.00 - 3.00
Vaccinium ovalifolium		0.29 - 24.00	0.20 - 15.50	0.06 - 8.00	
Vaccinium parvifolium		0.29 - 16.50	0.10 - 1.00		
Vaccinium scoparium				0.17 - 1.00	1.00 - 10.00
HERBACEOUS					
Achillea millefolium			0.10 - 1.00		
Achlys triphylla		0.14 - 20.00	0.10 - 10.00	0.06 - 4.00	
Arnica latifolia		0.14 - 1.00	0.20 - 3.00	0.22 - 0.83	1.00 - 1.00
Campanula scouleri			0.10 - 3.00		
Clintonia uniflora	1.00 - 3.00	0.29 - 8.00	0.20 - 3.50	0.11 - 4.50	
Erythronium montanum		0.43 - 33.33	0.40 - 3.75	0.33 - 6.67	
Festuca occidentalis					
Festuca viridula					
Goodyera oblongifolia	1.00 - 1.00	0.43 - 1.00	0.20 - 1.00		
Hieracium albiflorum	1.00 - 1.00		0.10 - 3.00	0.06 - 0.30	
Juncus parryi					
Ligusticum grayi				0.17 - 1.00	
Lomatium martindalei					
Lupinus (arcticus ssp. subalpinus, latifolius)			0.10 - 1.00	0.22 - 1.25	
Luzula glabrata			0.20 - 1.65	0.33 - 1.33	1.00 - 1.00
Mitella breweri			0.40 - 6.50	0.06 - 1.00	
Moehringia macrophylla			0.10 - 1.00		
Nothochelone nemorosa				0.06 - 2.00	
Orthilia secunda		0.29 - 2.00	0.10 - 1.00	0.33 - 1.38	
Pedicularis bracteosa					
Pedicularis racemosa				0.11 - 0.65	
Phlox diffusa					
Polemonium pulcherrimum				0.06 - 0.30	
Polygonum bistortoides					
Polystichum lonchitis				0.06 - 0.30	
Polystichum munitum			0.20 - 1.00		
Pyrola asarifolia		0.14 - 1.00			
Rubus lasiococcus		0.57 - 1.50	0.50 - 10.80	0.56 - 5.50	1.00 - 30.00
Senecio triangularis			0.20 - 2.00		
Streptopus lanceolatus		0.14 - 8.00	0.40 - 2.25	0.06 - 1.00	
Tiarella trifoliata		0.14 - 2.00	1.00 - 6.80	0.11 - 2.00	
Valeriana sitchensis			0.60 - 3.67	0.17 - 1.33	1.00 - 1.00
Veratrum viride	1.00 - 1.00	0.14 - 1.00	0.50 - 1.80	0.17 - 1.00	
Viola glabella			0.20 - 3.00	0.06 - 1.00	
Xerophyllum tenax			0.10 - 1.00	0.33 - 1.55	1.00 - 3.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	TSUMER-(ABIAMA-ABILAS)/ LUZGLA	ABILAS-ABIAMA/ LUZGLA	TSUMER-ABIAMA/ Dep.	TSUMER-ABIAMA/ RHOALB	TSUMER-ABIAMA/ VACALA/ RUBPED
plots	1	1	4	45	11
TREES					
Abies amabilis	1.00 - 3.00	1.00 - 23.00	1.00 - 49.65	0.82 - 38.66	1.00 - 53.09
Abies grandis					
Abies lasiocarpa	1.00 - 23.00	1.00 - 20.00		0.51 - 24.46	0.09 - 13.30
Abies procera				0.02 - 3.00	
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis				0.53 - 16.12	0.82 - 7.14
Cornus nuttallii					
Larix lyallii					
Picea engelmannii				0.07 - 5.67	
Picea sitchensis					
Pinus albicaulis					
Pinus contorta				0.02 - 3.00	
Pinus monticola			0.25 - 3.00	0.04 - 2.00	0.09 - 1.30
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii			0.25 - 20.00	0.07 - 15.33	0.45 - 9.20
Taxus brevifolia					
Thuja plicata			0.25 - 3.00		
Tsuga heterophylla			0.25 - 15.30	0.11 - 5.40	0.27 - 29.00
Tsuga mertensiana	1.00 - 23.00		1.00 - 63.30	1.00 - 35.27	1.00 - 41.39
SHRUBS					
Acer circinatum			0.25 - 0.30		
Acer glabrum					
Alnus viridis ssp. sinuata				0.09 - 8.00	
Amelanchier alnifolia				0.02 - 3.00	
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi					
Cassiope mertensiana					
Chimaphila menziesii			0.25 - 1.00	0.04 - 2.00	0.09 - 3.00
Chimaphila umbellata				0.04 - 2.00	0.09 - 1.00
Gaultheria ovatifolia			0.25 - 1.00	0.04 - 2.00	
Gaultheria shallon					
Juniperus communis					
Linnaea borealis			0.25 - 1.00	0.04 - 3.00	
Luetkea pectinata	1.00 - 3.00			0.18 - 1.04	
Mahonia nervosa			0.25 - 1.00		
Menziesia ferruginea				0.18 - 22.75	0.64 - 1.47
Paxistima myrsinites				0.13 - 3.17	
Phyllodoce empetriformis			0.25 - 1.00	0.40 - 2.81	0.09 - 1.00
Phyllodoce glanduliflora					
Rhododendron albiflorum			0.25 - 2.00	1.00 - 30.78	0.27 - 2.33

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	TSUMER-(ABIAMA-ABILAS)/ LUZGLA	ABILAS-ABIAMA/ LUZGLA	TSUMER-ABIAMA/ Dep.	TSUMER-ABIAMA/ RHOALB	TSUMER-ABIAMA/ VACALA/ RUBPED
Ribes acerifolium				0.09 - 3.08	
Ribes lacustre				0.11 - 4.60	
Rosa gymnocarpa				0.02 - 3.00	
Sorbus sitchensis	1.00 - 1.00	1.00 - 4.00		0.51 - 2.05	0.09 - 0.30
Spiraea betulifolia					
Spiraea splendens				0.02 - 30.00	
Vaccinium alaskense			0.75 - 1.43	0.11 - 16.60	0.91 - 31.00
Vaccinium deliciosum	1.00 - 3.00		0.25 - 3.00	0.20 - 3.00	
Vaccinium membranaceum			0.25 - 2.00	0.93 - 18.75	0.64 - 21.00
Vaccinium ovalifolium				0.16 - 18.29	0.27 - 17.67
Vaccinium parvifolium			0.50 - 0.65	0.02 - 3.00	0.36 - 2.25
Vaccinium scoparium				0.04 - 2.00	
HERBACEOUS					
Achillea millefolium					
Achlys triphylla				0.02 - 3.00	
Arnica latifolia	1.00 - 1.00			0.31 - 3.07	0.09 - 3.00
Campanula scouleri					
Clintonia uniflora				0.13 - 7.55	0.18 - 1.15
Erythronium montanum	1.00 - 1.00	1.00 - 1.00	0.25 - 1.00	0.31 - 15.69	0.09 - 1.00
Festuca occidentalis		1.00 - 1.00			
Festuca viridula				0.02 - 1.00	
Goodyera oblongifolia				0.16 - 1.29	0.27 - 0.77
Hieracium albiflorum		1.00 - 1.00		0.02 - 1.00	
Juncus parryi					
Ligusticum grayi				0.04 - 2.00	
Lomatium martindalei					
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 30.00	1.00 - 1.00		0.11 - 1.80	
Luzula glabrata	1.00 - 40.00	1.00 - 80.00		0.07 - 1.00	
Mitella breweri				0.09 - 3.00	
Moehringia macrophylla	1.00 - 1.00				
Nothochelone nemorosa					
Orthilia secunda			0.25 - 1.00	0.24 - 3.03	0.36 - 0.90
Pedicularis bracteosa					
Pedicularis racemosa		1.00 - 3.00		0.16 - 1.37	
Phlox diffusa					
Polemonium pulcherrimum				0.07 - 3.33	
Polygonum bistortoides				0.04 - 1.00	
Polystichum lonchitis				0.02 - 1.00	
Polystichum munitum				0.04 - 0.65	0.09 - 0.30
Pyrola asarifolia				0.09 - 2.00	
Rubus lasiococcus	1.00 - 30.00	1.00 - 8.00		0.58 - 11.13	
Senecio triangularis				0.11 - 1.00	
Streptopus lanceolatus				0.11 - 3.60	0.18 - 1.00
Tiarella trifoliata		1.00 - 1.00		0.18 - 4.50	0.09 - 1.00
Valeriana sitchensis	1.00 - 1.00	1.00 - 1.00		0.36 - 7.08	0.09 - 3.00
Veratrum viride	1.00 - 1.00	1.00 - 1.00		0.18 - 1.88	0.09 - 1.00
Viola glabella				0.09 - 2.00	
Xerophyllum tenax		1.00 - 3.00	0.25 - 0.30	0.16 - 6.71	0.55 - 31.50

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	TSUMER-ABIAMA/ ERYMON	TSUMER-ABIAMA/ VACMEM/ VALSIT	TSUMER-ABIAMA/ VACMEM/ XERTEN	TSUMER-ABILAS/ ALNVIR	ABILAS-(TSUMER)/ FESVIR
plots	1	1	10	1	4
TREES					
Abies amabilis	1.00 - 51.00	1.00 - 1.00	0.90 - 23.26		
Abies grandis					
Abies lasiocarpa	1.00 - 2.30	1.00 - 28.30	0.50 - 22.06	1.00 - 58.00	1.00 - 40.75
Abies procera			0.10 - 3.00		
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	1.00 - 3.30	1.00 - 69.00	0.40 - 7.75	1.00 - 3.00	
Cornus nuttallii					
Larix lyallii					
Picea engelmannii			0.10 - 10.00		
Picea sitchensis					
Pinus albicaulis					0.75 - 5.00
Pinus contorta					
Pinus monticola			0.10 - 3.00		
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii			0.40 - 10.75		
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla			0.30 - 26.67		
Tsuga mertensiana	1.00 - 23.60	1.00 - 13.00	1.00 - 32.03	1.00 - 33.00	
SHRUBS					
Acer circinatum					
Acer glabrum					
Alnus viridis ssp. sinuata				1.00 - 30.00	
Amelanchier alnifolia					
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi					
Cassiope mertensiana				1.00 - 3.00	
Chimaphila menziesii			0.10 - 1.00		
Chimaphila umbellata			0.40 - 2.50		
Gaultheria ovatifolia			0.40 - 4.75		
Gaultheria shallon					
Juniperus communis					
Linnaea borealis					
Luetkea pectinata					0.25 - 10.00
Mahonia nervosa					
Menziesia ferruginea			0.20 - 5.50		
Paxistima myrsinites		1.00 - 0.30	0.40 - 5.50		0.25 - 1.00
Phyllodoce empetriformis			0.20 - 7.50		
Phyllodoce glanduliflora					
Rhododendron albiflorum			0.20 - 2.00	1.00 - 3.00	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	TSUMER-ABIAMA/ ERYMON	TSUMER-ABIAMA/ VACMEM/ VALSIT	TSUMER-ABIAMA/ VACMEM/ XERTEN	TSUMER-ABILAS/ ALNVIR	ABILAS-(TSUMER)/ FESVIR
Ribes acerifolium					0.25 - 3.00
Ribes lacustre			0.10 - 1.00		
Rosa gymnocarpa					
Sorbus sitchensis			0.60 - 1.55		0.25 - 3.00
Spiraea betulifolia					
Spiraea splendens					0.25 - 1.00
Vaccinium alaskense					
Vaccinium deliciosum			0.30 - 3.67		
Vaccinium membranaceum	1.00 - 1.00	1.00 - 5.00	1.00 - 24.60		
Vaccinium ovalifolium					
Vaccinium parvifolium					
Vaccinium scoparium			0.20 - 1.00		0.50 - 2.00
HERBACEOUS					
Achillea millefolium					0.25 - 3.00
Achlys triphylla			0.20 - 5.50		
Arnica latifolia			0.20 - 5.50		0.50 - 2.00
Campanula scouleri			0.20 - 2.00		
Clintonia uniflora			0.40 - 5.50		
Erythronium montanum	1.00 - 15.00		0.40 - 9.25		
Festuca occidentalis					
Festuca viridula					1.00 - 20.00
Goodyera oblongifolia			0.30 - 1.67		
Hieracium albiflorum		1.00 - 0.30	0.40 - 1.50		
Juncus parryi					
Ligusticum grayi					0.75 - 1.67
Lomatium martindalei			0.10 - 1.00		
Lupinus (arcticus ssp. subalpinus, latifolius)			0.10 - 3.00	1.00 - 3.00	1.00 - 12.00
Luzula glabrata		1.00 - 0.30	0.10 - 1.00		0.75 - 4.00
Mitella breweri					0.25 - 1.00
Moehringia macrophylla			0.20 - 2.00		
Nothochelone nemorosa		1.00 - 0.30	0.20 - 2.00		
Orthilia secunda		1.00 - 1.00	0.10 - 1.00		
Pedicularis bracteosa					0.75 - 1.00
Pedicularis racemosa		1.00 - 0.30	0.30 - 1.00		
Phlox diffusa					0.50 - 5.50
Polemonium pulcherrimum					0.50 - 2.00
Polygonum bistortoides					0.25 - 10.00
Polystichum lonchitis		1.00 - 1.00			
Polystichum munitum			0.20 - 1.00		
Pyrola asarifolia			0.10 - 3.00		
Rubus lasiococcus			0.80 - 4.13		
Senecio triangularis					0.25 - 3.00
Streptopus lanceolatus			0.10 - 1.00		
Tiarella trifoliata			0.10 - 1.00		
Valeriana sitchensis		1.00 - 1.00	0.20 - 9.00		0.75 - 12.67
Veratrum viride			0.10 - 3.00		0.50 - 10.00
Viola glabella			0.10 - 1.00		
Xerophyllum tenax	1.00 - 1.00		1.00 - 16.70		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS/ POLPUL-PEDRAC	ABILAS/ VACDEL	CUPNOO/ VACDEL	TSUMER/ PHYEMP-VACDEL	TSUMER-ABILAS/ VACDEL-PHYEMP
plots	6	11	1	11	39
TREES					
Abies amabilis		0.27 - 4.67		0.73 - 10.38	0.33 - 9.79
Abies grandis					
Abies lasiocarpa	1.00 - 54.83	1.00 - 41.91		0.45 - 2.40	1.00 - 26.02
Abies procera					
Acer macrophyllum					
Alnus rubra					
Arbutus menziesii					
Betula papyrifera					
Chamaecyparis nootkatensis	0.17 - 40.00	0.36 - 23.75	1.00 - 45.00	0.64 - 10.00	0.41 - 9.25
Cornus nuttallii					
Larix lyallii					
Picea engelmannii	0.17 - 1.00	0.18 - 20.00			0.05 - 4.50
Picea sitchensis					
Pinus albicaulis	0.17 - 1.00	0.09 - 1.00		0.18 - 15.50	0.10 - 1.50
Pinus contorta		0.09 - 3.00			0.03 - 14.00
Pinus monticola					0.08 - 0.77
Pinus ponderosa					
Populus balsamifera ssp. trichocarpa					
Populus tremuloides					
Prunus emarginata					
Pseudotsuga menziesii					
Taxus brevifolia					
Thuja plicata		0.09 - 10.00			
Tsuga heterophylla					
Tsuga mertensiana		0.45 - 2.20		1.00 - 30.91	0.95 - 28.56
SHRUBS					
Acer circinatum					
Acer glabrum					
Alnus viridis ssp. sinuata					
Amelanchier alnifolia					0.03 - 1.00
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi		0.09 - 1.00			0.03 - 3.00
Cassiope mertensiana		0.18 - 10.00		0.73 - 9.00	0.28 - 9.36
Chimaphila menziesii					
Chimaphila umbellata					
Gaultheria ovatifolia					
Gaultheria shallon					
Juniperus communis	0.17 - 1.00	0.18 - 20.50			
Linnaea borealis					
Luetkea pectinata	0.17 - 25.00	0.45 - 13.60		0.82 - 4.11	0.56 - 8.65
Mahonia nervosa					
Menziesia ferruginea				0.18 - 2.00	0.05 - 1.65
Paxistima myrsinites	0.17 - 1.00	0.45 - 19.40		0.09 - 2.00	0.03 - 13.00
Phyllodoce empetriformis	0.17 - 1.00	0.55 - 7.17	1.00 - 6.00	1.00 - 28.18	0.85 - 20.58
Phyllodoce glanduliflora					0.03 - 3.00
Rhododendron albiflorum	0.17 - 0.30	0.09 - 10.00		0.36 - 9.25	0.08 - 3.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Mountain Hemlock -Silver fir Forest and Tree Island Groups.

Species / Association	ABILAS/ POLPUL-PEDRAC	ABILAS/ VACDEL	CUPNOO/ VACDEL	TSUMER/ PHYEMP-VACDEL	TSUMER-ABILAS/ VACDEL-PHYEMP
Ribes acerifolium	0.33 - 1.15		1.00 - 10.00		0.05 - 2.00
Ribes lacustre		0.09 - 10.00		0.09 - 1.00	0.05 - 4.00
Rosa gymnocarpa					
Sorbus sitchensis	0.17 - 15.00	0.36 - 1.50	1.00 - 1.00	0.45 - 4.60	0.54 - 2.71
Spiraea betulifolia					
Spiraea splendens	0.17 - 15.00				
Vaccinium alaskense				0.18 - 8.00	
Vaccinium deliciosum	0.33 - 2.00	1.00 - 35.73	1.00 - 65.00	0.82 - 38.89	0.92 - 33.25
Vaccinium membranaceum	0.17 - 2.00	0.55 - 13.33		0.82 - 6.67	0.67 - 15.28
Vaccinium ovalifolium					0.03 - 1.00
Vaccinium parvifolium					
Vaccinium scoparium		0.45 - 12.20		0.09 - 3.00	0.10 - 15.50
HERBACEOUS					
Achillea millefolium	0.50 - 1.10	0.18 - 1.00			0.03 - 1.00
Achlys triphylla					
Arnica latifolia	0.33 - 2.00	0.73 - 2.88	1.00 - 1.00	0.18 - 7.00	0.33 - 2.69
Campanula scouleri					
Clintonia uniflora					
Erythronium montanum	0.17 - 0.30		1.00 - 3.00	0.27 - 4.67	0.51 - 10.40
Festuca occidentalis					
Festuca viridula		0.27 - 1.67			0.10 - 1.50
Goodyera oblongifolia		0.09 - 1.00			
Hieracium albiflorum		0.09 - 1.00			0.08 - 1.00
Juncus parryi	0.50 - 6.33	0.09 - 10.00	1.00 - 1.00	0.09 - 1.00	0.08 - 3.33
Ligusticum grayi		0.27 - 4.00			0.33 - 1.31
Lomatium martindalei	0.17 - 0.30			0.09 - 0.30	
Lupinus (arcticus ssp. subalpinus, latifolius)	0.50 - 3.33	0.91 - 2.50		0.36 - 2.00	0.44 - 5.24
Luzula glabrata	0.33 - 0.65	0.55 - 12.50	1.00 - 0.30		0.49 - 6.37
Mitella breweri		0.18 - 10.50	1.00 - 0.30	0.09 - 8.00	0.23 - 1.14
Moehringia macrophylla		0.09 - 1.00			
Nothochelone nemorosa					
Orthilia secunda	0.33 - 1.00	0.18 - 1.00			0.08 - 1.00
Pedicularis bracteosa		0.45 - 1.40			0.03 - 1.00
Pedicularis racemosa	0.50 - 1.67	0.64 - 3.14		0.09 - 1.00	0.15 - 2.00
Phlox diffusa	0.67 - 1.15	0.36 - 3.25			0.03 - 1.00
Polemonium pulcherrimum	1.00 - 3.88	0.09 - 3.00	1.00 - 3.00	0.09 - 1.00	0.13 - 1.20
Polygonum bistortoides	0.67 - 1.83	0.09 - 1.00	1.00 - 2.00	0.09 - 1.00	0.23 - 2.26
Polystichum lonchitis				0.09 - 0.30	
Polystichum munitum					
Pyrola asarifolia					
Rubus lasiococcus	0.50 - 1.33	0.64 - 8.14		0.09 - 1.00	0.36 - 5.79
Senecio triangularis					0.03 - 3.00
Streptopus lanceolatus				0.09 - 3.00	
Tiarella trifoliata		0.09 - 1.00	1.00 - 0.30		
Valeriana sitchensis	0.33 - 1.50	0.64 - 10.14	1.00 - 8.00	0.18 - 11.00	0.51 - 3.55
Veratrum viride		0.27 - 1.67		0.45 - 2.40	0.21 - 2.04
Viola glabella		0.18 - 3.00			
Xerophyllum tenax					0.33 - 7.10

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	PICSIT/ RUBSPE/ CAROBN-LYSAME	TSUHET-(THUPLI-ALNRUB)/ LYSAME-ATHFIL	TSUHET-THUPLI/ GAUSHA/ LYSAME	ALNRUB/ ATHFIL-LYSAME	ALNRUB/ GLYSTR	ACEMAC/ MAISTE
plots	2	3	4	2	1	1
TREES						
Abies amabilis		0.33 - 6.00	0.25 - 21.00			
Abies grandis		0.67 - 8.50		0.50 - 1.00		
Abies lasiocarpa						
Abies procera						
Acer macrophyllum						1.00 - 98.00
Alnus rubra		0.33 - 14.00	0.25 - 21.00	1.00 - 50.00	1.00 - 83.00	
Arbutus menziesii						
Betula papyrifera						
Chamaecyparis nootkatensis		0.33 - 9.00				
Cornus nuttallii						
Larix lyallii						
Picea engelmannii		0.33 - 6.00				
Picea sitchensis	1.00 - 34.50		0.25 - 8.00			
Pinus albicaulis						
Pinus contorta						
Pinus monticola						
Pinus ponderosa						
Populus balsamifera ssp. trichocarpa		0.67 - 8.00				
Populus tremuloides						
Pseudotsuga menziesii		0.33 - 1.00				
Taxus brevifolia	0.50 - 3.00	0.33 - 1.00				
Thuja plicata	0.50 - 20.00	1.00 - 17.00	1.00 - 42.75	1.00 - 7.00		1.00 - 1.00
Tsuga heterophylla	0.50 - 28.00	1.00 - 24.00	1.00 - 53.75	1.00 - 5.00	1.00 - 3.00	
Tsuga mertensiana						
SHRUBS						
Acer circinatum		0.33 - 30.00				
Cornus sericea				0.50 - 1.00		
Gaultheria shallon	1.00 - 10.50		1.00 - 30.00	1.00 - 8.00		
Linnaea borealis	0.50 - 3.00	0.33 - 8.00	0.50 - 2.00	0.50 - 3.00		
Malus fusca	0.50 - 3.00					
Menziesia ferruginea	1.00 - 2.00	0.67 - 4.50	0.50 - 2.00	0.50 - 1.00		
Oplopanax horridus		0.67 - 2.00	0.75 - 1.67	0.50 - 30.00		1.00 - 1.00
Ribes bracteosum						
Ribes lacustre		0.33 - 1.00			1.00 - 1.00	
Rosa gymnocarpa		0.33 - 3.00				
Rubus parviflorus						1.00 - 3.00
Rubus spectabilis	1.00 - 7.00	1.00 - 3.00	0.75 - 1.67	1.00 - 7.00	1.00 - 8.00	
Salix scouleriana						
Symphoricarpos albus						
Vaccinium alaskense	0.50 - 1.00		0.75 - 4.67			
Vaccinium membranaceum						
Vaccinium ovalifolium			0.25 - 60.00			
Vaccinium ovatum	0.50 - 1.00					
Vaccinium parvifolium	1.00 - 1.00	1.00 - 1.67	0.75 - 1.67			
HERBACEOUS						

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	PICSIT/ RUBSPE/ CAROBN-LYSAME	TSUHET-(THUPLI-ALNRUB)/ LYSAME-ATHFIL	TSUHET-THUPLI/ GAUSHA/ LYSAME	ALNRUB/ ATHFIL-LYSAME	ALNRUB/ GLYSTR	ACEMAC/ MAISTE
plots	2	3	4	2	1	1
Achlys triphylla		1.00 - 3.33			1.00 - 1.00	
Athyrium filix-femina	0.50 - 13.00	1.00 - 6.33	0.50 - 1.00	1.00 - 2.00	1.00 - 20.00	
Blechnum spicant	1.00 - 2.00	1.00 - 8.00	1.00 - 9.75	1.00 - 11.50	1.00 - 1.00	
Bromus sitchensis	0.50 - 1.00					
Bromus vulgaris						
Carex deweyana					1.00 - 3.00	
Carex obnupta	1.00 - 50.00		0.25 - 1.00			
Cinna latifolia						
Circaea alpina		0.67 - 1.00		1.00 - 2.00	1.00 - 1.00	
Claytonia sibirica	0.50 - 1.00	0.33 - 1.00	0.25 - 1.00		1.00 - 1.00	
Clintonia uniflora		1.00 - 1.00	0.50 - 1.00	0.50 - 1.00		1.00 - 1.00
Cornus unalaschkensis	0.50 - 3.00	0.33 - 3.00	1.00 - 1.50	0.50 - 1.00	1.00 - 1.00	
Dryopteris expansa	0.50 - 1.00			0.50 - 1.00		
Dryopteris filix-mas						
Elymus glaucus						
Elymus hirsutus						
Equisetum hyemale		0.67 - 2.00		0.50 - 1.00		
Fragaria virginiana						
Galium triflorum	0.50 - 1.00	1.00 - 1.00	0.25 - 1.00			
Geranium robertianum						
Glyceria striata		0.33 - 3.00			1.00 - 60.00	
Gymnocarpium disjunctum		1.00 - 13.00	0.25 - 1.00	0.50 - 1.00		
Gymnocarpium dryopteris						
Heracleum maximum						
Hydrophyllum tenuipes				1.00 - 1.00		
Lysichiton americanus	1.00 - 3.00	1.00 - 17.67	1.00 - 21.50	1.00 - 39.00		
Maianthemum dilatatum	1.00 - 10.50	0.67 - 1.00	1.00 - 2.00	1.00 - 5.50	1.00 - 1.00	
Maianthemum stellatum		0.33 - 1.00	0.25 - 1.00			1.00 - 30.00
Melica subulata						
Montia parvifolia						
Mycelis muralis						
Oenanthe sarmentosa	0.50 - 1.00			0.50 - 1.00		
Osmorhiza berteroi		0.33 - 1.00				
Oxalis oregana		0.67 - 31.50	0.25 - 20.00			
Pedicularis racemosa						
Poa trivialis						
Polystichum munitum	0.50 - 13.00	0.67 - 16.50				
Prosartes hookeri						1.00 - 40.00
Rubus pedatus		0.33 - 1.00	0.50 - 2.00	0.50 - 3.00	1.00 - 1.00	
Scirpus microcarpus		0.33 - 1.00		0.50 - 3.00		
Stachys chamissonis				1.00 - 2.00	1.00 - 3.00	
Streptopus amplexifolius		1.00 - 1.67				
Tellima grandiflora		0.67 - 2.00		0.50 - 3.00		
Tiarella trifoliata		1.00 - 6.00	0.50 - 1.00	0.50 - 1.00	1.00 - 8.00	
Tolmiea menziesii				0.50 - 13.00	1.00 - 3.00	
Viola glabella		1.00 - 3.33		1.00 - 4.50	1.00 - 3.00	1.00 - 1.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	ACEMAC/ OXAORE	ACEMAC/ POLMUN-TOLMEN	ACEMAC/ RUBSPE	ALNRUB/ ACECIR/ CLASIB	ALNRUB/ ELYGLA	ALNRUB/ OPLHOR-RUBSPE
plots	9	6	5	1	14	1
TREES						
Abies amabilis						1.00 - 6.00
Abies grandis		0.50 - 3.67			0.07 - 3.00	
Abies lasiocarpa						
Abies procera						
Acer macrophyllum	1.00 - 66.70	1.00 - 75.33	1.00 - 65.00		0.29 - 13.25	
Alnus rubra	0.33 - 5.77	0.33 - 15.50	0.40 - 30.00	1.00 - 88.00	1.00 - 74.14	1.00 - 43.00
Arbutus menziesii						
Betula papyrifera						
Chamaecyparis nootkatensis						
Cornus nuttallii						
Larix lyallii						
Picea engelmannii						
Picea sitchensis	0.78 - 4.80		0.20 - 20.00		0.93 - 6.73	
Pinus albicaulis						
Pinus contorta						
Pinus monticola						
Pinus ponderosa						
Populus balsamifera ssp. trichocarpa		0.17 - 3.00			0.14 - 17.50	
Populus tremuloides						
Pseudotsuga menziesii	0.11 - 1.30	0.17 - 8.00			0.21 - 2.30	1.00 - 1.00
Taxus brevifolia						
Thuja plicata	0.22 - 7.00		0.40 - 12.00			1.00 - 6.00
Tsuga heterophylla	0.33 - 6.00	0.17 - 3.00	0.20 - 8.00		0.14 - 1.15	1.00 - 16.00
Tsuga mertensiana						
SHRUBS						
Acer circinatum	0.89 - 54.13	0.33 - 7.00	0.60 - 20.67	1.00 - 20.00	0.21 - 0.30	
Cornus sericea						
Gaultheria shallon						
Linnaea borealis		0.17 - 1.00				1.00 - 1.00
Malus fusca		0.17 - 3.00				
Menziesia ferruginea						
Oplopanax horridus			0.20 - 1.00	1.00 - 8.00		1.00 - 8.00
Ribes bracteosum						
Ribes lacustre			0.20 - 1.00	1.00 - 20.00	0.14 - 0.65	
Rosa gymnocarpa	0.11 - 1.00	0.50 - 1.00			0.14 - 0.30	1.00 - 1.00
Rubus parviflorus			0.20 - 3.00			
Rubus spectabilis	0.89 - 5.20	0.50 - 3.33	1.00 - 44.60		0.64 - 1.13	1.00 - 3.00
Salix scouleriana					0.43 - 10.55	
Symphoricarpos albus		0.83 - 3.60	0.20 - 1.00		0.14 - 1.15	
Vaccinium alaskense						
Vaccinium membranaceum						
Vaccinium ovalifolium						
Vaccinium ovatum						
Vaccinium parvifolium						
HERBACEOUS						

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	ACEMAC/ OXAORE	ACEMAC/ POLMUN-TOLMEN	ACEMAC/ RUBSPE	ALNRUB/ ACECIR/ CLASIB	ALNRUB/ ELYGLA	ALNRUB/ OPLHOR-RUBSPE
plots	9	6	5	1	14	1
Achlys triphylla	0.44 - 3.65	0.33 - 5.50	0.20 - 1.00		0.07 - 0.30	1.00 - 1.00
Athyrium filix-femina	0.78 - 2.00	0.33 - 3.00	0.80 - 2.00	1.00 - 3.00	0.29 - 2.33	
Blechnum spicant				1.00 - 1.00		1.00 - 1.00
Bromus sitchensis					0.29 - 16.58	
Bromus vulgaris		0.67 - 2.00	0.60 - 1.67		0.07 - 20.00	
Carex deweyana	0.89 - 4.41	0.83 - 3.60	0.80 - 8.75		0.50 - 3.80	
Carex obnupta						
Cinna latifolia			0.40 - 4.50		0.07 - 0.30	
Circaea alpina	1.00 - 16.22	1.00 - 10.33	1.00 - 3.20		0.57 - 10.04	
Claytonia sibirica	1.00 - 4.56	0.67 - 7.25	1.00 - 2.40	1.00 - 30.00	0.86 - 7.28	
Clintonia uniflora						
Cornus unalaschkensis		0.17 - 1.00				1.00 - 1.00
Dryopteris expansa			0.20 - 3.00			
Dryopteris filix-mas					0.07 - 0.30	
Elymus glaucus	0.44 - 3.75	0.17 - 3.00	0.20 - 3.00		0.79 - 28.18	
Elymus hirsutus					0.21 - 19.33	
Equisetum hyemale						
Fragaria virginiana			0.20 - 1.00			
Galium triflorum	0.56 - 3.00				0.36 - 4.86	
Geranium robertianum		0.67 - 4.50	0.20 - 1.00			
Glyceria striata						
Gymnocarpium disjunctum						
Gymnocarpium dryopteris					0.07 - 0.30	
Heracleum maximum		0.17 - 1.00			0.07 - 1.00	
Hydrophyllum tenuipes	0.67 - 4.05	0.67 - 1.00	0.60 - 1.67		0.14 - 1.00	
Lysichiton americanus						
Maianthemum dilatatum					0.07 - 0.30	1.00 - 1.00
Maianthemum stellatum		0.17 - 1.00		1.00 - 1.00		
Melica subulata	0.44 - 1.33	0.50 - 2.33	0.60 - 2.33		0.07 - 2.00	
Montia parvifolia					0.29 - 7.58	
Mycelis muralis	0.67 - 4.00	1.00 - 1.33	0.60 - 1.00		0.71 - 2.80	
Oenanthe sarmentosa		0.17 - 1.00			0.21 - 2.67	
Osmorhiza berteroi	0.11 - 1.00	0.50 - 1.00			0.14 - 0.65	
Oxalis oregana	1.00 - 39.33		0.40 - 5.50		0.79 - 8.63	
Pedicularis racemosa						
Poa trivialis					0.64 - 24.00	
Polystichum munitum	1.00 - 16.37	1.00 - 34.00	0.80 - 23.50	1.00 - 3.00	0.93 - 3.86	1.00 - 1.00
Prosartes hookeri		0.17 - 1.00				
Rubus pedatus						1.00 - 1.00
Scirpus microcarpus					0.07 - 1.00	
Stachys chamissonis	0.56 - 2.60	0.67 - 6.25	0.40 - 2.00		0.64 - 2.40	
Streptopus amplexifolius						1.00 - 1.00
Tellima grandiflora	0.11 - 1.00	0.50 - 1.00	0.20 - 3.00		0.07 - 2.00	
Tiarella trifoliata	0.44 - 0.83				0.14 - 1.15	1.00 - 2.00
Tolmiea menziesii	1.00 - 8.22	0.83 - 9.00	1.00 - 19.80	1.00 - 1.00	0.43 - 2.55	
Viola glabella		0.67 - 1.50	0.40 - 1.00		0.21 - 1.67	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	ALNRUB/ RUBSPE	ALNRUB/ STACHA-TOLMEN	ABIGRA/ BROVUL-POLMUN	ALNRUB/ OXAORE	PICSIT-(ALNRUB)/ RUBSPE/ POLMUN	PICSIT/ SCIMIC
plots	10	3	2	7	2	1
TREES						
Abies amabilis						
Abies grandis		1.00 - 7.00	1.00 - 53.50	0.14 - 6.00		
Abies lasiocarpa						
Abies procera						
Acer macrophyllum	0.20 - 8.50		1.00 - 9.00	0.57 - 15.33		
Alnus rubra	1.00 - 59.70	1.00 - 88.00	1.00 - 12.50	1.00 - 69.57	1.00 - 65.00	1.00 - 3.00
Arbutus menziesii						
Betula papyrifera						
Chamaecyparis nootkatensis						
Cornus nuttallii						
Larix lyallii						
Picea engelmannii						
Picea sitchensis	0.30 - 10.00			0.86 - 10.88	1.00 - 18.00	1.00 - 34.00
Pinus albicaulis						
Pinus contorta						
Pinus monticola						
Pinus ponderosa						
Populus balsamifera ssp. trichocarpa	0.10 - 8.00					
Populus tremuloides						
Pseudotsuga menziesii	0.10 - 3.00			0.29 - 3.50		
Taxus brevifolia						
Thuja plicata	0.30 - 9.00	0.33 - 3.00	0.50 - 5.00	0.29 - 1.00		1.00 - 3.00
Tsuga heterophylla	0.50 - 4.00	0.67 - 1.50	0.50 - 4.00	0.86 - 3.82	0.50 - 3.00	1.00 - 8.00
Tsuga mertensiana						
SHRUBS						
Acer circinatum	0.40 - 21.25	0.33 - 3.00	1.00 - 3.50	0.71 - 26.00		1.00 - 4.00
Cornus sericea	0.20 - 21.50					
Gaultheria shallon	0.10 - 1.00				0.50 - 3.00	
Linnaea borealis						
Malus fusca						
Menziesia ferruginea						
Oplopanax horridus	0.10 - 1.00	0.33 - 2.00	0.50 - 1.00	0.14 - 3.00		
Ribes bracteosum	0.30 - 13.67					
Ribes lacustre	0.30 - 1.67	1.00 - 1.43	1.00 - 5.00			
Rosa gymnocarpa	0.10 - 1.00	0.33 - 1.00	0.50 - 2.00			
Rubus parviflorus	0.20 - 3.00			0.14 - 3.00		
Rubus spectabilis	1.00 - 43.00	0.67 - 2.00	1.00 - 5.00	0.71 - 4.00	1.00 - 8.00	1.00 - 6.00
Salix scouleriana						
Symphoricarpos albus						
Vaccinium alaskense						
Vaccinium membranaceum						
Vaccinium ovalifolium	0.10 - 1.00				0.50 - 1.00	
Vaccinium ovatum						
Vaccinium parvifolium						
HERBACEOUS						

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	ALNRUB/ RUBSPE	ALNRUB/ STACHA-TOLMEN	ABIGRA/ BROVUL-POLMUN	ALNRUB/ OXAORE	PICSIT-(ALNRUB)/ RUBSPE/ POLMUN	PICSIT/ SCIMIC
plots	10	3	2	7	2	1
Achlys triphylla	0.30 - 1.00		0.50 - 2.00	0.29 - 1.15		
Athyrium filix-femina	0.90 - 6.89	1.00 - 2.00	0.50 - 6.00	0.71 - 2.80	0.50 - 3.00	1.00 - 6.00
Blechnum spicant	0.40 - 1.00			0.29 - 1.00		1.00 - 3.00
Bromus sitchensis				0.14 - 5.00	0.50 - 1.00	
Bromus vulgaris		0.33 - 3.00	1.00 - 47.50			
Carex deweyana	0.60 - 5.50	0.33 - 1.00		0.86 - 1.67	1.00 - 2.00	1.00 - 2.00
Carex obnupta						
Cinna latifolia	0.20 - 4.50					
Circaea alpina	0.90 - 6.00	0.67 - 21.50	1.00 - 5.50	0.86 - 6.83		1.00 - 6.00
Claytonia sibirica	0.70 - 4.14	1.00 - 21.00	1.00 - 2.00	1.00 - 6.43	1.00 - 4.50	1.00 - 2.00
Clintonia uniflora						
Cornus unalaschkensis						
Dryopteris expansa	0.20 - 7.00	0.33 - 1.00		0.29 - 1.00		
Dryopteris filix-mas	0.10 - 20.00		1.00 - 2.15	0.14 - 5.00		
Elymus glaucus	0.30 - 4.67	0.33 - 25.00	1.00 - 32.50	0.43 - 9.33		
Elymus hirsutus	0.10 - 5.00	0.33 - 10.00		0.14 - 25.00		
Equisetum hyemale						
Fragaria virginiana	0.10 - 1.00		1.00 - 5.50			
Galium triflorum	0.10 - 1.00		0.50 - 15.00	0.43 - 0.77	1.00 - 2.00	1.00 - 4.00
Geranium robertianum						
Glyceria striata	0.20 - 2.00					1.00 - 35.00
Gymnocarpium disjunctum						
Gymnocarpium dryopteris	0.20 - 1.00	0.33 - 1.00	0.50 - 15.00			
Heracleum maximum	0.10 - 13.00	0.33 - 4.00	1.00 - 14.50	0.14 - 1.00	0.50 - 1.00	
Hydrophyllum tenuipes						
Lysichiton americanus						1.00 - 4.00
Maianthemum dilatatum	0.10 - 8.00			0.14 - 1.00	0.50 - 13.00	
Maianthemum stellatum						
Melica subulata	0.10 - 10.00					
Montia parvifolia	0.10 - 1.00					
Mycelis muralis	0.30 - 1.33	0.33 - 1.00		0.43 - 0.77		1.00 - 2.00
Oenanthe sarmentosa				0.14 - 1.00	0.50 - 3.00	1.00 - 6.00
Osmorhiza berteroi		0.67 - 2.00		0.14 - 1.00		
Oxalis oregana	0.50 - 18.00			1.00 - 34.43		1.00 - 1.00
Pedicularis racemosa						
Poa trivialis	0.10 - 15.00		1.00 - 15.00	0.14 - 4.00		
Polystichum munitum	0.80 - 14.50	0.67 - 1.50	1.00 - 8.00	1.00 - 23.47	0.50 - 80.00	1.00 - 4.00
Prosartes hookeri	0.10 - 1.00					
Rubus pedatus	0.10 - 1.00		0.50 - 1.00			
Scirpus microcarpus						1.00 - 45.00
Stachys chamissonis	0.40 - 4.00	0.33 - 20.00	0.50 - 15.00	0.43 - 1.00		
Streptopus amplexifolius	0.10 - 1.00					
Tellima grandiflora					1.00 - 2.00	
Tiarella trifoliata	0.60 - 3.67	0.67 - 1.00	0.50 - 10.00	1.00 - 2.86		
Tolmiea menziesii	0.90 - 24.00	0.67 - 24.00	1.00 - 9.00	0.71 - 7.20		1.00 - 3.00
Viola glabella	0.20 - 1.00	0.33 - 20.00	0.50 - 2.00	0.14 - 3.00		1.00 - 4.00

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	TSUHET-(PSEMEN-THUPLI)/ POLMUN-ATHFIL	POPBAL-ALNRUB/ CAROBN	POPBAL-PICSIT-(ACEMAC)/ OXAORE	PSEMEN-PINPON-POPBAL/ ACECIR	ABIAMA/ RUBSPE-VACALA	ABIAMA-POPBAL/ OPLHOR
plots	11	2	6	1	1	1
TREES						
Abies amabilis	0.27 - 2.00				1.00 - 20.00	1.00 - 68.00
Abies grandis	0.09 - 3.00					
Abies lasiocarpa						
Abies procera						
Acer macrophyllum	0.09 - 3.00		1.00 - 20.33	1.00 - 16.00		
Alnus rubra		1.00 - 20.00	0.50 - 16.87			
Arbutus menziesii						
Betula papyrifera						
Chamaecyparis nootkatensis						
Cornus nuttallii				1.00 - 41.00		
Larix lyallii						
Picea engelmannii						
Picea sitchensis	0.18 - 0.80	1.00 - 4.50	1.00 - 33.43			
Pinus albicaulis						
Pinus contorta						
Pinus monticola						
Pinus ponderosa						
Populus balsamifera ssp. trichocarpa		1.00 - 30.00	1.00 - 15.67			1.00 - 50.00
Populus tremuloides						
Pseudotsuga menziesii	0.73 - 32.82		0.33 - 22.50			
Taxus brevifolia	0.09 - 6.00					
Thuja plicata	0.64 - 40.14		0.33 - 2.00			
Tsuga heterophylla	1.00 - 65.64		0.67 - 11.05		1.00 - 40.00	1.00 - 8.00
Tsuga mertensiana						
SHRUBS						
Acer circinatum	0.36 - 20.50		0.50 - 22.00	1.00 - 70.00		1.00 - 3.00
Cornus sericea						
Gaultheria shallon	0.36 - 0.65				1.00 - 3.00	
Linnaea borealis	0.27 - 5.33					
Malus fusca						
Menziesia ferruginea	0.27 - 0.77					
Oplopanax horridus	0.18 - 1.00					1.00 - 3.00
Ribes bracteosum						1.00 - 1.00
Ribes lacustre	0.18 - 2.00	0.50 - 1.00				1.00 - 1.00
Rosa gymnocarpa	0.36 - 1.33		0.33 - 0.65			
Rubus parviflorus	0.09 - 5.00				1.00 - 8.00	1.00 - 1.00
Rubus spectabilis	0.64 - 3.71	1.00 - 2.00	0.67 - 1.58		1.00 - 60.00	1.00 - 1.00
Salix scouleriana						
Symphoricarpos albus		1.00 - 15.50	0.33 - 0.30			
Vaccinium alaskense	0.64 - 0.80				1.00 - 3.00	
Vaccinium membranaceum	0.09 - 1.00		0.33 - 0.30			
Vaccinium ovalifolium	0.09 - 1.00					
Vaccinium ovatum						
Vaccinium parvifolium	0.82 - 4.48		0.17 - 0.30		1.00 - 3.00	
HERBACEOUS						

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	TSUHET-(PSEMEN-THUPLI)/ POLMUN-ATHFIL	POPBAL-ALNRUB/ CAROBN	POPBAL-PICSIT-(ACEMAC)/ OXAORE	PSEMEN-PINPON-POPBAL/ ACECIR	ABIAMA/ RUBSPE-VACALA	ABIAMA-POPBAL/ OPLHOR
plots	11	2	6	1	1	1
Achlys triphylla	0.64 - 10.47		0.33 - 44.50		1.00 - 3.00	
Athyrium filix-femina	0.82 - 5.00	0.50 - 1.00	0.33 - 0.65		1.00 - 3.00	1.00 - 1.00
Blechnum spicant	0.45 - 4.20		0.17 - 0.30		1.00 - 1.00	
Bromus sitchensis			0.50 - 6.67			
Bromus vulgaris		0.50 - 1.00	0.33 - 7.00			
Carex deweyana	0.09 - 1.00	1.00 - 11.50	0.67 - 8.50			
Carex obnupta		1.00 - 20.00				
Cinna latifolia						
Circaea alpina	0.18 - 4.50	1.00 - 1.00	0.67 - 4.08		1.00 - 8.00	
Claytonia sibirica	0.36 - 1.50	1.00 - 1.00	0.67 - 4.40		1.00 - 1.00	
Clintonia uniflora	0.73 - 2.54				1.00 - 1.00	1.00 - 3.00
Cornus unalaschkensis	0.09 - 0.30		0.17 - 5.00			
Dryopteris expansa	0.55 - 1.33		0.17 - 1.00			1.00 - 3.00
Dryopteris filix-mas	0.09 - 1.00		0.17 - 1.00			
Elymus glaucus		1.00 - 29.00	0.33 - 2.65	1.00 - 8.00		
Elymus hirsutus			0.33 - 6.50			
Equisetum hyemale						
Fragaria virginiana						
Galium triflorum	0.55 - 1.10		0.67 - 2.50			
Geranium robertianum						
Glyceria striata						
Gymnocarpium disjunctum	0.09 - 13.00					
Gymnocarpium dryopteris	0.36 - 18.50		0.17 - 5.00		1.00 - 3.00	1.00 - 1.00
Heracleum maximum						
Hydrophyllum tenuipes	0.18 - 2.00		0.17 - 3.00		1.00 - 1.00	
Lysichiton americanus						
Maianthemum dilatatum	0.45 - 1.06	0.50 - 1.00	0.83 - 0.78		1.00 - 3.00	
Maianthemum stellatum	0.36 - 4.83					1.00 - 1.00
Melica subulata		0.50 - 3.00	0.83 - 2.46			
Montia parvifolia		0.50 - 1.00		1.00 - 3.00		
Mycelis muralis	0.09 - 3.00	1.00 - 1.00	0.83 - 2.26			
Oenanthe sarmentosa		0.50 - 1.00				
Osmorhiza berteroi	0.09 - 1.00		0.50 - 1.10			
Oxalis oregana	0.36 - 2.25	1.00 - 3.00	1.00 - 32.33			
Pedicularis racemosa				1.00 - 20.00		
Poa trivialis			0.50 - 14.00			
Polystichum munitum	1.00 - 34.18	1.00 - 2.00	0.83 - 21.60		1.00 - 3.00	
Prosartes hookeri	0.27 - 1.00			1.00 - 1.00		1.00 - 1.00
Rubus pedatus			0.33 - 1.50		1.00 - 1.00	
Scirpus microcarpus						
Stachys chamissonis		1.00 - 1.00	0.33 - 1.65			
Streptopus amplexifolius	0.18 - 1.00					
Tellima grandiflora	0.09 - 1.00	0.50 - 1.00				
Tiarella trifoliata	0.82 - 17.33		0.83 - 8.80		1.00 - 3.00	1.00 - 1.00
Tolmiea menziesii		0.50 - 1.00	0.33 - 5.00		1.00 - 13.00	
Viola glabella	0.27 - 1.00		0.33 - 0.30		1.00 - 8.00	

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	ABIAMA-TSUHET/ OPLHOR	ABILAS/ RUBSPE
plots	11	1
TREES		
Abies amabilis	1.00 - 44.82	
Abies grandis		
Abies lasiocarpa		1.00 - 58.00
Abies procera		
Acer macrophyllum		
Alnus rubra	0.09 - 40.00	
Arbutus menziesii		
Betula papyrifera		
Chamaecyparis nootkatensis	0.09 - 1.00	
Cornus nuttallii		
Larix lyallii		
Picea engelmannii		1.00 - 9.00
Picea sitchensis		
Pinus albicaulis		
Pinus contorta		
Pinus monticola		
Pinus ponderosa		
Populus balsamifera ssp. trichocarpa	0.18 - 7.00	
Populus tremuloides		
Pseudotsuga menziesii	0.18 - 45.00	
Taxus brevifolia		
Thuja plicata	0.64 - 30.71	
Tsuga heterophylla	1.00 - 53.18	1.00 - 3.00
Tsuga mertensiana		
SHRUBS		
Acer circinatum	0.45 - 10.00	
Cornus sericea	0.18 - 2.00	
Gaultheria shallon	0.18 - 1.00	
Linnaea borealis	0.18 - 11.50	
Malus fusca		
Menziesia ferruginea		
Oplopanax horridus	1.00 - 23.36	
Ribes bracteosum	0.09 - 3.00	
Ribes lacustre	0.45 - 1.80	1.00 - 8.00
Rosa gymnocarpa	0.09 - 2.00	
Rubus parviflorus	0.09 - 1.00	1.00 - 3.00
Rubus spectabilis	0.55 - 8.33	1.00 - 40.00
Salix scouleriana		
Symphoricarpos albus		
Vaccinium alaskense	0.55 - 9.17	
Vaccinium membranaceum	0.27 - 4.00	
Vaccinium ovalifolium		
Vaccinium ovatum		
Vaccinium parvifolium	0.45 - 2.80	
HERBACEOUS		

Appendix C. Synthesis Table with association and species constancy and relative cover.
Forest and Woodland Class: North Pacific Hardwood-Conifer Swamp and North Pacific Lowland Riparian Forest and Woodland Groups.

Species / Association	ABIAMA-TSUHET/ OPLHOR	ABILAS/ RUBSPE
plots	11	1
Achlys triphylla	0.36 - 7.50	1.00 - 3.00
Athyrium filix-femina	0.91 - 11.40	1.00 - 8.00
Blechnum spicant	0.45 - 4.80	
Bromus sitchensis		1.00 - 3.00
Bromus vulgaris		
Carex deweyana		
Carex obnupta		
Cinna latifolia		1.00 - 8.00
Circaea alpina	0.09 - 3.00	
Claytonia sibirica	0.18 - 1.00	
Clintonia uniflora	1.00 - 4.27	1.00 - 1.00
Cornus unalaschkensis	0.55 - 4.33	1.00 - 1.00
Dryopteris expansa	0.18 - 2.00	
Dryopteris filix-mas		
Elymus glaucus		1.00 - 1.00
Elymus hirsutus		
Equisetum hyemale		
Fragaria virginiana		
Galium triflorum	0.18 - 1.50	
Geranium robertianum		
Glyceria striata	0.09 - 1.00	
Gymnocarpium disjunctum	0.18 - 10.50	
Gymnocarpium dryopteris	0.64 - 12.43	1.00 - 3.00
Heracleum maximum		1.00 - 8.00
Hydrophyllum tenuipes	0.09 - 1.00	
Lysichiton americanus	0.09 - 3.00	
Maianthemum dilatatum	0.18 - 1.00	
Maianthemum stellatum	0.36 - 1.75	
Melica subulata		
Montia parvifolia		
Mycelis muralis	0.18 - 1.00	
Oenanthe sarmentosa		
Osmorhiza berteroi	0.27 - 1.00	
Oxalis oregana	0.09 - 1.00	
Pedicularis racemosa		
Poa trivialis		
Polystichum munitum	0.64 - 8.14	
Prosartes hookeri	0.27 - 1.00	
Rubus pedatus	0.36 - 10.25	1.00 - 3.00
Scirpus microcarpus		
Stachys chamissonis		
Streptopus amplexifolius	0.36 - 3.25	1.00 - 1.00
Tellima grandiflora		
Tiarella trifoliata	1.00 - 8.64	1.00 - 3.00
Tolmiea menziesii	0.18 - 1.00	
Viola glabella	0.55 - 4.83	1.00 - 1.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Forest and Woodland Class: North Pacific Lowland-Montane Riparian and Wet Slope Shrubland

Species / Association	ACECIR	ACECIR/ ATHFIL-TOLMEN	ALNVIR	ALNVIR-ACECIR	ALNVIR-OPLHOR	ALNVIR-RUBSPE/ ATHFIL
plots	14	18	8	6	7	27
TREES						
Abies amabilis		0.06 - 1.00	0.13 - 3.00	0.33 - 2.15	0.29 - 2.00	0.37 - 1.60
Abies lasiocarpa			0.13 - 1.00	0.17 - 3.00		0.07 - 2.50
Acer macrophyllum	0.14 - 9.50	0.22 - 3.25		0.17 - 3.00		0.04 - 13.00
Abies procera						0.04 - 1.00
Arbutus menziesii						
Chamaecyparis nootkatensis			0.13 - 4.00	0.33 - 3.00	0.43 - 4.33	0.15 - 7.50
Juniperus maritima						
Picea engelmannii						
Picea sitchensis		0.11 - 9.50				
Pinus albicaulis						
Pinus contorta						
Pinus ponderosa						
Pseudotsuga menziesii	0.14 - 2.00					0.07 - 0.65
Taxus brevifolia	0.14 - 10.50					
Thuja plicata	0.07 - 20.00					
Tsuga heterophylla	0.14 - 0.75	0.11 - 3.00		0.17 - 1.00		0.04 - 3.00
Tsuga mertensiana					0.29 - 6.00	0.15 - 4.50
SHRUBS						
Acer circinatum	1.00 - 78.93	1.00 - 83.72		1.00 - 42.50	0.14 - 13.00	0.11 - 17.00
Acer glabrum var. douglasii	0.36 - 8.20	0.28 - 14.00	0.13 - 8.00			0.15 - 8.25
Alnus viridis ssp. sinuata	0.29 - 2.00	0.17 - 6.33	1.00 - 64.63	1.00 - 51.33	1.00 - 79.71	1.00 - 77.59
Amelanchier alnifolia	0.07 - 8.00	0.06 - 1.00	0.13 - 3.00			
Cornus sericea	0.14 - 2.00	0.06 - 20.00	0.13 - 20.00			
Holodiscus discolor	0.21 - 2.33			0.17 - 3.00		
Mahonia aquifolium						
Malus fusca						
Menziesia ferruginea	0.14 - 2.00	0.17 - 1.67		0.17 - 3.00	0.14 - 3.00	0.26 - 8.86
Oplopanax horridus	0.07 - 1.00	0.61 - 11.82			1.00 - 18.14	0.11 - 2.33
Paxistima myrsinites	0.36 - 26.20	0.22 - 3.25	0.13 - 8.00	0.33 - 10.50		0.07 - 1.00
Prunus emarginata		0.11 - 5.50	0.13 - 3.00			
Ribes bracteosum		0.06 - 3.00		0.17 - 1.00	0.29 - 1.00	0.15 - 3.25
Ribes lacustre	0.43 - 1.67	0.28 - 3.80	0.13 - 3.00	0.17 - 2.00	0.14 - 1.00	0.15 - 6.50
Ribes triste						0.04 - 1.00
Rosa nutkana				0.17 - 3.00		0.04 - 1.00
Rubus parviflorus	0.36 - 18.40	0.17 - 12.00	0.50 - 16.75	0.33 - 21.50	0.14 - 1.00	0.15 - 5.75
Rubus spectabilis		0.67 - 10.92		0.33 - 0.65	0.86 - 26.50	0.93 - 34.56
Salix commutata						0.04 - 15.00
Salix scouleriana	0.14 - 2.00		0.13 - 13.00			0.04 - 3.00
Salix sitchensis						0.04 - 8.00
Sambucus racemosa	0.07 - 1.00	0.61 - 3.64	0.63 - 7.20	0.33 - 3.00	0.57 - 13.50	0.67 - 5.06
Symphoricarpos albus						
Vaccinium membranaceum		0.06 - 13.00	0.13 - 1.00	0.17 - 3.00		0.33 - 6.78
Vaccinium ovalifolium	0.14 - 1.00					0.07 - 7.00
Vaccinium parvifolium	0.36 - 1.30	0.11 - 2.00		0.17 - 3.00	0.14 - 8.00	
HERBACEOUS						
Achlys triphylla	0.36 - 1.80	0.39 - 2.43		0.33 - 4.50	0.43 - 17.00	0.30 - 3.25

Appendix C. Synthesis tables of associations with species constancy and average cover.
Forest and Woodland Class: North Pacific Lowland-Montane Riparian and Wet Slope Shrubland

Species / Association	ACECIR	ACECIR/ ATHFIL-TOLMEN	ALNVIR	ALNVIR-ACECIR	ALNVIR-OPLHOR	ALNVIR-RUBSPE/ ATHFIL
plots	14	18	8	6	7	27
Arnica latifolia						
Artemisia ludoviciana				0.17 - 1.00		
Asarum caudatum	0.14 - 1.00	0.39 - 2.33				0.04 - 1.00
Athyrium filix-femina	0.07 - 1.00	0.50 - 3.44		0.17 - 1.00	0.86 - 19.17	0.81 - 19.50
Bromus pacificus						
Caltha leptosepala						
Carex scirpoidea						
Chamerion angustifolium	0.07 - 3.00		0.25 - 1.50	0.17 - 1.00		0.15 - 4.50
Cirsium edule		0.11 - 1.50	0.25 - 1.00	0.17 - 1.00		
Claytonia sibirica		0.61 - 3.82	0.38 - 22.67	0.17 - 1.00	0.43 - 17.00	0.44 - 9.25
Corydalis scouleri		0.39 - 9.71		0.17 - 0.30	0.14 - 3.00	0.04 - 20.00
Cryptogramma acrostichoides	0.43 - 1.00	0.06 - 1.00	0.25 - 2.00	0.50 - 1.00		
Equisetum arvense	0.07 - 1.00					
Fragaria virginiana			0.13 - 1.00	0.17 - 3.00		
Galium aparine	0.14 - 2.00	0.28 - 1.00	0.13 - 3.00		0.43 - 7.33	0.11 - 5.67
Galium triflorum	0.50 - 0.87	0.44 - 1.50	0.38 - 4.67	0.17 - 1.00		0.11 - 3.33
Gymnocarpium dryopteris		0.06 - 1.00			0.29 - 14.00	0.19 - 2.80
Heracleum maximum			0.63 - 7.60		0.29 - 1.00	0.11 - 1.00
Hydrophyllum fendleri			0.63 - 4.80	0.17 - 1.00	0.14 - 1.00	0.04 - 20.00
Hydrophyllum tenuipes		0.56 - 4.00			0.43 - 1.00	0.22 - 1.67
Lupinus (arcticus ssp. subalpinus, latifolius)						
Maianthemum stellatum	0.21 - 1.67	0.39 - 2.00	0.38 - 22.00	0.67 - 7.25	0.43 - 18.67	0.56 - 6.87
Mertensia paniculata var. borealis		0.06 - 3.00				0.07 - 1.00
Oenanthe sarmentosa						
Oxalis oregana		0.11 - 4.50			0.14 - 1.00	
Petasites frigidus					0.14 - 3.00	
Phacelia hastata			0.13 - 1.00			0.04 - 1.00
Phleum alpinum						
Polypodium glycyrrhiza	0.21 - 1.00	0.39 - 0.90				
Polystichum munitum	0.43 - 1.00	0.78 - 3.86		0.33 - 1.00		0.19 - 7.20
Prosartes hookeri	0.14 - 1.00	0.28 - 1.00	0.13 - 8.00	0.17 - 3.00		0.15 - 13.25
Pteridium aquilinum	0.43 - 4.67	0.22 - 21.58	0.25 - 17.50	0.33 - 15.50		0.44 - 17.42
Rubus pedatus		0.06 - 1.00			0.14 - 1.00	0.07 - 3.00
Stellaria crispa	0.07 - 1.00	0.44 - 1.13				0.04 - 1.00
Streptopus amplexifolius		0.22 - 1.00			0.29 - 5.50	0.19 - 1.40
Streptopus lanceolatus		0.11 - 1.00	0.25 - 2.00		0.43 - 9.67	0.30 - 5.38
Tellima grandiflora		0.17 - 1.67			0.14 - 1.00	
Thalictrum occidentale			0.50 - 4.50	0.17 - 1.00	0.14 - 8.00	0.04 - 1.00
Tiarella trifoliata	0.07 - 0.10	0.28 - 1.40				0.33 - 6.89
Tolmiea menziesii	0.07 - 1.00	0.39 - 1.57			0.29 - 10.50	0.22 - 13.17
Trientalis borealis	0.36 - 2.22	0.06 - 1.00				
Trillium ovatum	0.57 - 0.89	0.39 - 1.29	0.13 - 3.00	0.33 - 1.00	0.14 - 1.00	0.19 - 1.00
Urtica dioica			0.38 - 4.00			0.07 - 1.00
Valeriana sitchensis			0.38 - 30.67		0.29 - 2.00	0.19 - 8.60
Veratrum viride			0.25 - 15.15		0.43 - 4.00	0.37 - 3.90
Vicia americana						
Viola glabella	0.21 - 1.00	0.50 - 1.00	0.25 - 10.50	0.33 - 1.00	0.57 - 2.00	0.59 - 9.50

Appendix C. Synthesis tables of associations with species constancy and average cover.
Forest and Woodland Class: North Pacific Lowland-Montane Riparian and Wet Slope Shrubland

Species / Association	CORSER	OPLHOR	RUBSPE-RIBBRA	SALSIT/ EQUARV-PETFRI	SYMALB-MALFUS
plots	1	2	3	1	2
TREES					
Abies amabilis		0.50 - 3.00	0.33 - 1.00	1.00 - 3.00	
Abies lasiocarpa			0.33 - 8.00		
Acer macrophyllum					
Abies procera					
Arbutus menziesii					
Chamaecyparis nootkatensis				1.00 - 3.00	
Juniperus maritima					
Picea engelmannii			0.33 - 8.00		
Picea sitchensis					
Pinus albicaulis			0.33 - 1.00		
Pinus contorta					
Pinus ponderosa					
Pseudotsuga menziesii					
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla		0.50 - 3.00			
Tsuga mertensiana			0.33 - 3.00	1.00 - 3.00	
SHRUBS					
Acer circinatum			0.33 - 3.00		
Acer glabrum var. douglasii					0.50 - 1.00
Alnus viridis ssp. sinuata				1.00 - 1.00	0.50 - 8.00
Amelanchier alnifolia					0.50 - 20.00
Cornus sericea	1.00 - 90.00				
Holodiscus discolor					1.00 - 13.00
Mahonia aquifolium					0.50 - 8.00
Malus fusca					1.00 - 5.50
Menziesia ferruginea			0.33 - 1.00	1.00 - 3.00	
Oplopanax horridus		1.00 - 45.00	0.33 - 3.00		
Paxistima myrsinites					
Prunus emarginata					0.50 - 8.00
Ribes bracteosum		1.00 - 10.50	0.67 - 4.50	1.00 - 3.00	
Ribes lacustre	1.00 - 1.00				
Ribes triste	1.00 - 8.00				
Rosa nutkana					1.00 - 3.00
Rubus parviflorus	1.00 - 20.00				0.50 - 8.00
Rubus spectabilis		1.00 - 13.00	1.00 - 76.67	1.00 - 1.00	
Salix commutata					
Salix scouleriana	1.00 - 20.00				
Salix sitchensis				1.00 - 50.00	
Sambucus racemosa	1.00 - 1.00		1.00 - 6.33		
Symphoricarpos albus					1.00 - 55.00
Vaccinium membranaceum		0.50 - 1.00		1.00 - 8.00	
Vaccinium ovalifolium		0.50 - 3.00	0.67 - 8.00	1.00 - 3.00	
Vaccinium parvifolium		0.50 - 3.00	0.33 - 1.00		
HERBACEOUS					
Achlys triphylla		0.50 - 3.00	0.33 - 1.00		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Forest and Woodland Class: North Pacific Lowland-Montane Riparian and Wet Slope Shrubland

Species / Association	CORSER	OPLHOR	RUBSPE-RIBBRA	SALSIT/ EQUARV-PETFRI	SYMALB-MALFUS
plots	1	2	3	1	2
Arnica latifolia				1.00 - 8.00	
Artemisia ludoviciana					1.00 - 2.00
Asarum caudatum					
Athyrium filix-femina	1.00 - 3.00	0.50 - 13.00	0.67 - 15.50		
Bromus pacificus					1.00 - 4.50
Caltha leptosepala				1.00 - 8.00	
Carex scirpoidea					1.00 - 1.00
Chamerion angustifolium					0.50 - 1.00
Cirsium edule					
Claytonia sibirica		0.50 - 1.00	0.33 - 1.00		
Corydalis scouleri		0.50 - 60.00	0.33 - 3.00		
Cryptogramma acrostichoides			0.33 - 1.00		
Equisetum arvense				1.00 - 13.00	
Fragaria virginiana					0.50 - 8.00
Galium aparine			0.33 - 1.00		1.00 - 1.00
Galium triflorum		0.50 - 1.00			0.50 - 1.00
Gymnocarpium dryopteris					
Heracleum maximum	1.00 - 1.00	0.50 - 8.00		1.00 - 1.00	1.00 - 3.00
Hydrophyllum fendleri	1.00 - 70.00				
Hydrophyllum tenuipes		1.00 - 2.00	0.67 - 1.00		
Lupinus (arcticus ssp. subalpinus, latifolius)					
Maianthemum stellatum	1.00 - 1.00				
Mertensia paniculata var. borealis			0.67 - 3.00		
Oenanthe sarmentosa				1.00 - 13.00	
Oxalis oregana					
Petasites frigidus				1.00 - 8.00	
Phacelia hastata					0.50 - 3.00
Phleum alpinum					
Polypodium glycyrrhiza					
Polystichum munitum			0.33 - 1.00		
Prosartes hookeri					0.50 - 3.00
Pteridium aquilinum					
Rubus pedatus		1.00 - 2.00	0.67 - 2.00		
Stellaria crispa					
Streptopus amplexifolius		1.00 - 8.00		1.00 - 1.00	
Streptopus lanceolatus		1.00 - 3.00	0.67 - 4.50		
Tellima grandiflora					
Thalictrum occidentale					1.00 - 2.00
Tiarella trifoliata		0.50 - 3.00	0.67 - 1.00		
Tolmiea menziesii		0.50 - 3.00	0.33 - 3.00		
Trientalis borealis					
Trillium ovatum		0.50 - 3.00	0.67 - 1.00		
Urtica dioica	1.00 - 3.00				1.00 - 7.00
Valeriana sitchensis		0.50 - 13.00	0.67 - 4.50	1.00 - 30.00	
Veratrum viride			0.67 - 5.50	1.00 - 3.00	
Vicia americana					1.00 - 1.00
Viola glabella		0.50 - 3.00	0.67 - 2.00		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	BROSIT-CARPHA	HYDFEN	ARTLUD-LOMMAR	EUCPAU	PHAHAS	POLDAV	ANTLAN
plots	2	8	15	13	24	4	8
TREES							
Abies lasiocarpa	0.50 - 0.30	0.13 - 0.50	0.07 - 0.10	0.08 - 1.00	0.04 - 0.50		0.25 - 4.50
Chamaecyparis nootkatensis	0.50 - 3.00			0.08 - 1.00			
Pinus contorta							
Pseudotsuga menziesii							
Tsuga mertensiana							
Abies amabilis							
SHRUBS							
Arctostaphylos uva-ursi							
Phyllodoce empetriformis							0.25 - 4.55
Amelanchier alnifolia							
Paxistima myrsinites		0.13 - 15.50	0.20 - 0.37	0.08 - 3.00	0.04 - 3.00		
HERBACEOUS							
Achillea millefolium	0.50 - 2.00	0.75 - 0.85	0.60 - 3.28	0.23 - 0.67	0.50 - 2.53	0.50 - 0.30	0.13 - 0.10
Agoseris glauca	1.00 - 1.00			0.08 - 0.10		0.25 - 0.50	
Anaphalis margaritacea	0.50 - 6.00	0.13 - 0.50	0.20 - 1.33	0.15 - 0.30	0.08 - 8.00		
Angelica arguta							
Antennaria lanata							1.00 - 26.19
Antennaria microphylla							
Aquilegia formosa			0.07 - 3.00	0.08 - 0.50	0.08 - 0.30		
Arenaria capillaris	0.50 - 0.30			0.08 - 3.00	0.04 - 0.10		0.38 - 6.20
Arnica latifolia			0.07 - 3.00	0.08 - 0.50			0.13 - 0.10
Artemisia ludoviciana		0.38 - 2.17	1.00 - 25.97	0.23 - 1.37	0.21 - 1.92		
Athyrium americanum							
Athyrium filix-femina							
Bromus sitchensis	1.00 - 35.00	0.88 - 1.51	0.33 - 0.92	0.31 - 0.63	0.54 - 0.73	0.25 - 3.00	
Carex luzulina							
Carex nigricans							0.75 - 3.85
Carex phaeocephala	1.00 - 8.00	0.13 - 0.10	0.07 - 0.10	0.08 - 0.10	0.08 - 2.75		0.13 - 0.50
Carex rossii	1.00 - 2.00	0.25 - 0.30	0.13 - 0.30		0.08 - 0.50	0.25 - 0.50	0.13 - 0.50
Carex spectabilis	1.00 - 7.65	0.13 - 0.50	0.20 - 1.33	0.54 - 3.66	0.17 - 2.13	0.25 - 3.00	1.00 - 2.56
Calamagrostis rubescens							
Castilleja miniata		0.50 - 4.25	0.33 - 1.42	0.54 - 1.29	0.21 - 0.92		
Chamerion angustifolium		0.38 - 0.50	0.47 - 3.30	0.31 - 1.13	0.13 - 5.37		
Cirsium edule	1.00 - 2.50	0.63 - 0.98	0.47 - 1.29	0.38 - 0.44	0.67 - 11.55		
Danthonia intermedia							
Delphinium glareosum		0.13 - 0.10	0.53 - 2.18		0.21 - 1.04		
Elmera racemosa				0.15 - 8.00	0.21 - 4.50		
Epilobium anagallidifolium		0.75 - 2.93	0.67 - 0.80	0.69 - 1.06	0.63 - 0.92	0.25 - 0.50	
Erigeron peregrinus	0.50 - 5.00	0.13 - 0.50	0.07 - 0.50	0.23 - 0.50	0.08 - 1.75	0.25 - 0.50	0.25 - 1.75
Erysimum arenicola		0.63 - 0.42	0.67 - 0.42	0.15 - 1.75	0.38 - 0.69		
Eucephalus paucicapitatus	1.00 - 0.65	0.25 - 3.00	0.40 - 1.33	1.00 - 24.12	0.38 - 1.57	0.25 - 0.50	
Festuca (brachyphylla, saximontana)			0.07 - 0.10				0.13 - 3.00
Festuca roemeri		0.50 - 1.65	0.13 - 1.75		0.21 - 0.84	0.25 - 3.00	0.25 - 3.00
Festuca viridula							
Elymus glaucus	0.50 - 3.00	0.13 - 3.00	0.07 - 0.50		0.04 - 0.50		
Heracleum maximum					0.04 - 2.00		
Hieracium gracile				0.15 - 0.30	0.08 - 0.40		0.63 - 0.92

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	BROSIT-CARPHA	HYDFEN	ARTLUD-LOMMAR	EUCPAU	PHAHAS	POLDAV	ANTLAN
plots	2	8	15	13	24	4	8
Hydrophyllum fendleri	0.50 - 8.00	1.00 - 35.81	0.33 - 1.50	0.31 - 1.75	0.58 - 5.66		
Juncus parryi	0.50 - 1.00	0.13 - 0.10					0.38 - 3.00
Koeleria macrantha							
Lathyrus nevadensis		0.38 - 1.33	0.07 - 0.10		0.08 - 1.75		
Ligusticum grayi							
Lomatium martindalei	0.50 - 0.30	0.50 - 1.03	0.80 - 0.93	0.85 - 1.00	0.79 - 0.72		0.13 - 1.00
Luetkea pectinata							0.13 - 0.10
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 3.50	0.38 - 10.50	0.07 - 3.00	0.54 - 5.57	0.25 - 6.75	0.50 - 0.50	0.13 - 0.10
Lupinus sellulus var. lobbii						0.25 - 0.10	
Luzula (comosa, multiflora)	0.50 - 0.30	0.25 - 0.30	0.07 - 0.10	0.23 - 0.50	0.08 - 0.55		0.25 - 1.75
Luzula glabrata							
Melica subulata	0.50 - 8.00		0.07 - 0.10				
Nothocalais alpestris							
Oreostemma alpigenum							0.50 - 4.65
Packera flettii		0.63 - 1.92	0.20 - 1.33	0.08 - 3.00	0.29 - 0.27		
Phacelia hastata	1.00 - 7.50	0.75 - 5.50	0.73 - 9.06	0.85 - 2.32	1.00 - 19.60	0.25 - 0.50	
Phlox diffusa	0.50 - 2.00	0.50 - 8.40	0.53 - 1.39	0.69 - 8.18	0.38 - 1.89	0.25 - 0.50	0.13 - 1.00
Poa cusickii		0.38 - 1.20	0.13 - 0.50	0.46 - 0.37	0.08 - 0.50		0.13 - 0.10
Poa secunda		0.25 - 1.75	0.53 - 0.76	0.23 - 1.33	0.25 - 0.52	0.25 - 3.00	0.13 - 0.50
Polygonum bistortoides	1.00 - 2.00	0.25 - 0.50	0.13 - 1.55	0.69 - 1.67	0.29 - 0.87	0.25 - 3.00	0.75 - 4.25
Polygonum davisiae				0.08 - 15.50		1.00 - 26.50	
Potentilla flabellifolia				0.08 - 0.50			0.25 - 1.75
Pseudoroegneria spicata							
Pteridium aquilinum							
Pulsatilla occidentalis				0.38 - 1.00			0.25 - 0.10
Saussurea americana		0.38 - 0.50		0.08 - 0.50	0.13 - 1.33		
Sedum divergens	0.50 - 1.00	0.13 - 0.50	0.33 - 1.42	0.23 - 2.03	0.42 - 0.59		
Selaginella wallacei							
Senecio triangularis					0.04 - 0.50		
Silene parryi	0.50 - 0.30	0.25 - 3.00	0.33 - 1.42	0.23 - 1.50	0.25 - 0.43		
Thalictrum occidentale		0.63 - 19.42	0.07 - 3.00		0.08 - 1.75		
Trisetum spicatum	1.00 - 1.15	0.38 - 0.23	0.27 - 0.30	0.15 - 0.30	0.13 - 1.07		0.25 - 0.50
Vahlodea atropurpurea					0.04 - 0.50		0.50 - 0.30
Valeriana sitchensis		0.25 - 0.50	0.20 - 0.67	0.54 - 1.57	0.21 - 0.76		0.13 - 1.00
Veratrum viride			0.07 - 0.10	0.15 - 1.75	0.04 - 3.00		
Veronica cusickii	0.50 - 0.30		0.07 - 0.50	0.15 - 0.50			0.38 - 1.33
Carex concinnoides							
Carex geyeri							
Carex pseudoscirpoidea							
Cryptogramma acrostichoides			0.13 - 1.75	0.31 - 0.63	0.08 - 0.50		
Eriophyllum lanatum		0.13 - 3.00	0.13 - 3.00		0.17 - 1.75		
Erythronium grandiflorum				0.08 - 0.50			
Eucephalus ledophyllus							
Penstemon confertus							
Penstemon davidsonii			0.20 - 0.37		0.13 - 0.87	0.25 - 0.50	
Polygonum douglasii							
Vulpia myuros							
Zigadenus venenosus							

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	JUNPAR-(POLBIS)	CARSPE-(LUPARC-POLBIS)	HERMAX	LUPARC	PTEAQU	SAUAME-(HERMAX)	CARPSE
plots	14	64	7	47	3	5	1
TREES							
Abies lasiocarpa	0.21 - 2.27	0.09 - 1.35	0.43 - 5.43	0.21 - 2.70			
Chamaecyparis nootkatensis	0.07 - 15.00	0.03 - 0.95	0.14 - 0.30			0.20 - 0.60	
Pinus contorta							
Pseudotsuga menziesii							
Tsuga mertensiana		0.02 - 0.60		0.06 - 0.30			
Abies amabilis		0.02 - 3.30					
SHRUBS							
Arctostaphylos uva-ursi							
Phyllodoce empetriformis	0.07 - 3.00	0.16 - 2.35		0.17 - 1.45			
Amelanchier alnifolia				0.02 - 0.50			
Paxistima myrsinites				0.11 - 1.26	0.33 - 5.00	0.20 - 1.00	
HERBACEOUS							
Achillea millefolium	0.14 - 5.05	0.14 - 1.34	0.71 - 5.20	0.19 - 3.06	0.33 - 1.00	0.40 - 9.50	
Agoseris glauca				0.02 - 0.50			
Anaphalis margaritacea		0.02 - 2.00	0.57 - 8.75	0.06 - 1.43		0.20 - 1.00	
Angelica arguta			0.43 - 11.67			0.40 - 6.50	
Antennaria lanata	0.71 - 12.73	0.17 - 2.33		0.13 - 0.92			
Antennaria microphylla	0.07 - 5.00	0.05 - 0.37		0.19 - 0.50			
Aquilegia formosa		0.02 - 3.00	0.29 - 17.50	0.02 - 0.10		0.60 - 2.83	
Arenaria capillaris	0.64 - 9.64	0.17 - 1.82		0.28 - 4.96			
Arnica latifolia	0.21 - 3.50	0.23 - 5.04	0.43 - 1.33	0.21 - 11.45		0.40 - 2.00	
Artemisia ludoviciana		0.03 - 9.25	0.14 - 8.00	0.09 - 5.50			
Athyrium americanum	0.07 - 3.00	0.03 - 1.50		0.02 - 1.00			
Athyrium filix-femina			0.14 - 0.30				
Bromus sitchensis	0.07 - 1.00	0.13 - 2.33	0.43 - 4.00	0.28 - 0.70	0.33 - 3.00	0.80 - 21.50	
Carex luzulina				0.04 - 0.65	0.33 - 3.00	0.60 - 4.33	
Carex nigricans	0.29 - 6.00	0.17 - 1.87	0.29 - 8.00	0.02 - 0.50			
Carex phaeocephala	0.07 - 1.00	0.09 - 0.30		0.17 - 2.06		0.20 - 1.00	
Carex rossii	0.14 - 0.75	0.06 - 0.40	0.14 - 2.00	0.15 - 1.93			
Carex spectabilis	0.57 - 8.50	1.00 - 34.50	0.14 - 2.00	0.55 - 7.77	0.33 - 15.50	0.60 - 1.50	
Calamagrostis rubescens							
Castilleja miniata		0.05 - 0.23	0.14 - 1.00	0.19 - 2.68		0.40 - 1.00	
Chamerion angustifolium		0.11 - 9.80	0.43 - 2.10	0.06 - 2.03	0.33 - 10.00	0.80 - 2.20	
Cirsium edule	0.07 - 1.00	0.13 - 1.25	0.57 - 11.00	0.21 - 1.49		0.80 - 1.13	
Danthonia intermedia	0.21 - 1.33	0.05 - 0.43		0.02 - 0.10		0.20 - 1.00	
Delphinium glareosum				0.02 - 3.00		0.20 - 0.30	
Elmera racemosa		0.02 - 9.00		0.11 - 0.62			
Epilobium anagallidifolium		0.33 - 0.78	0.14 - 1.00	0.36 - 0.85		0.40 - 1.25	
Erigeron peregrinus	0.14 - 1.75	0.52 - 3.04	0.14 - 1.00	0.30 - 4.04		0.20 - 15.50	1.00 - 1.00
Erysimum arenicola		0.03 - 0.30		0.21 - 0.84			
Eucephalus paucicapitatus		0.09 - 3.83		0.28 - 0.92	0.33 - 15.00	0.20 - 3.00	
Festuca (brachyphylla, saximontana)		0.03 - 0.50		0.02 - 0.50			
Festuca roemeri	0.14 - 9.25	0.09 - 1.72	0.29 - 5.50	0.04 - 0.50			
Festuca viridula	0.07 - 8.00	0.11 - 7.86				0.20 - 1.00	1.00 - 8.00
Elymus glaucus		0.05 - 10.33	0.14 - 2.00		0.33 - 30.00	0.40 - 20.00	
Heracleum maximum			1.00 - 22.14		0.33 - 0.30	0.40 - 4.50	
Hieracium gracile	0.57 - 1.84	0.44 - 1.69		0.53 - 1.00			

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	JUNPAR-(POLBIS)	CARSPE-(LUPARC-POLBIS)	HERMAX	LUPARC	PTEAQU	SAUAME-(HERMAX)	CARPSE
plots	14	64	7	47	3	5	1
Hydrophyllum fendleri		0.05 - 6.20	0.86 - 19.33	0.09 - 9.25	0.33 - 1.00	0.80 - 11.25	
Juncus parryi	1.00 - 32.96	0.25 - 2.34		0.51 - 7.13			
Koeleria macrantha							
Lathyrus nevadensis			0.29 - 12.50		0.67 - 10.00	0.40 - 7.00	
Ligusticum grayi	0.07 - 1.00	0.05 - 1.67				0.20 - 1.00	1.00 - 1.00
Lomatium martindalei	0.29 - 0.60	0.27 - 0.41		0.64 - 0.94			
Luetkea pectinata	0.43 - 4.17	0.50 - 6.89		0.38 - 4.31			
Lupinus (arcticus ssp. subalpinus, latifolius)	0.50 - 3.43	0.73 - 12.39	0.43 - 8.67	1.00 - 23.42		0.60 - 7.17	1.00 - 1.00
Lupinus sellulus var. lobbii							
Luzula (comosa, multiflora)	0.36 - 0.58	0.27 - 0.64		0.30 - 1.54			
Luzula glabrata	0.07 - 1.00	0.05 - 1.77					1.00 - 3.00
Melica subulata			0.29 - 8.50	0.02 - 3.00	0.67 - 2.00	0.40 - 13.50	
Nothocalais alpestris		0.08 - 4.60					
Oreostemma alpigenum	0.07 - 0.10	0.03 - 1.75		0.02 - 3.00			
Packera flettii	0.07 - 1.00	0.05 - 0.17		0.02 - 0.10			
Phacelia hastata		0.13 - 1.75	0.43 - 5.33	0.30 - 4.39	0.33 - 1.00	0.20 - 1.00	
Phlox diffusa	0.64 - 1.54	0.30 - 1.74	0.14 - 1.00	0.66 - 10.08			
Poa cusickii	0.50 - 0.60	0.44 - 0.90		0.40 - 1.79		0.20 - 4.00	
Poa secunda		0.19 - 0.85		0.40 - 1.64		0.20 - 0.50	
Polygonum bistortoides	0.71 - 4.18	0.73 - 3.79	0.14 - 0.30	0.51 - 7.40		0.60 - 1.50	1.00 - 1.00
Polygonum davisiae				0.02 - 15.50			
Potentilla flabellifolia		0.16 - 1.85	0.14 - 4.00	0.04 - 7.75			1.00 - 3.00
Pseudoroegneria spicata							
Pteridium aquilinum					1.00 - 81.83		
Pulsatilla occidentalis		0.11 - 6.29		0.04 - 1.75			
Saussurea americana		0.02 - 3.00	0.14 - 1.00			1.00 - 25.10	
Sedum divergens		0.05 - 0.37		0.32 - 0.97			
Selaginella wallacei							
Senecio triangularis		0.05 - 1.67	0.14 - 3.00			0.40 - 2.00	
Silene parryi	0.14 - 0.75	0.28 - 0.99		0.32 - 3.33		0.60 - 1.50	
Thalictrum occidentale		0.05 - 17.17	0.71 - 17.66	0.02 - 0.50	0.67 - 11.00	0.60 - 20.00	
Trisetum spicatum	0.29 - 4.10	0.31 - 0.58		0.55 - 1.54		0.40 - 3.00	
Vahlodea atropurpurea	0.07 - 10.00	0.17 - 4.49		0.11 - 0.26			
Valeriana sitchensis		0.36 - 4.55	0.14 - 3.00	0.17 - 1.88		0.60 - 27.67	1.00 - 3.00
Veratrum viride		0.16 - 1.58	0.29 - 5.50	0.02 - 0.50		1.00 - 0.76	1.00 - 20.00
Veronica cusickii	0.29 - 5.38	0.39 - 3.10		0.17 - 1.50			1.00 - 1.00
Carex concinnoides							
Carex geyeri							
Carex pseudoscirpoidea							1.00 - 70.00
Cryptogramma acrostichoides		0.06 - 1.25	0.14 - 0.30	0.09 - 0.58		0.20 - 0.50	
Eriophyllum lanatum				0.04 - 9.25			
Erythronium grandiflorum	0.29 - 4.75	0.09 - 2.93		0.13 - 4.67			1.00 - 3.00
Eucephalus ledophyllus		0.03 - 6.50					
Penstemon confertus							
Penstemon davidsonii		0.03 - 0.50		0.11 - 0.76			
Polygonum douglasii				0.02 - 3.00	0.33 - 4.00		
Vulpia myuros							
Zigadenus venenosus							

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	FESVIR-EUCLED	ELMRAC	FESVIR-LUPARC	LUEPEC	CARSPE-PHLDIF	PHLDIF-(LOMMAR-CARPHA)	DANINT
plots	19	1	27	71	8	55	3
TREES							
Abies lasiocarpa	0.11 - 3.00		0.04 - 1.00	0.21 - 2.51	0.13 - 0.30	0.11 - 0.45	
Chamaecyparis nootkatensis				0.04 - 0.47		0.02 - 0.30	
Pinus contorta							0.67 - 1.00
Pseudotsuga menziesii			0.04 - 1.00				0.33 - 1.00
Tsuga mertensiana				0.11 - 1.31			
Abies amabilis				0.01 - 0.30			
SHRUBS							
Arctostaphylos uva-ursi							1.00 - 6.33
Phyllodoce empetriformis	0.05 - 3.00		0.22 - 2.83	0.32 - 2.15	0.13 - 4.00	0.09 - 2.10	
Amelanchier alnifolia						0.02 - 0.50	
Paxistima myrsinites			0.04 - 3.00	0.03 - 0.30		0.13 - 1.17	
HERBACEOUS							
Achillea millefolium	0.47 - 2.33		0.19 - 3.60	0.08 - 0.63	0.13 - 0.30	0.51 - 2.64	0.67 - 11.50
Agoseris glauca	0.16 - 3.00		0.19 - 2.60	0.04 - 0.37		0.04 - 0.75	
Anaphalis margaritacea				0.06 - 1.40		0.04 - 0.50	
Angelica arguta							
Antennaria lanata	0.05 - 3.00		0.33 - 5.22	0.24 - 2.23	0.13 - 10.00	0.04 - 1.55	
Antennaria microphylla				0.01 - 0.30	0.63 - 0.84	0.36 - 0.63	
Aquilegia formosa	0.11 - 2.00		0.04 - 3.00			0.02 - 3.00	
Arenaria capillaris	0.21 - 4.75		0.41 - 4.18	0.15 - 2.18	0.63 - 2.10	0.35 - 5.01	
Arnica latifolia	0.11 - 4.50	1.00 - 0.50	0.19 - 7.20	0.17 - 2.95	0.13 - 1.00	0.09 - 0.26	
Artemisia ludoviciana						0.16 - 6.51	
Athyrium americanum		1.00 - 15.50		0.04 - 0.30			
Athyrium filix-femina							
Bromus sitchensis						0.09 - 1.34	
Carex luzulina							
Carex nigricans	0.05 - 1.00		0.22 - 3.17	0.37 - 5.82		0.05 - 1.37	
Carex phaeocephala	0.05 - 3.00		0.04 - 3.00	0.11 - 0.76	0.38 - 7.17	0.31 - 5.61	
Carex rossii			0.04 - 1.00	0.07 - 0.84	0.13 - 0.50	0.16 - 0.67	0.33 - 3.00
Carex spectabilis	0.37 - 9.71	1.00 - 3.00	0.63 - 6.59	0.62 - 4.65	1.00 - 24.75	0.24 - 2.06	
Calamagrostis rubescens			0.04 - 1.00				
Castilleja miniata	0.53 - 6.70		0.15 - 2.00	0.01 - 0.30	0.13 - 3.00	0.24 - 0.48	
Chamerion angustifolium	0.05 - 8.00	1.00 - 3.00				0.13 - 0.37	
Cirsium edule	0.05 - 1.00	1.00 - 15.50		0.06 - 1.28		0.16 - 3.66	
Danthonia intermedia			0.04 - 1.00	0.01 - 1.00	0.25 - 0.50	0.09 - 0.52	1.00 - 16.00
Delphinium glareosum						0.04 - 5.05	
Elmera racemosa		1.00 - 85.50		0.15 - 2.30	0.13 - 0.30	0.04 - 0.10	
Epilobium anagallidifolium	0.05 - 3.00		0.11 - 2.33	0.28 - 0.78	0.25 - 0.30	0.27 - 0.81	
Erigeron peregrinus	0.32 - 4.67	1.00 - 0.50	0.44 - 2.92	0.24 - 1.81	0.25 - 9.25	0.09 - 2.50	
Erysimum arenicola				0.07 - 0.96	0.63 - 0.38	0.60 - 0.79	
Eucephalus paucicapitatus		1.00 - 3.00		0.18 - 0.95	0.25 - 3.00	0.22 - 0.86	
Festuca (brachyphylla, saximontana)	0.05 - 3.00			0.01 - 0.50	0.13 - 0.50	0.16 - 0.78	
Festuca roemeri				0.03 - 1.75		0.18 - 2.75	
Festuca viridula	1.00 - 27.11		1.00 - 26.37	0.04 - 1.00		0.05 - 1.00	
Elymus glaucus	0.11 - 2.00		0.04 - 3.00			0.02 - 0.50	
Heracleum maximum	0.05 - 1.00						
Hieracium gracile	0.21 - 2.00	1.00 - 3.00	0.52 - 2.00	0.61 - 0.72	0.38 - 5.50	0.18 - 0.89	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	FESVIR-EUCLED	ELMRAC	FESVIR-LUPARC	LUEPEC	CARSPE-PHLDIF	PHLDIF-(LOMMAR-CARPHA)	DANINT
plots	19	1	27	71	8	55	3
Hydrophyllum fendleri	0.05 - 1.00					0.16 - 0.94	
Juncus parryi	0.21 - 3.00		0.37 - 6.30	0.45 - 3.49	0.38 - 9.67	0.22 - 3.21	
Koeleria macrantha							
Lathyrus nevadensis						0.09 - 0.92	
Ligusticum grayi	0.53 - 5.20		0.37 - 8.80			0.02 - 3.00	
Lomatium martindalei	0.16 - 1.67		0.19 - 3.20	0.24 - 0.95	0.88 - 0.83	0.67 - 2.03	
Luetkea pectinata		1.00 - 3.00	0.37 - 9.40	1.00 - 18.89	0.25 - 2.50	0.11 - 2.58	
Lupinus (arcticus ssp. subalpinus, latifolius)	0.84 - 15.44		0.85 - 16.43	0.35 - 8.18	0.50 - 1.75	0.27 - 3.19	
Lupinus sellulus var. lobbii			0.07 - 4.50	0.01 - 1.00		0.02 - 0.50	
Luzula (comosa, multiflora)	0.21 - 6.00		0.15 - 5.50	0.24 - 0.58	0.63 - 1.38	0.02 - 3.00	0.33 - 1.00
Luzula glabrata	0.16 - 4.67		0.19 - 3.00	0.04 - 8.00			
Melica subulata							
Nothocalais alpestris	0.58 - 3.09		0.48 - 2.92	0.04 - 1.00		0.05 - 1.67	
Oreostemma alpigenum	0.11 - 3.00		0.26 - 6.29	0.08 - 0.92		0.05 - 6.33	
Packera flettii				0.11 - 1.05	0.13 - 1.00	0.13 - 0.80	
Phacelia hastata		1.00 - 15.50	0.11 - 1.67	0.03 - 0.50	0.25 - 0.75	0.38 - 2.18	
Phlox diffusa	0.42 - 11.63		0.56 - 6.93	0.34 - 3.71	1.00 - 21.00	1.00 - 18.76	
Poa cusickii				0.28 - 0.44	0.88 - 1.20	0.20 - 1.05	
Poa secunda				0.10 - 0.39	0.25 - 0.50	0.44 - 1.15	
Polygonum bistortoides	0.21 - 14.50		0.48 - 5.31	0.27 - 1.84	0.88 - 2.00	0.29 - 2.23	
Polygonum davisiae	0.21 - 3.00		0.22 - 4.33			0.02 - 3.00	
Potentilla flabellifolia	0.21 - 2.50		0.44 - 3.25	0.08 - 5.35	0.13 - 0.50	0.02 - 0.50	
Pseudoroegneria spicata							0.33 - 8.00
Pteridium aquilinum							
Pulsatilla occidentalis	0.32 - 4.17	1.00 - 0.50	0.33 - 5.44	0.10 - 1.37	0.13 - 15.50	0.02 - 1.00	
Saussurea americana							
Sedum divergens		1.00 - 0.50		0.07 - 1.00	0.25 - 0.50	0.45 - 2.39	
Selaginella wallacei							1.00 - 2.33
Senecio triangularis	0.05 - 3.00		0.04 - 1.00				
Silene parryi	0.11 - 3.00		0.04 - 8.00	0.15 - 0.98	0.50 - 1.75	0.45 - 2.34	
Thalictrum occidentale	0.05 - 3.00		0.04 - 8.00			0.04 - 1.75	
Trisetum spicatum			0.04 - 1.00	0.31 - 0.80	0.50 - 0.50	0.45 - 1.60	
Vahlodea atropurpurea				0.21 - 0.87			
Valeriana sitchensis	0.16 - 3.00	1.00 - 0.50	0.11 - 2.33	0.07 - 0.62	0.25 - 2.00	0.11 - 3.75	
Veratrum viride	0.21 - 2.50		0.07 - 3.00	0.07 - 0.34			
Veronica cusickii	0.47 - 3.00		0.70 - 6.00	0.34 - 3.73	0.38 - 1.27	0.15 - 2.58	
Carex concinnoides							0.67 - 4.50
Carex geyeri	0.26 - 6.80						0.33 - 3.00
Carex pseudoscirpoidea							
Cryptogramma acrostichoides				0.10 - 0.64	0.13 - 0.50	0.18 - 0.96	0.67 - 1.00
Eriophyllum lanatum						0.11 - 2.18	0.33 - 30.00
Erythronium grandiflorum	0.05 - 3.00		0.11 - 2.33	0.04 - 0.37		0.02 - 0.50	
Eucephalus ledophyllus	1.00 - 24.79		0.26 - 2.71	0.01 - 1.00		0.05 - 1.67	
Penstemon confertus	0.42 - 10.25		0.07 - 2.00	0.01 - 3.00		0.04 - 2.00	
Penstemon davidsonii			0.04 - 3.00	0.10 - 0.79	0.13 - 0.50	0.11 - 0.47	
Polygonum douglasii							
Vulpia myuros							0.67 - 8.00
Zigadenus venenosus							0.67 - 2.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	PSESPI	LUZGLA-(LUPARC)	VALSIT-ATHFIL	VALSIT-CARSPE	VALSIT-LIGGRA	VALSIT-VERVIR
plots	2	7	1	15	11	24
TREES						
Abies lasiocarpa		0.29 - 6.00		0.27 - 4.08	0.18 - 7.00	0.21 - 3.80
Chamaecyparis nootkatensis				0.13 - 9.00		0.08 - 7.00
Pinus contorta						
Pseudotsuga menziesii						
Tsuga mertensiana						0.04 - 1.00
Abies amabilis		0.14 - 6.00				0.04 - 1.00
SHRUBS						
Arctostaphylos uva-ursi						
Phyllodoce empetriformis		0.14 - 3.00		0.20 - 6.33	0.09 - 1.00	0.17 - 1.15
Amelanchier alnifolia	0.50 - 1.00					
Paxistima myrsinites	0.50 - 1.00					
HERBACEOUS						
Achillea millefolium	1.00 - 3.00			0.13 - 3.15	0.27 - 2.33	0.08 - 1.50
Agoseris glauca					0.09 - 1.00	0.08 - 8.00
Anaphalis margaritacea						
Angelica arguta				0.07 - 2.00		0.04 - 2.00
Antennaria lanata				0.20 - 1.33	0.09 - 1.00	
Antennaria microphylla						
Aquilegia formosa				0.13 - 0.75	0.18 - 2.00	0.08 - 0.75
Arenaria capillaris					0.09 - 3.00	
Arnica latifolia		0.29 - 1.00		0.20 - 8.33	0.64 - 3.73	0.33 - 7.00
Artemisia ludoviciana						
Athyrium americanum						
Athyrium filix-femina		1.00 - 50.00				
Bromus sitchensis		0.14 - 10.00		0.07 - 0.50	0.09 - 3.00	0.21 - 2.80
Carex luzulina						
Carex nigricans		0.14 - 3.00		0.07 - 5.00		0.08 - 0.65
Carex phaeocephala		0.14 - 3.00		0.07 - 0.50		
Carex rossii	0.50 - 1.00			0.07 - 0.50		
Carex spectabilis		0.43 - 1.67		0.87 - 44.23	0.55 - 3.83	0.83 - 31.23
Calamagrostis rubescens						
Castilleja miniata				0.13 - 6.75	0.09 - 3.00	
Chamerion angustifolium		0.14 - 1.00		0.27 - 2.33		0.25 - 4.18
Cirsium edule				0.13 - 2.00	0.09 - 0.50	0.29 - 2.40
Danthonia intermedia						
Delphinium glareosum				0.07 - 3.00		0.04 - 10.00
Elmera racemosa						0.04 - 15.00
Epilobium anagallidifolium		0.14 - 1.00	1.00 - 8.00	0.07 - 0.50	0.27 - 2.17	0.25 - 5.88
Erigeron peregrinus		0.14 - 1.00		0.27 - 3.63	0.73 - 4.75	0.29 - 1.07
Erysimum arenicola						0.04 - 6.00
Eucephalus paucicapitatus				0.13 - 11.50	0.09 - 0.50	0.21 - 3.42
Festuca (brachyphylla, saximontana)						
Festuca roemeri						0.04 - 13.00
Festuca viridula		0.29 - 1.00			0.73 - 16.13	0.13 - 5.67
Elymus glaucus		0.14 - 30.00		0.13 - 10.50	0.09 - 3.00	0.25 - 6.00
Heracleum maximum				0.13 - 1.50		0.25 - 5.05
Hieracium gracile				0.07 - 3.00	0.18 - 1.00	0.13 - 1.43

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain-Vancouverian Subalpine-Montane Dry Herbaceous Meadow Group.

Species / Association	PSESPI	LUZGLA-(LUPARC)	VALSIT-ATHFIL	VALSIT-CARSPE	VALSIT-LIGGRA	VALSIT-VERVIR
plots	2	7	1	15	11	24
Hydrophyllum fendleri				0.13 - 4.00	0.18 - 9.25	0.13 - 7.50
Juncus parryi				0.20 - 1.53	0.09 - 1.00	0.04 - 4.00
Koeleria macrantha						
Lathyrus nevadensis						
Ligusticum grayi		0.29 - 1.00		0.07 - 3.00	0.82 - 8.22	0.17 - 5.50
Lomatium martindalei					0.18 - 1.75	0.04 - 3.00
Luetkea pectinata		0.14 - 1.00		0.13 - 5.15	0.09 - 3.00	0.17 - 2.13
Lupinus (arcticus ssp. subalpinus, latifolius)		0.57 - 10.75		0.80 - 7.71	0.73 - 8.06	0.88 - 6.14
Lupinus sellulus var. lobbii						
Luzula (comosa, multiflora)	0.50 - 1.00			0.13 - 0.40	0.18 - 3.00	
Luzula glabrata		1.00 - 27.14		0.13 - 10.15	0.64 - 3.71	0.13 - 5.43
Melica subulata						
Nothocalais alpestris		0.43 - 1.67			0.45 - 2.60	0.08 - 1.00
Oreostemma alpigenum				0.07 - 3.00	0.09 - 3.00	
Packera flettii						
Phacelia hastata				0.13 - 0.75	0.09 - 0.10	0.13 - 0.67
Phlox diffusa		0.29 - 1.00			0.09 - 3.00	0.04 - 1.00
Poa cusickii				0.27 - 1.45	0.09 - 0.50	0.17 - 1.25
Poa secunda				0.07 - 0.50		0.13 - 1.33
Polygonum bistortoides		0.29 - 5.50		0.60 - 7.00	0.73 - 4.25	0.67 - 4.27
Polygonum davisiae						
Potentilla flabellifolia		0.14 - 1.00		0.20 - 7.00	0.55 - 7.50	0.33 - 5.75
Pseudoroegneria spicata	1.00 - 34.00					
Pteridium aquilinum						
Pulsatilla occidentalis		0.29 - 5.50		0.20 - 2.33	0.73 - 5.75	0.13 - 0.67
Saussurea americana				0.13 - 4.00	0.18 - 3.00	0.08 - 9.00
Sedum divergens				0.07 - 0.50		
Selaginella wallacei	0.50 - 13.00					
Senecio triangularis			1.00 - 3.00	0.07 - 20.00	0.27 - 4.67	0.46 - 3.03
Silene parryi				0.13 - 1.75		0.17 - 1.15
Thalictrum occidentale				0.07 - 20.00	0.18 - 30.25	0.13 - 2.33
Trisetum spicatum				0.07 - 8.00	0.18 - 0.75	0.13 - 7.83
Vahlodea atropurpurea				0.13 - 2.50		0.04 - 0.50
Valeriana sitchensis		0.71 - 5.40	1.00 - 30.00	1.00 - 24.50	1.00 - 25.59	0.92 - 15.92
Veratrum viride		0.14 - 1.00		0.47 - 1.86	0.64 - 2.07	1.00 - 33.69
Veronica cusickii		0.29 - 6.50		0.20 - 6.10	0.55 - 4.17	0.08 - 1.00
Carex concinnoides						
Carex geyeri						
Carex pseudoscirpoidea						
Cryptogramma acrostichoides	0.50 - 3.00			0.13 - 0.75	0.09 - 0.10	0.13 - 1.00
Eriophyllum lanatum	0.50 - 3.00					
Erythronium grandiflorum		0.43 - 4.67		0.33 - 5.20		0.08 - 8.00
Eucephalus ledophyllus		0.29 - 2.00		0.07 - 20.00	0.27 - 1.67	0.13 - 4.67
Penstemon confertus						
Penstemon davidsonii	0.50 - 8.00					
Polygonum douglasii	1.00 - 2.00					0.04 - 3.00
Vulpia myuros						
Zigadenus venenosus	0.50 - 3.00					

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain Subalpine-Montane Mesic Shrubland Group.

Species / Association	AMEALN/ CALRUB	JUNCOM- (PHLDIF)	PAXMYR/ PHLDIF	RUBPAR/ CHAANG	RUBPAR - RUBSPE	SPISPL
plots	1	40	10	2	2	5
TREES						
Abies amabilis						
Abies lasiocarpa		0.18 - 3.29				0.40 - 2.00
Abies procera						
Chamaecyparis nootkatensis						
Picea engelmannii						
Pinus albicaulis		0.08 - 2.33				
Pinus contorta						
Pinus monticola		0.03 - 0.50				
Pinus ponderosa						
Pseudotsuga menziesii		0.03 - 0.50				
Tsuga heterophylla						
Tsuga mertensiana						
SHRUBS						
Acer circinatum						
Alnus viridis ssp. sinuata					0.50 - 1.00	
Amelanchier alnifolia	1.00 - 60.00					
Arctostaphylos nevadensis						
Arctostaphylos uva-ursi	1.00 - 8.00	0.03 - 1.00				
Gaultheria shallon						
Holodiscus discolor						
Juniperus communis		1.00 - 39.94				0.20 - 20.00
Mahonia nervosa						
Menziesia ferruginea						
Paxistima myrsinites	1.00 - 13.00	0.20 - 3.69	1.00 - 24.10			
Phyllodoce empetriformis		0.05 - 9.25				
Rosa nutkana		0.03 - 1.00				
Rubus parviflorus				1.00 - 60.00	1.00 - 25.00	
Rubus spectabilis					0.50 - 13.00	0.20 - 13.00
Sambucus racemosa				1.00 - 2.00	0.50 - 3.00	
Sorbus sitchensis		0.03 - 0.50			0.50 - 3.00	0.20 - 8.00
Spiraea betulifolia						
Spiraea splendens		0.03 - 0.50				1.00 - 64.00
Symphoricarpos albus					0.50 - 3.00	
Symphoricarpos hesperius						
Vaccinium deliciosum		0.18 - 3.94				0.20 - 3.00
Vaccinium membranaceum		0.23 - 3.56	0.20 - 3.00			0.40 - 16.50
Vaccinium scoparium		0.08 - 17.67				
HERBACEOUS						
Achillea millefolium	1.00 - 1.00	0.68 - 2.84	0.60 - 1.02			
Agoseris glauca		0.18 - 0.81				
Antennaria lanata		0.08 - 1.37	0.10 - 1.00			
Antennaria microphylla		0.50 - 0.69				
Arenaria capillaris	1.00 - 1.00	0.40 - 2.44	0.40 - 4.38			
Arnica latifolia		0.05 - 1.00				
Arnica mollis						
Bromus sitchensis		0.03 - 0.50				
Calamagrostis rubescens	1.00 - 60.00					

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain Subalpine-Montane Mesic Shrubland Group.

Species / Association	AMEALN/ CALRUB	JUNCOM- (PHLDIF)	PAXMYR/ PHLDIF	RUBPAR/ CHAANG	RUBPAR - RUBSPE	SPISPL
plots	1	40	10	2	2	5
Carex geyeri	1.00 - 20.00					
Carex rossii		0.15 - 1.33	0.30 - 0.70			
Carex spectabilis		0.23 - 10.28				0.60 - 9.67
Castilleja hispida		0.05 - 0.30				0.20 - 1.00
Castilleja miniata		0.05 - 0.75	0.50 - 1.02			
Chamerion angustifolium		0.18 - 0.80		1.00 - 20.00		0.40 - 1.00
Cryptogramma acrostichoides		0.13 - 0.26	0.60 - 0.78			
Danthonia intermedia		0.05 - 0.30				0.20 - 1.00
Erigeron peregrinus		0.20 - 1.09	0.20 - 7.00			0.40 - 4.50
Erysimum arenicola		0.50 - 0.49	0.60 - 0.37			
Eucephalus ledophyllus	1.00 - 1.00		0.20 - 2.00			
Festuca viridula		0.03 - 1.00	0.10 - 8.00			
Gentiana calycosa		0.20 - 4.25	0.30 - 0.37			0.20 - 1.00
Heracleum maximum				1.00 - 34.00		
Hieracium albiflorum		0.08 - 1.33				0.20 - 1.00
Hieracium gracile		0.20 - 0.71				0.20 - 1.00
Hydrophyllum fendleri		0.03 - 3.00	0.20 - 1.75	1.00 - 1.00	1.00 - 2.00	
Juncus parryi		0.15 - 4.22	0.20 - 15.05			0.40 - 26.50
Ligusticum grayi		0.03 - 1.00				
Lomatium martindalei		0.40 - 0.76	0.60 - 1.33			0.40 - 4.50
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 13.00	0.58 - 7.50	0.40 - 3.63			0.20 - 8.00
Luzula (comosa, multiflora)		0.18 - 0.33	0.30 - 0.83			
Luzula glabrata			0.10 - 1.00			
Maianthemum racemosum				0.50 - 3.00	1.00 - 8.00	
Moehringia macrophylla		0.03 - 0.10	0.40 - 1.03			0.20 - 3.00
Pedicularis bracteosa						
Penstemon procerus		0.23 - 3.29	0.40 - 1.38			
Phlox diffusa	1.00 - 13.00	0.93 - 6.58	1.00 - 13.65			0.20 - 8.00
Poa cusickii		0.23 - 0.46	0.30 - 0.83			
Poa secunda		0.20 - 0.76	0.40 - 1.13			
Polygonum bistortoides		0.45 - 1.17	0.30 - 0.37			0.80 - 3.25
Potentilla flabellifolia		0.10 - 0.95				
Pseudoroegneria spicata						
Pteridium aquilinum				1.00 - 16.50		0.20 - 20.00
Pulsatilla occidentalis						
Rubus lasiococcus						
Sedum divergens		0.38 - 1.17	0.50 - 2.00			
Sedum lanceolatum		0.18 - 2.66				
Senecio integerrimus						
Silene parryi		0.43 - 0.69	0.80 - 1.50			
Thalictrum occidentale	1.00 - 3.00	0.03 - 3.00	0.20 - 0.75		0.50 - 30.00	
Trisetum spicatum		0.50 - 0.60	0.30 - 0.83			
Urtica dioica				1.00 - 19.00		
Valeriana sitchensis		0.03 - 1.00	0.20 - 2.00			0.60 - 9.00
Veratrum viride						0.20 - 3.00
Veronica wormskjoldii						
Viola glabella					1.00 - 2.00	0.20 - 3.00
Xerophyllum tenax		0.03 - 3.00				0.20 - 3.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain Subalpine-Montane Mesic Shrubland Group.

Species / Association	SYMHES	VACCAE/ FESVIR	VACCAE/ XERTEN	VACDEL/ FESVIR	VACSCO	VACSCO/ FESVIR
plots	1	3	1	6	4	3
TREES						
Abies amabilis						
Abies lasiocarpa	1.00 - 8.00	0.67 - 1.00		0.67 - 6.75	1.00 - 7.00	0.67 - 4.50
Abies procera						
Chamaecyparis nootkatensis	1.00 - 7.00			0.17 - 1.00	0.25 - 1.00	
Picea engelmannii		0.33 - 1.00				
Pinus albicaulis					0.25 - 3.00	
Pinus contorta					0.25 - 3.00	
Pinus monticola						
Pinus ponderosa						
Pseudotsuga menziesii						
Tsuga heterophylla						
Tsuga mertensiana			1.00 - 0.10			
SHRUBS						
Acer circinatum						
Alnus viridis ssp. sinuata	1.00 - 4.00					
Amelanchier alnifolia						
Arctostaphylos nevadensis						
Arctostaphylos uva-ursi						
Gaultheria shallon						
Holodiscus discolor	1.00 - 9.00					
Juniperus communis				0.17 - 30.00	0.25 - 8.00	0.33 - 1.00
Mahonia nervosa						
Menziesia ferruginea					0.25 - 8.00	
Paxistima myrsinites				0.17 - 1.00	0.50 - 5.50	0.33 - 8.00
Phyllodoce empetriformis		0.33 - 1.00		0.17 - 10.00	0.25 - 1.00	
Rosa nutkana	1.00 - 15.00					
Rubus parviflorus						
Rubus spectabilis						
Sambucus racemosa						
Sorbus sitchensis			1.00 - 0.10		0.25 - 1.00	
Spiraea betulifolia						
Spiraea splendens						
Symphoricarpos albus						
Symphoricarpos hesperius	1.00 - 40.00					
Vaccinium deliciosum				1.00 - 26.67	0.25 - 1.00	0.33 - 3.00
Vaccinium membranaceum				0.17 - 1.00	0.50 - 5.50	
Vaccinium scoparium					1.00 - 45.00	1.00 - 50.00
HERBACEOUS						
Achillea millefolium	1.00 - 5.00			0.50 - 1.67	0.75 - 1.67	0.33 - 1.00
Agoseris glauca		0.67 - 2.00				0.67 - 1.00
Antennaria lanata		1.00 - 4.67		0.17 - 1.00		0.33 - 1.00
Antennaria microphylla						
Arenaria capillaris		1.00 - 6.33		0.33 - 5.50		0.67 - 1.00
Arnica latifolia				0.50 - 10.33	0.75 - 1.67	0.33 - 3.00
Arnica mollis		0.67 - 2.00		0.17 - 1.00	0.50 - 1.00	
Bromus sitchensis	1.00 - 8.00			0.17 - 1.00		
Calamagrostis rubescens						

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain Subalpine-Montane Mesic Shrubland Group.

Species / Association	SYMHES	VACCAE/ FESVIR	VACCAE/ XERTEN	VACDEL/ FESVIR	VACSCO	VACSCO/ FESVIR
plots	1	3	1	6	4	3
Carex geyeri						
Carex rossii						
Carex spectabilis				0.33 - 6.50		
Castilleja hispida	1.00 - 8.00					
Castilleja miniata		1.00 - 1.00		0.17 - 1.00	0.25 - 10.00	0.33 - 1.00
Chamerion angustifolium	1.00 - 2.00			0.33 - 1.00		
Cryptogramma acrostichoides						
Danthonia intermedia		0.67 - 5.50			0.25 - 1.00	
Erigeron peregrinus		1.00 - 24.33		0.50 - 4.00		0.67 - 2.00
Erysimum arenicola						
Eucephalus ledophyllus				0.83 - 2.80	0.50 - 5.50	0.33 - 13.00
Festuca viridula		1.00 - 10.33		1.00 - 16.83	0.75 - 4.00	1.00 - 21.00
Gentiana calycosa		0.67 - 2.00				
Heracleum maximum	1.00 - 20.00					
Hieracium albiflorum			1.00 - 0.10	0.17 - 1.00	0.50 - 2.00	
Hieracium gracile		0.67 - 1.00		0.17 - 1.00	0.25 - 3.00	0.67 - 4.50
Hydrophyllum fendleri	1.00 - 30.00			0.17 - 1.00		
Juncus parryi		0.33 - 1.00			0.50 - 2.00	0.67 - 1.00
Ligusticum grayi		1.00 - 12.00		0.83 - 3.80	0.25 - 3.00	0.67 - 4.50
Lomatium martindalei				0.33 - 1.00	0.25 - 1.00	
Lupinus (arcticus ssp. subalpinus, latifolius)	1.00 - 2.00		1.00 - 0.50	0.83 - 7.00	0.75 - 5.67	1.00 - 5.67
Luzula (comosa, multiflora)		1.00 - 1.00	1.00 - 0.10			0.67 - 1.00
Luzula glabrata		0.67 - 2.00		0.50 - 12.00	0.25 - 3.00	0.67 - 4.50
Maianthemum racemosum						
Moehringia macrophylla						
Pedicularis bracteosa		0.67 - 1.00		0.33 - 1.00		0.33 - 1.00
Penstemon procerus	1.00 - 4.00	0.33 - 1.00			0.25 - 3.00	0.33 - 1.00
Phlox diffusa		0.67 - 5.50		0.50 - 33.33	0.75 - 7.00	0.67 - 13.00
Poa cusickii				0.17 - 1.00		0.67 - 1.00
Poa secunda	1.00 - 8.00					
Polygonum bistortoides			1.00 - 0.50	0.33 - 2.00		0.33 - 1.00
Potentilla flabellifolia	1.00 - 3.00	1.00 - 2.33		0.33 - 7.00		0.33 - 1.00
Pseudoroegneria spicata						
Pteridium aquilinum						
Pulsatilla occidentalis		0.67 - 1.00				0.33 - 1.00
Rubus lasiococcus				0.17 - 3.00	0.25 - 8.00	
Sedum divergens				0.17 - 1.00	0.25 - 1.00	0.33 - 1.00
Sedum lanceolatum						0.67 - 7.00
Senecio integerrimus		1.00 - 1.67		0.17 - 1.00		0.67 - 4.50
Silene parryi						
Thalictrum occidentale	1.00 - 20.00					
Trisetum spicatum		0.33 - 1.00		0.17 - 3.00	0.25 - 1.00	0.33 - 3.00
Urtica dioica						
Valeriana sitchensis		0.33 - 3.00		0.67 - 8.00	0.25 - 3.00	0.33 - 13.00
Veratrum viride				0.67 - 7.75		
Veronica wormskjoldii		0.67 - 11.50				
Viola glabella						
Xerophyllum tenax			1.00 - 38.00	0.17 - 10.00	0.25 - 50.00	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain Subalpine-Montane Mesic Shrubland Group.

Species / Association	VACMEM/ PHLDIF	VACMEM	VACMEM/ CALRUB	VACMEM/ XERTEN
plots	8	25	1	9
TREES				
Abies amabilis		0.16 - 3.58		0.22 - 7.00
Abies lasiocarpa		0.60 - 7.01	1.00 - 1.00	0.67 - 5.83
Abies procera		0.04 - 1.00		0.11 - 6.00
Chamaecyparis nootkatensis		0.16 - 2.50		0.56 - 1.60
Picea engelmannii				
Pinus albicaulis		0.04 - 1.00		0.11 - 3.00
Pinus contorta		0.04 - 3.00		
Pinus monticola		0.20 - 2.10		0.11 - 3.00
Pinus ponderosa				
Pseudotsuga menziesii		0.12 - 1.00	1.00 - 1.00	0.44 - 4.50
Tsuga heterophylla				0.11 - 6.00
Tsuga mertensiana		0.08 - 6.00		0.22 - 4.50
SHRUBS				
Acer circinatum				0.11 - 3.00
Alnus viridis ssp. sinuata		0.04 - 3.00		
Amelanchier alnifolia		0.08 - 0.65	1.00 - 3.00	0.22 - 1.00
Arctostaphylos nevadensis				0.11 - 13.00
Arctostaphylos uva-ursi		0.04 - 5.00		0.11 - 1.00
Gaultheria shallon				
Holodiscus discolor				
Juniperus communis		0.20 - 4.56		0.44 - 2.00
Mahonia nervosa				
Menziesia ferruginea		0.08 - 10.50		
Paxistima myrsinites	0.75 - 15.92	0.32 - 11.56	1.00 - 13.00	0.78 - 1.47
Phyllodoce empetriformis		0.12 - 1.50		0.33 - 4.00
Rosa nutkana				
Rubus parviflorus				0.11 - 1.00
Rubus spectabilis				
Sambucus racemosa				
Sorbus sitchensis		0.56 - 9.93	1.00 - 3.00	0.56 - 1.26
Spiraea betulifolia		0.04 - 3.00	1.00 - 1.00	
Spiraea splendens		0.24 - 9.75		0.22 - 4.50
Symphoricarpos albus				
Symphoricarpos hesperius				
Vaccinium deliciosum		0.24 - 3.83		0.33 - 4.67
Vaccinium membranaceum	1.00 - 29.88	1.00 - 40.60	1.00 - 40.00	1.00 - 33.67
Vaccinium scoparium		0.08 - 19.00		0.22 - 5.50
HERBACEOUS				
Achillea millefolium	0.75 - 1.75	0.28 - 1.50	1.00 - 1.00	0.33 - 0.77
Agoseris glauca		0.04 - 0.30		
Antennaria lanata		0.20 - 0.62		0.11 - 1.00
Antennaria microphylla		0.12 - 0.53		
Arenaria capillaris	0.25 - 8.00	0.04 - 1.00	1.00 - 8.00	0.11 - 1.00
Arnica latifolia		0.44 - 4.32		0.11 - 1.00
Arnica mollis				
Bromus sitchensis		0.04 - 0.50		0.11 - 1.00
Calamagrostis rubescens			1.00 - 50.00	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: Northern Rocky Mountain Subalpine-Montane Mesic Shrubland Group.

Species / Association	VACMEM/ PHLDIF	VACMEM	VACMEM/ CALRUB	VACMEM/ XERTEN
plots	8	25	1	9
Carex geyeri		0.04 - 8.00		
Carex rossii	0.50 - 0.40	0.24 - 1.50	1.00 - 1.00	0.11 - 2.00
Carex spectabilis	0.25 - 1.55	0.28 - 7.94		
Castilleja hispida		0.04 - 3.00		
Castilleja miniata	0.50 - 1.03	0.40 - 0.62	1.00 - 8.00	0.22 - 1.00
Chamerion angustifolium		0.40 - 2.23	1.00 - 3.00	0.56 - 1.00
Cryptogramma acrostichoides	0.50 - 0.40	0.08 - 0.30		0.11 - 1.00
Danthonia intermedia	0.13 - 15.50			
Erigeron peregrinus	0.50 - 1.75	0.32 - 4.91		
Erysimum arenicola	0.38 - 0.37			
Eucephalus ledophyllus		0.28 - 2.57	1.00 - 3.00	0.11 - 1.00
Festuca viridula		0.16 - 4.50	1.00 - 3.00	0.11 - 3.00
Gentiana calycosa	0.50 - 4.88	0.20 - 3.60		
Heracleum maximum				0.11 - 1.00
Hieracium albiflorum		0.44 - 1.01		0.78 - 0.90
Hieracium gracile	0.25 - 0.30	0.28 - 0.86		
Hydrophyllum fendleri	0.38 - 0.37			
Juncus parryi	0.25 - 9.25	0.28 - 5.76		0.33 - 1.67
Ligusticum grayi		0.16 - 1.50		
Lomatium martindalei	1.00 - 2.01	0.36 - 0.53		0.11 - 1.00
Lupinus (arcticus ssp. subalpinus, latifolius)	0.50 - 0.50	0.92 - 4.64	1.00 - 3.00	0.78 - 7.71
Luzula (comosa, multiflora)	0.63 - 0.42	0.32 - 0.51	1.00 - 1.00	
Luzula glabrata		0.20 - 4.20		
Maianthemum racemosum		0.04 - 1.00		
Moehringia macrophylla	0.88 - 0.74	0.36 - 0.63	1.00 - 3.00	0.33 - 1.00
Pedicularis bracteosa		0.20 - 1.30	1.00 - 1.00	0.11 - 1.00
Penstemon procerus	0.50 - 6.13	0.12 - 1.50	1.00 - 1.00	
Phlox diffusa	1.00 - 14.88	0.44 - 1.69	1.00 - 20.00	0.33 - 1.67
Poa cusickii	0.75 - 0.30	0.28 - 1.20		
Poa secunda	0.50 - 1.13	0.24 - 0.52		0.11 - 1.00
Polygonum bistortoides	0.50 - 3.00	0.36 - 1.39		
Potentilla flabellifolia	0.13 - 0.50			0.11 - 3.00
Pseudoroegneria spicata				
Pteridium aquilinum		0.08 - 19.00		0.22 - 2.00
Pulsatilla occidentalis		0.04 - 0.50		
Rubus lasiococcus		0.36 - 7.37		0.56 - 1.80
Sedum divergens	0.50 - 1.75	0.20 - 1.50		0.11 - 1.00
Sedum lanceolatum			1.00 - 1.00	
Senecio integerrimus				
Silene parryi	0.88 - 2.83	0.28 - 3.66		
Thalictrum occidentale	0.25 - 0.30	0.08 - 2.00	1.00 - 3.00	0.11 - 1.00
Trisetum spicatum	0.50 - 0.40	0.32 - 0.75		
Urtica dioica				
Valeriana sitchensis	0.38 - 0.50	0.48 - 7.00		0.22 - 2.00
Veratrum viride		0.32 - 3.31		0.22 - 1.00
Veronica wormskjoldii				
Viola glabella		0.12 - 0.70		
Xerophyllum tenax		0.32 - 5.63		1.00 - 47.22

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Grassland and Shrubland through Western Cordillerian Montane Schlerophyll Scrub Groups.

Species / Association	ARC(NEV, UVA)-JUNCOM	ARC(NEV, UVA)/ PAXMYR	ARCUVA-FRAVIR-(FESROE)	BROVUL-FESSUB	LOMMAR lithomorphic	FESROE-CERARV-KOEMAC
plots	2	2	1	1	1	2
TREES						
Abies amabilis				1.00 - 3.00		
Arbutus menziesii						
Juniperus maritima						
Pseudotsuga menziesii		0.50 - 1.00		1.00 - 0.30		0.50 - 1.00
Thuja plicata				1.00 - 12.00		
Tsuga heterophylla				1.00 - 2.00		
SHRUBS						
Acer glabrum var. douglasii						
Amelanchier alnifolia		0.50 - 3.00		1.00 - 0.30		
Arctostaphylos columbiana						
Arctostaphylos nevadensis	0.50 - 13.00	0.50 - 60.00				
Arctostaphylos uva-ursi	0.50 - 38.00	0.50 - 30.00	1.00 - 20.00			
Ceanothus velutinus						
Gaultheria shallon						
Holodiscus discolor				1.00 - 3.00		
Juniperus communis	0.50 - 15.50					
Mahonia aquifolium						1.00 - 3.00
Paxistima myrsinites		1.00 - 10.50	1.00 - 1.00			
Phyllodoce empetriformis						
Prunus emarginata						
Rosa gymnocarpa						
Rubus leucodermis				1.00 - 7.00		
Rubus parviflorus				1.00 - 0.30		
Rubus spectabilis						
Salix scouleriana						
Sorbus scopulina						
Spiraea betulifolia		0.50 - 3.00	1.00 - 1.00			
Symphoricarpos albus						
Vaccinium ovalifolium						
HERBACEOUS						
Achillea millefolium	0.50 - 3.00		1.00 - 13.00		1.00 - 3.00	1.00 - 2.00
Actaea rubra				1.00 - 5.00		
Adenocaulon bicolor				1.00 - 8.00		
Aira caryophyllea						
Allium crenulatum	0.50 - 3.00					1.00 - 1.00
Antennaria lanata						
Arenaria capillaris	0.50 - 3.00	1.00 - 1.00				
Balsamorhiza sagittata		0.50 - 20.00				
Blechnum spicant						
Bromus carinatus						
Bromus hordeaceus						
Bromus vulgaris				1.00 - 50.00		
Calamagrostis rubescens		0.50 - 8.00				
Carex phaeocephala						
Carex spectabilis						
Cerastium arvense ssp. strictum						1.00 - 1.00
Chamerion angustifolium						
Clarkia amoena ssp. caurina						0.50 - 1.00
Collinsia parviflora	1.00 - 0.75				1.00 - 1.00	
Cryptogramma acrostichoides		0.50 - 3.00	1.00 - 1.00			
Danthonia californica						

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Grassland and Shrubland through Western Cordillerian Montane Schlerophyll Scrub Groups.

Species / Association	ARC(NEV, UVA)-JUNCOM	ARC(NEV, UVA)/ PAXMYR	ARCUVA-FRAVIR-(FESROE)	BROVUL-FESSUB	LOMMAR lithomorphic	FESROE-CERARV-KOEMAC
plots	2	2	1	1	1	2
Danthonia unispicata						
Daucus pusillus						
Elymus glaucus			1.00 - 3.00			
Eriophyllum lanatum	0.50 - 3.00					0.50 - 1.00
Erythronium grandiflorum						
Festuca (brachyphylla, saximontana)						
Festuca roemeri	0.50 - 15.50					1.00 - 24.00
Festuca subulata				1.00 - 10.00		
Festuca viridula						
Fragaria vesca				1.00 - 4.00	1.00 - 3.00	
Fragaria virginiana	0.50 - 1.00		1.00 - 3.00			1.00 - 1.00
Fritillaria affinis						1.00 - 1.00
Juncus parryi						
Koeleria macrantha						
Lilium columbianum						
Lomatium martindalei	1.00 - 11.50				1.00 - 8.00	1.00 - 2.00
Lomatium nudicaule						1.00 - 1.00
Lomatium utriculatum						1.00 - 1.00
Lotus micranthus						
Luetkea pectinata						
Lupinus sellulus var. lobbii	0.50 - 0.10					
Luzula (comosa, multiflora)	0.50 - 1.00					
Osmorhiza purpurea				1.00 - 6.00		
Penstemon serrulatus			1.00 - 3.00			
Phacelia hastata						
Phlox diffusa	0.50 - 15.50					
Plectritis congesta						
Polystichum munitum				1.00 - 1.00		
Pseudoroegneria spicata		0.50 - 60.00				
Selaginella wallacei			1.00 - 3.00		1.00 - 3.00	0.50 - 1.00
Senecio integerrimus		0.50 - 1.00				
Silene parryi	0.50 - 3.00					0.50 - 1.00
Valeriana sitchensis						
Vulpia myuros						
Zigadenus venenosus						1.00 - 1.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Grassland and Shrubland through Western Cordillerian Montane Schlerophyll Scrub Groups.

Species / Association	FESROE-PLECON	KOLMAC-(AGRPAL)	BLESPI	ARCCOL	CEAVEL
plots	9	2	1	4	10
TREES					
Abies amabilis					
Arbutus menziesii	0.22 - 0.2			0.50 - 8.00	
Juniperus maritima				0.75 - 7.67	
Pseudotsuga menziesii				0.75 - 6.00	0.60 - 3.67
Thuja plicata					
Tsuga heterophylla			1.00 - 3.00		
SHRUBS					
Acer glabrum var. douglasii					0.40 - 19.00
Amelanchier alnifolia		0.50 - 1.00		0.75 - 1.00	0.80 - 13.50
Arctostaphylos columbiana				1.00 - 37.50	
Arctostaphylos nevadensis					
Arctostaphylos uva-ursi	0.11 - 0.2	0.50 - 1.00		0.75 - 12.00	0.20 - 5.50
Ceanothus velutinus					1.00 - 32.40
Gaultheria shallon			1.00 - 3.00	0.25 - 1.00	
Holodiscus discolor	0.11 - 8.00	1.00 - 3.00		1.00 - 4.25	
Juniperus communis				0.25 - 1.00	
Mahonia aquifolium	0.22 - 4.00			0.75 - 1.00	0.30 - 3.00
Paxistima myrsinites				1.00 - 1.50	1.00 - 18.10
Phyllodoce empetriformis					
Prunus emarginata					0.70 - 19.57
Rosa gymnocarpa				1.00 - 1.00	0.30 - 1.67
Rubus leucodermis					
Rubus parviflorus					0.40 - 8.75
Rubus spectabilis			1.00 - 3.00		
Salix scouleriana					0.60 - 14.17
Sorbus scopulina					0.40 - 6.75
Spiraea betulifolia		0.50 - 1.00			0.70 - 11.43
Symphoricarpos albus	0.11 - 3.00			0.25 - 1.00	0.40 - 12.25
Vaccinium ovalifolium			1.00 - 3.00		
HERBACEOUS					
Achillea millefolium	0.44 - 2.00	1.00 - 8.00		1.00 - 1.00	0.30 - 1.67
Actaea rubra					
Adenocaulon bicolor					
Aira caryophyllea	0.56 - 4.00	1.00 - 3.00			
Allium crenulatum				0.25 - 1.00	
Antennaria lanata					
Arenaria capillaris		0.50 - 1.00			0.10 - 1.00
Balsamorhiza sagittata					
Blechnum spicant			1.00 - 60.00		
Bromus carinatus	0.56 - 4.00	0.50 - 3.00			
Bromus hordeaceus	0.67 - 5.00	0.50 - 8.00			
Bromus vulgaris				0.25 - 1.00	
Calamagrostis rubescens		0.50 - 3.00			0.90 - 25.78
Carex phaeocephala					
Carex spectabilis					
Cerastium arvense ssp. strictum	0.33 - 4.00	0.50 - 1.00		0.50 - 1.00	0.10 - 1.00
Chamerion angustifolium					0.60 - 4.33
Clarkia amoena ssp. caurina	0.89 - 3.00				
Collinsia parviflora	0.22 - 2.00	1.00 - 1.00			0.20 - 1.00
Cryptogramma acrostichoides		1.00 - 5.50		0.25 - 1.00	0.10 - 1.00
Danthonia californica	0.67 - 4.00				

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Grassland and Shrubland through Western Cordillerian Montane Schlerophyll Scrub Groups.

Species / Association	FESROE-PLECON	KOLMAC-(AGRPAL)	BLESPI	ARCCOL	CEAVEL
plots	9	2	1	4	10
Danthonia unispicata		1.00 - 2.00			
Daucus pusillus	0.89 - 2.00				
Elymus glaucus	0.44 - 3.00	0.50 - 3.00		0.50 - 1.00	0.20 - 5.50
Eriophyllum lanatum	0.11 - 0.2	1.00 - 5.50		0.75 - 1.67	0.10 - 1.00
Erythronium grandiflorum		0.50 - 1.00			0.40 - 3.25
Festuca (brachyphylla, saximontana)					
Festuca roemeri	1.00 - 45.00			0.75 - 1.67	
Festuca subulata					
Festuca viridula					
Fragaria vesca					
Fragaria virginiana	0.22 - 6.00	1.00 - 2.00		0.75 - 1.00	0.20 - 3.00
Fritillaria affinis	0.33 - 0.2	0.50 - 1.00		0.75 - 1.00	0.10 - 1.00
Juncus parryi					
Koeleria macrantha	0.22 - 2.00	1.00 - 25.00			
Lilium columbianum					0.40 - 1.00
Lomatium martindalei				0.75 - 1.00	
Lomatium nudicaule		0.50 - 3.00		0.50 - 1.00	0.10 - 1.00
Lomatium utriculatum	0.11 - 8.00			0.50 - 1.00	
Lotus micranthus	0.67 - 3.00				
Luetkea pectinata					
Lupinus sellulus var. lobbii					
Luzula (comosa, multiflora)	0.56 - 2.00			0.50 - 1.00	0.10 - 1.00
Osmorhiza purpurea					
Penstemon serrulatus					0.10 - 1.00
Phacelia hastata					
Phlox diffusa					0.10 - 8.00
Plectritis congesta	1.00 - 20.00				
Polystichum munitum			1.00 - 3.00		
Pseudoroegneria spicata					
Selaginella wallacei	0.56 - 3.00	1.00 - 3.00		0.25 - 8.00	
Senecio integerrimus					
Silene parryi					
Valeriana sitchensis					
Vulpia myuros	0.33 - 6.00	1.00 - 25.00			
Zigadenus venenosus	0.44 - 2.00	1.00 - 10.50		0.75 - 1.00	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Bog and Poor Fen through Temperate Pacific Subalpine-MontaneWet Meadow Groups.

Species / Association	KALMIC-CARNIG	CUPNOO-TSUMER/ CALLEP	TSUHET-(THUPLI)/ LEDGRO/ SPHAGN	LEDGRO-KALMIC/ SPHAGN	SPIDOU	SALCOM
plots	11	1	5	1	3	20
TREES						
Abies amabilis		1.00 - 2.00				0.25 - 1.10
Abies lasiocarpa	0.09 - 1.00					0.10 - 1.00
Chamaecyparis nootkatensis		1.00 - 25.00				0.15 - 0.87
Picea sitchensis			0.60 - 2.33			
Pseudotsuga menziesii						
Taxus brevifolia			0.20 - 1.00			
Thuja plicata			1.00 - 11.80	1.00 - 0.50		
Tsuga heterophylla			1.00 - 11.80			
Tsuga mertensiana	0.09 - 1.00	1.00 - 4.00				0.35 - 2.21
SHRUBS						
Alnus viridis ssp. sinuata		1.00 - 0.30				
Cassiope mertensiana	0.27 - 3.00					
Empetrum nigrum	0.09 - 3.00		0.40 - 11.50	1.00 - 15.50		
Gaultheria shallon			1.00 - 5.20		0.33 - 2.00	
Kalmia microphylla	1.00 - 17.27		1.00 - 23.60	1.00 - 15.50		
Ledum groenlandicum			1.00 - 58.00	1.00 - 15.50		
Luetkea pectinata	0.18 - 9.00					
Phyllodoce empetriformis	0.55 - 7.83					
Salix commutata						1.00 - 50.55
Salix sitchensis						0.05 - 50.00
Spiraea douglasii					1.00 - 88.33	
Spiraea splendens						
Symphoricarpos albus					0.67 - 16.50	
Vaccinium deliciosum	0.64 - 12.00					
Vaccinium membranaceum						0.05 - 0.30
Vaccinium oxycoccos			0.40 - 10.50	1.00 - 15.50		
HERBACEOUS						
Agrostis oregonensis						
Arnica amplexicaulis		1.00 - 6.00				
Blechnum spicant			1.00 - 12.00	1.00 - 0.50		
Calamagrostis canadensis					0.33 - 3.00	
Caltha leptosepala	0.45 - 15.20	1.00 - 10.00				0.25 - 10.00
Carex aquatilis						
Carex brunnescens		1.00 - 8.00				
Carex illota						
Carex lenticularis var. lipocarpa						
Carex mertensii						
Carex nigricans	0.82 - 17.78					
Carex obnupta			1.00 - 16.80			
Carex spectabilis	0.82 - 20.33					
Castilleja parviflora	0.45 - 3.00					
Cornus unalaschkensis			1.00 - 1.80			
Dodecatheon jeffreyi		1.00 - 2.00				
Epilobium anagallidifolium	0.09 - 3.00	1.00 - 2.00				
Erigeron peregrinus	0.45 - 2.60					

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Bog and Poor Fen through Temperate Pacific Subalpine-MontaneWet Meadow Groups.

Species / Association	KALMIC-CARNIG	CUPNOO-TSUMER/ CALLEP	TSUHET-(THUPLI)/ LEDGRO/ SPHAGN	LEDGRO-KALMIC/ SPHAGN	SPIDOU	SALCOM
plots	11	1	5	1	3	20
Glyceria striata						
Heracleum maximum					0.33 - 13.00	0.10 - 5.50
Juncus drummondii						
Juncus mertensianus						
Ligusticum grayi	0.09 - 3.00				0.33 - 3.00	
Lupinus (arcticus ssp. subalpinus, latifolius)		1.00 - 10.00				0.50 - 15.03
Lysichiton americanus				1.00 - 3.00		
Maianthemum dilatatum			0.80 - 1.00			
Oreostemma alpigenum	0.91 - 22.00					
Phleum alpinum						0.50 - 2.06
Polygonum bistortoides	0.09 - 3.00					
Potentilla flabellifolia	0.64 - 5.71					
Pteridium aquilinum			0.80 - 21.00		0.33 - 20.00	
Sanguisorba officinalis			0.60 - 13.67	1.00 - 3.00		
Saxifraga nelsoniana ssp. cascadensis		1.00 - 25.00				
Scirpus microcarpus						
Thalictrum occidentale					0.67 - 5.50	0.15 - 4.00
Tolmiea menziesii						
Valeriana sitchensis		1.00 - 8.00				
Veratrum viride						
Veronica cusickii	0.36 - 6.00	1.00 - 3.00				
Viola palustris						
Equisetum arvense		1.00 - 4.00				0.20 - 9.25
Cirsium edule						0.45 - 4.88

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Bog and Poor Fen through Temperate Pacific Subalpine-MontaneWet Meadow Groups.

Species / Association	SPIDOU/ CARAQUD	SPISPL/ CARLEN	CARMER	CARNIG	CARSPE-CARNIG-(POTFLA)
plots	1	2	2	40	34
TREES					
Abies amabilis					
Abies lasiocarpa			0.50 - 1.00	0.08 - 0.63	0.09 - 3.83
Chamaecyparis nootkatensis					0.06 - 0.30
Picea sitchensis					
Pseudotsuga menziesii					
Taxus brevifolia					
Thuja plicata					
Tsuga heterophylla					
Tsuga mertensiana				0.08 - 0.30	0.03 - 0.30
SHRUBS					
Alnus viridis ssp. sinuata		0.50 - 1.00			
Cassiope mertensiana				0.28 - 4.01	0.09 - 0.47
Empetrum nigrum					
Gaultheria shallon					
Kalmia microphylla		0.50 - 1.00		0.05 - 3.00	0.09 - 1.67
Ledum groenlandicum					
Luetkea pectinata				0.73 - 9.07	0.47 - 3.86
Phyllodoce empetriformis		1.00 - 1.00		0.45 - 2.68	0.35 - 1.42
Salix commutata				0.05 - 5.50	0.06 - 0.30
Salix sitchensis					
Spiraea douglasii	1.00 - 70.00				
Spiraea splendens		1.00 - 60.00			0.09 - 0.30
Symphoricarpos albus					
Vaccinium deliciosum				0.30 - 1.23	0.29 - 4.68
Vaccinium membranaceum		0.50 - 1.00			
Vaccinium oxycoccos					
HERBACEOUS					
Agrostis oregonensis			0.50 - 20.00		0.06 - 0.65
Arnica amplexicaulis					0.03 - 5.00
Blechnum spicant					
Calamagrostis canadensis	1.00 - 3.00				
Caltha leptosepala				0.20 - 1.61	0.32 - 7.91
Carex aquatilis	1.00 - 20.00				
Carex brunnescens					0.03 - 35.00
Carex illota			0.50 - 8.00	0.05 - 15.15	0.12 - 13.75
Carex lenticularis var. lipocarpa		1.00 - 40.00			
Carex mertensii			1.00 - 70.00		0.03 - 0.30
Carex nigricans			0.50 - 10.00	1.00 - 55.31	0.91 - 22.74
Carex obnupta					
Carex spectabilis				0.80 - 5.50	1.00 - 33.22
Castilleja parviflora				0.25 - 0.84	026 - 1.00
Cornus unalaschkensis					
Dodecatheon jeffreyi		1.00 - 2.00		0.10 - 1.90	0.12 - 1.25
Epilobium anagallidifolium				0.03 - 1.00	0.26 - 2.31
Erigeron peregrinus		0.50 - 30.00		0.05 - 6.50	0.35 - 2.72

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North Pacific Lowland Bog and Poor Fen through Temperate Pacific Subalpine-MontaneWet Meadow Groups.

Species / Association	SPIDOU/ CARAQUD	SPISPL/ CARLEN	CARMER	CARNIG	CARSPE-CARNIG-(POTFLA)
plots	1	2	2	40	34
Glyceria striata	1.00 - 3.00				
Heracleum maximum					0.03 - 1.00
Juncus drummondii			0.50 - 15.00	0.43 - 2.11	0.38 - 7.29
Juncus mertensianus			0.50 - 5.00	0.23 - 1.03	0.24 - 2.33
Ligusticum grayi		1.00 - 10.50		0.03 - 3.00	0.15 - 3.20
Lupinus (arcticus ssp. subalpinus, latifolius)		0.50 - 1.00	1.00 - 5.00	0.20 - 6.38	0.38 - 8.31
Lysichiton americanus					
Maianthemum dilatatum					
Oreostemma alpigenum				0.25 - 5.20	0.18 - 5.33
Phleum alpinum			1.00 - 1.00	0.05 - 1.00	0.21 - 1.69
Polygonum bistortoides			1.00 - 8.00	0.23 - 2.18	0.44 - 4.20
Potentilla flabellifolia		1.00 - 1.00	1.00 - 4.00	0.23 - 3.67	0.62 - 13.98
Pteridium aquilinum					
Sanguisorba officinalis					
Saxifraga nelsoniana ssp. cascadensis				0.08 - 0.53	0.03 - 0.30
Scirpus microcarpus	1.00 - 13.00				
Thalictrum occidentale					
Tolmiea menziesii				0.03 - 0.30	
Valeriana sitchensis		0.50 - 20.00		0.03 - 0.30	0.15 - 1.42
Veratrum viride		0.50 - 1.00	0.50 - 10.00	0.03 - 1.00	0.12 - 0.70
Veronica cusickii				0.23 - 6.03	0.41 - 4.93
Viola palustris		0.50 - 13.00			
Equisetum arvense	1.00 - 1.00			0.03 - 8.00	0.03 - 20.00
Cirsium edule					0.03 - 0.50

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North America Bog and Fen Division.

Species / Association	CALLEP	CAR (AQD,NIG)-CALLEP	CARAQD	CARATH	CARLEN-SYMFOL	CARNEU
plots	3	8	1	1	2	1
TREES						
Abies lasiocarpa	0.67 - 5.50	0.25 - 1.00				
Chamaecyparis nootkatensis	0.33 - 2.00					1.00 - 6.30
Picea sitchensis						
Tsuga mertensiana	0.67 - 5.50	0.13 - 1.00				1.00 - 3.30
SHRUBS						
Alnus viridis ssp. sinuata						1.00 - 5.00
Luetkea pectinata		0.50 - 1.83				
Phyllodoce empetriformis	1.00 - 1.43	0.63 - 3.06				
HERBACEOUS						
Agoseris glauca						
Agrostis exarata						1.00 - 20.00
Aira caryophyllea				1.00 - 8.00		
Athyrium filix-femina	0.33 - 2.00					
Blechnum spicant						
Bromus sitchensis						
Caltha leptosepala	1.00 - 38.33	1.00 - 31.25				
Carex aquatilis			1.00 - 50.00	1.00 - 13.00		
Carex athrostachya				1.00 - 60.00		
Carex lenticularis var. lipocarpa					1.00 - 20.50	
Carex luzulina	0.33 - 20.00					
Carex neurophora						1.00 - 80.00
Carex nigricans		1.00 - 55.00				
Carex obnupta						
Carex spectabilis	0.67 - 13.00	0.88 - 5.29				1.00 - 1.00
Carex utriculata						
Castilleja parviflora	0.33 - 1.00	0.50 - 0.65				
Chamerion latifolium						
Deschampsia caespitosa						
Dodecatheon jeffreyi	0.67 - 17.50	0.38 - 27.67			1.00 - 20.50	
Elmera racemosa						
Epilobium anagallidifolium	0.33 - 6.00	0.13 - 1.00				1.00 - 5.00
Equisetum arvense		0.13 - 1.00	1.00 - 1.00			
Erigeron peregrinus	0.33 - 3.00	0.63 - 2.00				
Gentiana calycosa	0.33 - 20.00	0.50 - 5.33				
Glyceria striata						
Hypericum anagalloides					1.00 - 10.50	
Juncus drummondii	0.33 - 3.00	0.63 - 1.66				1.00 - 4.00
Juncus effusus						
Juncus mertensianus	0.33 - 2.00					
Leptarrhena pyrolifolia		0.50 - 11.75				1.00 - 1.00
Ligusticum grayi	0.67 - 5.50	0.38 - 1.67				
Lupinus (arcticus ssp. subalpinus, latifolius)	0.33 - 1.00	0.38 - 1.67				1.00 - 5.00
Mimulus lewisii		0.13 - 1.00				
Mimulus tilingii		0.13 - 1.00				
Oenanthe sarmentosa						
Oxyria digyna						
Pedicularis groenlandica		0.50 - 0.83			1.00 - 2.00	
Petasites frigidus		0.13 - 3.00				
Polygonum bistortoides	0.67 - 5.50	0.50 - 1.25			0.50 - 3.00	
Potentilla flabellifolia	0.33 - 1.00	0.63 - 3.20				
Ranunculus eschscholtzii	0.33 - 20.00	0.50 - 1.08				
Saxifraga nelsoniana ssp. cascadensis	0.33 - 8.00	0.13 - 1.00				

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North America Bog and Fen Division.

Species / Association	CALLEP	CAR (AQD,NIG)-CALLEP	CARAQD	CARATH	CARLEN-SYMFOL	CARNEU
plots	3	8	1	1	2	1
Scirpus microcarpus			1.00 - 20.00			
Senecio triangularis		0.38 - 1.67			0.50 - 1.00	
Sparganium eurycarpum						
Symphyotrichum foliaceum					1.00 - 40.00	
Triantha occidentalis ssp. brevistyla					1.00 - 10.50	
Trichophorum caespitosum					1.00 - 8.00	
Trifolium repens						
Trisetum spicatum						1.00 - 4.00
Vahlodea atropurpurea		0.13 - 1.00			1.00 - 5.50	
Valeriana sitchensis	0.67 - 6.50	0.13 - 1.00				1.00 - 1.00
Veratrum viride	0.67 - 1.00	0.25 - 1.00				1.00 - 5.00
Veronica wormskjoldii	0.33 - 6.00	0.63 - 1.40				
Viola palustris					0.50 - 3.00	1.00 - 10.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North America Bog and Fen Division.

Species / Association	CAROBN	CARUTR	DESCAE	EQUARV	JUNEFF	MIMLEW
plots	1	1	1	1	1	3
TREES						
Abies lasiocarpa				1.00 - 0.60		
Chamaecyparis nootkatensis						
Picea sitchensis	1.00 - 5.00				1.00 - 9.00	
Tsuga mertensiana						0.33 - 0.30
SHRUBS						
Alnus viridis ssp. sinuata						
Luetkea pectinata						0.33 - 0.30
Phyllodoce empetriformis						0.33 - 1.00
HERBACEOUS						
Agoseris glauca				1.00 - 3.00		0.67 - 1.15
Agrostis exarata						
Aira caryophyllea						
Athyrium filix-femina	1.00 - 3.00				1.00 - 8.00	
Blechnum spicant					1.00 - 3.00	
Bromus sitchensis				1.00 - 8.00		
Caltha leptosepala						
Carex aquatilis		1.00 - 3.00				
Carex athrostachya						
Carex lenticularis var. lipocarpa						
Carex luzulina						
Carex neurophora						
Carex nigricans						0.33 - 2.00
Carex obnupta	1.00 - 50.00					
Carex spectabilis			1.00 - 3.00	1.00 - 10.00		0.67 - 1.00
Carex utriculata		1.00 - 60.00				
Castilleja parviflora						0.33 - 1.00
Chamerion latifolium						
Deschampsia caespitosa		1.00 - 13.00	1.00 - 85.00			
Dodecatheon jeffreyi		1.00 - 80.00				
Elmera racemosa						0.67 - 1.50
Epilobium anagallidifolium						0.67 - 0.65
Equisetum arvense		1.00 - 1.00		1.00 - 35.00		
Erigeron peregrinus		1.00 - 1.00		1.00 - 2.00		0.33 - 1.00
Gentiana calycosa						
Glyceria striata					1.00 - 25.00	
Hypericum anagalloides						
Juncus drummondii						0.33 - 1.00
Juncus effusus					1.00 - 60.00	
Juncus mertensianus						0.67 - 0.65
Leptarrhena pyrolifolia						
Ligusticum grayi						0.33 - 1.00
Lupinus (arcticus ssp. subalpinus, latifolius)				1.00 - 2.00		
Mimulus lewisii				1.00 - 1.00		1.00 - 10.00
Mimulus tilingii				1.00 - 1.00		0.67 - 2.15
Oenanthe sarmentosa	1.00 - 0.30				1.00 - 6.00	
Oxyria digyna						0.67 - 1.50
Pedicularis groenlandica				1.00 - 3.00		0.33 - 1.00
Petasites frigidus						0.33 - 2.00
Polygonum bistortoides				1.00 - 30.00		0.67 - 0.65
Potentilla flabellifolia			1.00 - 3.00			0.33 - 1.00
Ranunculus eschscholtzii						0.33 - 0.30
Saxifraga nelsoniana ssp. cascadensis						0.67 - 1.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North America Bog and Fen Division.

Species / Association	CAROBN	CARUTR	DESCAE	EQUARV	JUNEFF	MIMLEW
plots	1	1	1	1	1	3
Scirpus microcarpus					1.00 - 15.00	
Senecio triangularis						0.33 - 1.00
Sparganium eurycarpum						
Symphyotrichum foliaceum						
Triantha occidentalis ssp. brevistyla						
Trichophorum caespitosum		1.00 - 8.00				
Trifolium repens	1.00 - 35.00					
Trisetum spicatum				1.00 - 1.00		
Vahlodea atropurpurea				1.00 - 1.00		0.33 - 0.30
Valeriana sitchensis				1.00 - 10.00		0.33 - 1.00
Veratrum viride						0.33 - 3.00
Veronica wormskjoldii				1.00 - 4.00		0.67 - 0.65
Viola palustris		1.00 - 1.00				

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North America Bog and Fen Division.

Species / Association	PETFRI	RANESC	SCIMIC	SENTRI	SPAEUR	TRICAE
plots	1	1	2	1	1	3
TREES						
Abies lasiocarpa						
Chamaecyparis nootkatensis						
Picea sitchensis			1.00 - 4.00			
Tsuga mertensiana						
SHRUBS						
Alnus viridis ssp. sinuata				1.00 - 3.00		
Luetkea pectinata						
Phyllodoce empetriformis						
HERBACEOUS						
Agoseris glauca						
Agrostis exarata			0.50 - 2.00			
Aira caryophyllea						
Athyrium filix-femina			1.00 - 3.50			
Blechnum spicant			0.50 - 4.00			
Bromus sitchensis						
Caltha leptosepala						0.33 - 1.00
Carex aquatilis						
Carex athrostachya						
Carex lenticularis var. lipocarpa						0.67 - 3.00
Carex luzulina						0.67 - 20.50
Carex neurophora						
Carex nigricans		1.00 - 15.50				
Carex obnupta						
Carex spectabilis						
Carex utriculata						
Castilleja parviflora						
Chamerion latifolium				1.00 - 40.00		
Deschampsia caespitosa						
Dodecatheon jeffreyi	1.00 - 3.00					1.00 - 5.67
Elmera racemosa						
Epilobium anagallidifolium		1.00 - 3.00				
Equisetum arvense						
Erigeron peregrinus		1.00 - 0.50				
Gentiana calycosa						
Glyceria striata			0.50 - 7.00			
Hypericum anagalloides						0.67 - 2.00
Juncus drummondii	1.00 - 0.50					
Juncus effusus						
Juncus mertensianus	1.00 - 3.00					
Leptarrhena pyrolifolia						
Ligusticum grayi						
Lupinus (arcticus ssp. subalpinus, latifolius)						
Mimulus lewisii				1.00 - 1.00		
Mimulus tilingii				1.00 - 1.00		
Oenanthe sarmentosa			1.00 - 50.00			
Oxyria digyna				1.00 - 1.00		
Pedicularis groenlandica						0.67 - 2.00
Petasites frigidus	1.00 - 15.50					
Polygonum bistortoides						
Potentilla flabellifolia						
Ranunculus eschscholtzii		1.00 - 38.00				
Saxifraga nelsoniana ssp. cascadensis						

Appendix C. Synthesis tables of associations with species constancy and average cover.
Shrub and Grassland Class: North America Bog and Fen Division.

Species / Association	PETFRI	RANESC	SCIMIC	SENTRI	SPAEUR	TRICAE
plots	1	1	2	1	1	3
Scirpus microcarpus			1.00 - 37.50			
Senecio triangularis				1.00 - 8.00		0.33 - 1.00
Sparganium eurycarpum					1.00 - 25.00	
Symphyotrichum foliaceum						1.00 - 7.33
Triantha occidentalis ssp. brevistyla						0.67 - 31.50
Trichophorum caespitosum						1.00 - 53.33
Trifolium repens						
Trisetum spicatum						
Vahlodea atropurpurea						1.00 - 7.33
Valeriana sitchensis				1.00 - 3.00		
Veratrum viride						
Veronica wormskjoldii						
Viola palustris						0.67 - 2.00

Appendix C. Synthesis tables of associations with species constancy and average cover.
Polar and High Montane Class: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath Group.

Species / Association	ARCUVA-(DASFLO)	EMPNIG-LUPSEL	CASMER-PHYEMP	PHYEMP-(VACDEL)/LUPARC	PHYEMP-VACDEL-CASMER	PHYGLA-(CASMER)
plots	8	13	65	16	102	13
TREES						
Abies amabilis					0.01 - 2.00	
Abies grandis						
Abies lasiocarpa			0.48 - 2.40	0.31 - 4.20	0.35 - 3.19	
Abies procera						
Chamaecyparis nootkatensis			0.05 - 2.10	0.06 - 2.00	0.04 - 2.73	
Larix lyallii			0.02 - 1.00			
Picea engelmannii					0.01 - 1.00	
Picea sitchensis						
Pinus albicaulis			0.02 - 0.10			
Pinus contorta						
Pinus monticola			0.05 - 0.37		0.01 - 0.30	
Pinus ponderosa						
Pseudotsuga menziesii						
Taxus brevifolia						
Thuja plicata						
Tsuga heterophylla						
Tsuga mertensiana			0.25 - 3.58	0.13 - 1.00	0.26 - 2.93	
SHRUBS						
Arctostaphylos uva-ursi	1.00 - 51.63	0.15 - 9.00				0.08 - 15.00
Cassiope mertensiana			1.00 - 34.51	0.31 - 6.60	0.49 - 8.18	0.69 - 15.25
Dasiphora floribunda	0.88 - 15.86	0.23 - 2.53			0.02 - 0.50	
Empetrum nigrum	0.25 - 28.50	1.00 - 52.41	0.02 - 0.05			0.15 - 5.42
Juniperus communis	0.75 - 16.67	0.15 - 20.00	0.06 - 5.58		0.02 - 1.75	0.15 - 3.00
Kalmia microphylla			0.02 - 3.00		0.01 - 1.00	0.23 - 2.28
Ledum groenlandicum						
Luetkea pectinata			0.78 - 7.48	1.00 - 9.08	0.78 - 7.44	0.54 - 5.30
Paxistima myrsinites			0.09 - 1.18		0.02 - 0.50	
Phyllodoce empetriformis		0.08 - 15.00	0.83 - 23.51	1.00 - 30.84	0.99 - 37.86	0.38 - 8.34
Phyllodoce glanduliflora	0.13 - 3.00	0.38 - 7.80	0.02 - 1.20			1.00 - 25.90
Rhododendron albiflorum					0.01 - 3.00	
Sorbus sitchensis			0.05 - 0.87	0.13 - 0.40	0.10 - 0.89	
Spiraea splendens					0.03 - 3.10	
Vaccinium deliciosum	0.13 - 3.00	0.15 - 3.00	0.80 - 8.27	0.63 - 11.30	0.87 - 22.53	0.23 - 3.00
Vaccinium membranaceum			0.11 - 1.73	0.19 - 0.50	0.18 - 2.00	0.08 - 3.00
Vaccinium scoparium	0.38 - 3.00	0.38 - 3.00	0.03 - 5.50		0.03 - 10.67	0.23 - 8.67
HERBACEOUS						
Achillea millefolium	0.75 - 3.00	0.08 - 3.00			0.02 - 1.55	0.23 - 5.33
Anemone drummondii	0.50 - 3.00	0.23 - 3.00				0.08 - 3.00
Antennaria alpina	0.50 - 3.00	0.38 - 2.48	0.05 - 1.43	0.06 - 3.00	0.02 - 1.00	0.38 - 2.33
Antennaria microphylla			0.03 - 1.55		0.02 - 0.50	
Arenaria capillaris	0.25 - 3.00	0.54 - 3.00	0.06 - 0.48	0.19 - 2.10	0.02 - 0.30	0.38 - 3.32
Arnica latifolia			0.17 - 1.28	0.44 - 1.61	0.17 - 2.69	
Artemisia furcata	0.50 - 9.00	0.62 - 4.20				
Campanula rotundifolia	0.88 - 2.71	0.15 - 3.00	0.02 - 0.50			
Carex nigricans	0.75 - 5.00	0.08 - 3.00	0.29 - 2.69	0.38 - 3.42	0.31 - 5.50	0.15 - 6.50
Carex phaeocephala	0.13 - 3.00	0.23 - 3.00		0.06 - 0.50	0.02 - 0.30	0.08 - 0.10

Appendix C. Synthesis tables of associations with species constancy and average cover.
Polar and High Montane Class: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath Group.

Species / Association	ARCUVA-(DASFLO)	EMPNIG-LUPSEL	CASMER-PHYEMP	PHYEMP-(VACDEL)/LUPARC	PHYEMP-VACDEL-CASMER	PHYGLA-(CASMER)
plots	8	13	65	16	102	13
Carex spectabilis		0.46 - 5.00	0.54 - 2.45	0.75 - 7.88	0.48 - 6.85	0.77 - 4.37
Castilleja parviflora			0.37 - 1.56	0.50 - 3.95	0.49 - 1.85	0.23 - 0.95
Elymus elymoides	0.25 - 3.00					
Erigeron aureus	0.38 - 3.00	0.85 - 2.78				0.08 - 0.10
Erigeron compositus	0.13 - 3.00					0.08 - 3.00
Erigeron peregrinus		0.08 - 3.00	0.18 - 1.43	0.44 - 3.47	0.21 - 0.81	0.15 - 0.50
Erysimum arenicola			0.03 - 0.30			
Festuca (brachyphylla, saximontana)	0.63 - 3.00	0.54 - 3.00	0.02 - 0.05			
Festuca roemeri			0.02 - 0.50		0.01 - 0.30	
Gentiana calycosa	0.38 - 2.33		0.05 - 1.23		0.15 - 3.80	0.08 - 0.35
Hieracium gracile		0.08 - 3.00	0.43 - 1.34	0.69 - 1.41	0.52 - 0.98	0.31 - 1.75
Juncus parryi			0.15 - 1.06	0.25 - 0.88	0.19 - 4.69	0.15 - 9.25
Lupinus (arcticus ssp. subalpinus, latifolius)	0.13 - 8.00		0.23 - 3.84	1.00 - 26.63	0.36 - 6.25	0.23 - 5.20
Lupinus sellulus var. lobbii	0.50 - 9.00	0.92 - 22.46	0.08 - 7.80			0.62 - 7.87
Luzula (comosa, multiflora)		0.08 - 3.00	0.17 - 0.81	0.44 - 1.33	0.16 - 0.41	0.15 - 0.50
Luzula glabrata			0.14 - 3.11	0.13 - 5.50	0.13 - 1.97	
Luzula spicata	0.38 - 3.00	0.38 - 3.00	0.03 - 0.08		0.01 - 1.00	
Minuartia obtusiloba	0.50 - 6.00	0.46 - 3.00				
Minuartia rubella	0.75 - 2.67	0.38 - 3.00				
Mitella breweri					0.01 - 3.00	
Oreostemma alpigenum	0.25 - 3.00	0.54 - 4.71	0.12 - 2.47		0.15 - 7.73	0.77 - 4.85
Pedicularis bracteosa			0.05 - 3.00	0.06 - 1.00		
Pedicularis contorta	0.38 - 2.33	0.62 - 3.00	0.09 - 3.00		0.07 - 12.29	0.08 - 3.00
Penstemon procerus	1.00 - 2.75	0.38 - 3.00	0.02 - 0.10		0.01 - 0.50	0.15 - 1.75
Phacelia sericea						
Phleum alpinum	0.13 - 3.00		0.02 - 0.10		0.01 - 1.00	0.23 - 0.75
Phlox diffusa	0.63 - 7.40	0.38 - 2.46	0.18 - 0.78	0.19 - 1.20	0.09 - 4.39	0.31 - 4.13
Polygonum bistortoides	0.13 - 3.00	0.15 - 3.00	0.28 - 1.48	0.50 - 6.38	0.59 - 2.59	0.38 - 2.00
Potentilla diversifolia	0.38 - 3.00	0.46 - 3.00	0.02 - 0.28			0.08 - 0.05
Potentilla flabellifolia		0.08 - 3.00	0.12 - 6.38	0.19 - 11.33	0.17 - 5.12	0.31 - 4.75
Rubus lasiococcus					0.01 - 0.50	
Silene parryi	0.13 - 3.00	0.23 - 3.00	0.05 - 0.50		0.02 - 8.00	0.08 - 0.10
Smelowskia calycina						
Solidago multiradiata		0.08 - 0.75	0.03 - 0.50			
Solidago simplex	0.88 - 3.00	0.46 - 3.00				
Trisetum spicatum	0.88 - 2.71	0.31 - 3.00	0.05 - 0.50	0.25 - 2.03	0.03 - 0.17	
Vahlodea atropurpurea			0.18 - 1.13	0.44 - 1.30	0.34 - 2.21	
Valeriana sitchensis			0.05 - 2.03	0.19 - 1.67	0.16 - 4.28	
Veratrum viride				0.13 - 0.75	0.05 - 3.02	
Veronica cusickii		0.23 - 3.00	0.28 - 2.43	0.31 - 3.46	0.25 - 4.10	0.54 - 3.04
Viola orbiculata					0.01 - 1.00	
Xerophyllum tenax			0.06 - 1.65	0.06 - 1.00	0.09 - 6.03	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Polar and High Montane Class: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath Group.

Species / Association	PHYEMP-CASMER lithomorphi	SORSIT/PHYEMP-VACDEL	VACMEM-PHYEMP	VACDEL	VACMEM-VACDEL
plots	2	4	7	52	6
TREES					
Abies amabilis		0.50 - 1.00	0.29 - 4.30	0.02 - 3.00	0.17 - 3.30
Abies grandis					
Abies lasiocarpa	0.50 - 0.10		0.43 - 5.93	0.38 - 3.52	0.50 - 4.33
Abies procera					
Chamaecyparis nootkatensis		0.25 - 3.00	0.29 - 2.50	0.10 - 2.80	
Larix lyallii					
Picea engelmannii					
Picea sitchensis					
Pinus albicaulis					
Pinus contorta					
Pinus monticola			0.29 - 0.30	0.02 - 1.00	
Pinus ponderosa					
Pseudotsuga menziesii					
Taxus brevifolia					
Thuja plicata					0.17 - 1.00
Tsuga heterophylla					
Tsuga mertensiana		0.50 - 2.00	0.29 - 7.15	0.10 - 3.78	0.33 - 2.50
SHRUBS					
Arctostaphylos uva-ursi					
Cassiope mertensiana	1.00 - 3.00		0.57 - 12.13	0.10 - 4.30	
Dasiphora floribunda					
Empetrum nigrum					
Juniperus communis			0.14 - 3.00	0.15 - 2.70	0.33 - 8.00
Kalmia microphylla					
Ledum groenlandicum					
Luetkea pectinata	1.00 - 3.00	0.75 - 1.00	0.71 - 4.20	0.46 - 5.42	0.33 - 8.25
Paxistima myrsinites			0.29 - 1.75	0.06 - 2.03	
Phyllodoce empetriformis	1.00 - 1.75	1.00 - 43.25	0.86 - 41.92	0.48 - 3.22	0.67 - 25.78
Phyllodoce glanduliflora					
Rhododendron albiflorum			0.14 - 15.00	0.06 - 7.83	0.17 - 0.50
Sorbus sitchensis		1.00 - 37.50	0.14 - 2.00	0.23 - 1.01	0.17 - 0.50
Spiraea splendens				0.13 - 6.86	0.33 - 26.75
Vaccinium deliciosum		1.00 - 27.00	0.14 - 4.00	1.00 - 48.19	1.00 - 32.00
Vaccinium membranaceum		0.50 - 5.50	1.00 - 28.50	0.10 - 2.80	1.00 - 32.42
Vaccinium scoparium				0.04 - 9.00	
HERBACEOUS					
Achillea millefolium			0.14 - 0.50	0.13 - 5.86	0.17 - 3.00
Anemone drummondii				0.02 - 15.00	
Antennaria alpina			0.14 - 0.30		
Antennaria microphylla				0.02 - 0.50	0.17 - 0.50
Arenaria capillaris				0.10 - 18.20	
Arnica latifolia		0.75 - 1.67	0.29 - 7.75	0.31 - 3.83	0.33 - 3.00
Artemisia furcata					
Campanula rotundifolia				0.02 - 3.00	
Carex nigricans		0.25 - 1.00		0.15 - 2.00	0.17 - 0.30
Carex phaeocephala			0.14 - 0.30		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Polar and High Montane Class: North Pacific Alpine-Subalpine Dwarf-shrubland and Heath Group.

Species / Association	PHYEMP-CASMER lithomorphi	SORSIT/PHYEMP-VACDEL	VACMEM-PHYEMP	VACDEL	VACMEM-VACDEL
plots	2	4	7	52	6
Carex spectabilis	0.50 - 3.00	1.00 - 3.75	0.29 - 0.40	0.65 - 8.66	0.50 - 11.33
Castilleja parviflora	1.00 - 1.75		0.14 - 0.50	0.02 - 1.00	0.33 - 0.50
Elymus elymoides					
Erigeron aureus					
Erigeron compositus					
Erigeron peregrinus	0.50 - 15.50	0.50 - 1.00	0.14 - 2.00	0.42 - 3.27	0.50 - 7.17
Erysimum arenicola				0.04 - 0.30	0.17 - 0.10
Festuca (brachyphylla, saximontana)				0.02 - 0.50	
Festuca roemeri				0.02 - 15.50	0.17 - 0.50
Gentiana calycosa				0.31 - 2.09	0.50 - 2.17
Hieracium gracile	0.50 - 0.50	0.50 - 1.00	0.29 - 0.40	0.75 - 1.40	0.50 - 0.23
Juncus parryi			0.43 - 0.67	0.29 - 5.35	
Lupinus (arcticus ssp. subalpinus, latifolius)		0.25 - 1.00	0.14 - 5.00	0.75 - 11.28	0.83 - 17.20
Lupinus sellulus var. lobbii					
Luzula (comosa, multiflora)				0.44 - 0.87	0.50 - 0.23
Luzula glabrata		0.50 - 2.00		0.13 - 4.43	0.17 - 13.00
Luzula spicata					0.17 - 0.10
Minuartia obtusiloba					
Minuartia rubella					
Mitella breweri		1.00 - 1.00			0.17 - 1.00
Oreostemma alpigenum				0.02 - 13.00	
Pedicularis bracteosa		0.50 - 1.00		0.08 - 1.70	
Pedicularis contorta				0.06 - 3.33	
Penstemon procerus			0.14 - 0.30	0.02 - 0.50	
Phacelia sericea					
Phleum alpinum	0.50 - 0.50			0.13 - 3.01	0.50 - 0.37
Phlox diffusa	0.50 - 0.50		0.14 - 2.00	0.31 - 3.44	0.17 - 3.00
Polygonum bistortoides		1.00 - 3.25	0.29 - 1.75	0.88 - 3.94	0.67 - 5.50
Potentilla diversifolia					
Potentilla flabellifolia		0.25 - 1.00		0.15 - 4.88	0.17 - 3.00
Rubus lasiococcus			0.14 - 4.00	0.06 - 11.33	
Silene parryi			0.14 - 0.50	0.19 - 1.01	0.33 - 0.30
Smelowskia calycina					
Solidago multiradiata					
Solidago simplex					
Trisetum spicatum	1.00 - 0.50	0.25 - 1.00	0.29 - 0.40	0.25 - 1.21	0.50 - 0.37
Vahlodea atropurpurea	0.50 - 0.50	0.75 - 1.00	0.14 - 0.30	0.35 - 1.29	0.50 - 1.27
Valeriana sitchensis		1.00 - 5.00	0.14 - 8.00	0.48 - 4.06	0.67 - 5.50
Veratrum viride		1.00 - 3.75		0.19 - 3.79	0.17 - 1.00
Veronica cusickii	1.00 - 0.50		0.14 - 0.50	0.60 - 1.80	0.33 - 0.30
Viola orbiculata		0.50 - 1.00		0.02 - 3.00	
Xerophyllum tenax			0.14 - 2.00	0.21 - 18.82	0.17 - 15.50

Appendix C. Synthesis tables of associations with species constancy and average cover.
Polar and High Montane Class: North Pacific Alpine Herbaceous Meadow Group.

Species / Association	CARBRE	CARPHA	FESBRA	FESROE-(PHLDIF-ARECAP)	PHLDIF-LUPSEL-(PEDCON)	SELWAL-(FESROE, FESBRA)
plots	1	6	2	52	15	10
SHRUBS						
Arctostaphylos nevadensis						
Arctostaphylos uva-ursi					0.13 - 3.00	
Dasiphora floribunda				0.04 - 10.00	0.13 - 3.00	0.70 - 2.30
Juniperus communis		0.17 - 8.00	0.50 - 3.00	0.08 - 1.15		0.40 - 2.50
Phyllodoce empetriformis						
HERBACEOUS						
Achillea millefolium		0.83 - 1.06	0.50 - 3.00	0.87 - 3.32	0.47 - 7.79	0.50 - 1.50
Achillea millefolium var. alpicola				0.08 - 4.00		0.40 - 0.95
Agoseris		0.33 - 0.30		0.77 - 2.30		
Agoseris glauca				0.15 - 4.04	0.67 - 2.75	
Allium cernuum				0.08 - 1.05		0.50 - 0.16
Allium crenulatum				0.29 - 4.95		0.50 - 4.99
Antennaria alpina	1.00 - 0.40	0.33 - 1.65			0.13 - 1.60	
Antennaria lanata				0.02 - 0.50	0.27 - 9.00	
Antennaria microphylla		0.50 - 0.37	0.50 - 0.50	0.44 - 0.69		
Antennaria umbrinella				0.04 - 11.05		0.40 - 0.42
Arenaria capillaris		0.17 - 0.30	0.50 - 3.00	0.77 - 6.31	0.80 - 6.00	0.50 - 1.48
Artemisia furcata		0.17 - 10.00			0.47 - 8.14	
Bromus sitchensis		0.17 - 0.50		0.15 - 1.09		
Calamagrostis stricta ssp. inexpansa						0.40 - 0.10
Campanula rotundifolia		0.17 - 0.50	0.50 - 0.50	0.54 - 3.32	0.27 - 3.00	0.50 - 0.62
Carex breweri	1.00 - 28.20		0.50 - 0.05			
Carex phaeocephala		1.00 - 13.67	0.50 - 0.30	0.44 - 2.23	0.80 - 7.77	0.50 - 0.32
Carex pseudoscirpoidea						
Carex spectabilis				0.06 - 6.20	0.73 - 14.35	
Collinsia parviflora			0.50 - 0.10	0.08 - 0.20		0.60 - 0.35
Danthonia intermedia			0.50 - 0.50	0.40 - 2.96		
Douglasia laevigata		0.50 - 2.17		0.06 - 1.33	0.07 - 0.50	0.40 - 2.21
Elymus elymoides		0.17 - 0.10		0.06 - 0.23	0.07 - 0.10	0.40 - 0.09
Erigeron aureus	1.00 - 11.40	0.17 - 3.00			0.73 - 5.00	
Erigeron compositus		0.33 - 1.65			0.07 - 3.00	0.80 - 0.20
Erysimum arenicola		0.50 - 0.30		0.33 - 0.44	0.07 - 0.50	
Festuca (brachyphylla, saximontana)		0.33 - 1.55	1.00 - 8.92		0.27 - 2.30	0.90 - 1.43
Festuca roemeri		0.17 - 0.30		1.00 - 21.57		0.90 - 3.49
Festuca viridula						
Geum triflorum var. campanulatum			0.50 - 3.00	0.38 - 2.60		0.90 - 3.24
Heracleum maximum						
Hydrophyllum fendleri				0.13 - 10.80		
Juncus parryi		0.17 - 0.30		0.08 - 6.18		
Koeleria macrantha				0.06 - 0.37		
Lomatium martindalei		0.33 - 0.75		0.33 - 3.44	0.07 - 3.00	0.10 - 0.50
Lomatium nudicaule				0.38 - 3.07		0.10 - 0.10
Lupinus (arcticus ssp. subalpinus, latifolius)		0.17 - 1.00		0.38 - 11.52		
Lupinus sellulus var. lobbii	1.00 - 24.40		1.00 - 0.35	0.08 - 1.65	1.00 - 18.59	0.60 - 1.60
Luzula glabrata		0.17 - 10.00				
Luzula spicata	1.00 - 0.60	0.33 - 0.55	0.50 - 0.10	0.06 - 1.20	0.33 - 2.50	0.40 - 1.15
Minuartia rubella		0.17 - 3.00		0.17 - 1.16	0.27 - 3.00	0.40 - 0.36
Oreostemma alpigenum		0.17 - 3.00		0.08 - 1.30	0.60 - 9.44	
Orthocarpus imbricatus				0.40 - 1.99		
Oxytropis campestris				0.02 - 0.60		0.40 - 1.83
Oxytropis monticola			0.50 - 0.50	0.19 - 2.50		0.50 - 1.50
Pedicularis contorta					0.87 - 12.23	
Penstemon procerus		0.17 - 3.00	0.50 - 0.50	0.23 - 6.06	0.80 - 3.27	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Polar and High Montane Class: North Pacific Alpine Herbaceous Meadow Group.

Species / Association	CARBRE	CARPHA	FESBRA	FESROE-(PHLDIF-ARECAP)	PHLDIF-LUPSEL-(PEDCON)	SELWAL-(FESROE, FESBRA)
plots	1	6	2	52	15	10
Phacelia hastata		0.17 - 3.00		0.21 - 1.34		
Phacelia sericea		0.50 - 1.13		0.06 - 0.23	0.07 - 0.50	0.40 - 0.11
Phleum alpinum		0.17 - 1.00		0.13 - 1.81	0.47 - 3.00	
Phlox diffusa		0.83 - 2.80	0.50 - 3.00	0.88 - 17.94	1.00 - 20.80	0.90 - 4.96
Poa secunda			0.50 - 0.10	0.21 - 0.28	0.13 - 1.75	0.60 - 0.33
Polygonum bistortoides		0.17 - 3.00		0.48 - 1.85	0.27 - 6.00	
Potentilla flabellifolia				0.06 - 1.50	0.53 - 6.00	
Pseudoroegneria spicata						
Saxifraga bronchialis		0.50 - 2.10				
Saxifraga caespitosa					0.07 - 0.50	0.40 - 0.26
Sedum divergens		0.67 - 0.98		0.02 - 1.00		
Selaginella wallacei				0.02 - 19.50		1.00 - 30.51
Sibbaldia procumbens	1.00 - 0.40				0.33 - 3.00	
Silene parryi		0.17 - 0.10	0.50 - 0.50	0.71 - 1.77	0.20 - 3.00	0.10 - 0.50
Smelowskia calycina					0.07 - 3.00	0.40 - 0.34
Solidago simplex var. nana					0.47 - 3.00	
Synthyris pinnatifida var. lanuginosa				0.02 - 15.50	0.07 - 0.50	0.60 - 0.95
Trisetum spicatum		0.33 - 0.30		0.21 - 1.86	0.47 - 6.43	
Valeriana sitchensis				0.04 - 0.50		
Veratrum viride				0.04 - 1.55		
Veronica cusickii		0.17 - 1.00		0.08 - 5.40	0.60 - 10.56	
Viola adunca		0.17 - 0.10	0.50 - 0.10	0.46 - 1.34		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	ACECIR-(HOLDIS) lithomorphic	CAMPIP lithomorphic	ATHAME-CRYACR	CARSPE lithomorphic	CARSPE-(PHYGLA-LUPSEL)
plots	4	6	3	22	2
TREES					
Abies lasiocarpa				0.18 - 0.60	
SHRUBS					
Acer circinatum	1.00 - 2.25				
Cassiope mertensiana				0.09 - 0.20	
Dasiphora floribunda					
Holodiscus discolor	0.75 - 4.00				
Juniperus communis		0.17 - 3.00		0.05 - 0.50	
Luetkea pectinata			0.67 - 1.00	0.50 - 2.27	0.50 - 3.00
Paxistima myrsinites		0.50 - 2.03			
Penstemon davidsonii	0.25 - 0.30	0.33 - 1.75		0.05 - 0.50	0.50 - 1.40
Petrophyton hendersonii		0.17 - 3.00			
Phyllodoce empetriformis			0.33 - 0.30	0.14 - 1.27	
Phyllodoce glanduliflora					1.00 - 3.88
Spiraea splendens			0.67 - 0.65	0.05 - 1.00	
Vaccinium deliciosum		0.33 - 0.50	0.33 - 0.30	0.09 - 0.40	
Vaccinium membranaceum				0.09 - 0.50	
HERBACEOUS					
Achillea millefolium	0.25 - 1.00	0.17 - 0.50		0.14 - 0.53	
Allium crenulatum				0.05 - 1.00	
Anaphalis margaritacea			0.67 - 1.00		
Anemone drummondii					
Antennaria microphylla				0.09 - 0.30	
Arenaria capillaris				0.27 - 0.97	
Arnica X diversifolia					
Astragalus cottonii					
Athyrium americanum			1.00 - 20.33		
Campanula piperi		1.00 - 5.08			
Campanula rotundifolia	0.25 - 2.00			0.18 - 0.30	
Carex nigricans				0.05 - 0.50	
Carex phaeocephala		0.17 - 0.50		0.09 - 0.30	
Carex spectabilis		0.17 - 3.00	0.67 - 0.65	1.00 - 2.84	1.00 - 0.93
Castilleja hispida					
Castilleja miniata		0.17 - 0.10		0.05 - 0.10	
Castilleja parviflora			0.33 - 3.00	0.23 - 0.60	
Cerastium arvense ssp. strictum					
Cryptogramma acrostichoides	0.50 - 0.65	0.17 - 0.10	1.00 - 0.77	0.14 - 0.37	
Delphinium glareosum			0.33 - 0.30	0.05 - 1.00	
Douglasia laevigata				0.18 - 0.53	
Elmera racemosa		0.17 - 0.10	0.67 - 4.50	0.09 - 1.75	
Elymus elymoides				0.05 - 0.10	
Epilobium anagallidifolium		0.33 - 0.30	1.00 - 1.33	0.27 - 0.43	
Erigeron aureus					0.50 - 0.35
Erigeron compositus					
Erigeron peregrinus		0.17 - 0.50			
Eriogonum pyrolifolium					
Erysimum arenicola				0.05 - 0.10	
Eucephalus paucicapitatus			0.67 - 1.65	0.23 - 0.92	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	ACECIR-(HOLDIS) lithomorphic	CAMPIP lithomorphic	ATHAME-CRYACR	CARSPE lithomorphic	CARSPE-(PHYGLA-LUPSEL)
plots	4	6	3	22	2
Festuca brachyphylla		0.17 - 0.10			0.50 - 1.00
Festuca roemeri		0.17 - 0.50		0.18 - 0.98	
Fragaria vesca					
Hedysarum occidentale				0.14 - 0.37	
Hieracium gracile		0.17 - 0.50	0.33 - 1.00	0.27 - 0.43	
Juncus drummondii				0.09 - 1.75	
Juncus mertensianus			0.67 - 0.65		
Juncus parryi			0.67 - 1.65	0.23 - 1.02	
Leptarrhena pyrolifolia			0.33 - 1.00		
Lomatium martindalei		0.33 - 0.10	0.33 - 0.30	0.36 - 0.94	
Luina hypoleuca					
Lupinus (arcticus ssp. subalpinus, latifolius)				0.45 - 3.20	
Lupinus sellulus var. lobbii		0.17 - 0.10		0.05 - 0.50	0.50 - 0.55
Luzula piperi			0.33 - 2.00	0.05 - 0.30	
Luzula spicata				0.05 - 0.10	
Minuartia obtusiloba					
Minuartia rubella					
Oreostemma alpigenum				0.05 - 0.50	
Packera flettii					
Parnassia fimbriata					
Penstemon procerus		0.17 - 0.50			0.50 - 0.20
Phacelia hastata				0.23 - 2.10	
Phacelia sericea		0.17 - 0.50	0.33 - 0.30		
Phlox diffusa		0.33 - 0.30		0.18 - 1.78	0.50 - 4.45
Poa cusickii				0.14 - 0.37	
Poa secunda		0.17 - 0.50		0.18 - 0.30	
Poa stenantha			0.33 - 1.00		
Polygonum bistortoides		0.17 - 0.50		0.55 - 0.97	0.50 - 0.50
Polygonum minimum					
Racomitrium elongatum	0.25 - 13.00				
Ranunculus eschscholtzii		0.17 - 0.50	0.33 - 1.00	0.18 - 2.38	
Saxifraga bronchialis		0.17 - 3.00			
Saxifraga tolmiei				0.14 - 0.37	
Sedum divergens	0.25 - 1.00			0.18 - 0.40	
Selaginella wallacei					
Senecio neowebsteri					
Silene parryi				0.14 - 0.50	
Smelowskia calycina					
Solidago multiradiata		0.17 - 0.50		0.05 - 3.00	
Solidago simplex					
Synthyris pinnatifida var. lanuginosa					
Trisetum spicatum			0.33 - 0.30	0.09 - 0.10	
Valeriana sitchensis	0.25 - 1.00		0.33 - 2.00	0.36 - 2.01	
Veronica cusickii		0.17 - 0.50		0.14 - 0.53	
Veronica wormskjoldii			0.33 - 5.00		
Viola adunca		0.33 - 0.30			
Viola flettii		0.50 - 0.37			

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	ELMRAC-(SENNEO) lithomorphic	VACDEL lithomorphic	DELGLA	LUPARC lithomorphic	ERIPYR lithomorphic
plots	19	3	23	2	4
TREES					
Abies lasiocarpa	0.11 - 2.65				
SHRUBS					
Acer circinatum					
Cassiope mertensiana					0.25 - 1.00
Dasiphora floribunda			0.13 - 1.20		
Holodiscus discolor					
Juniperus communis	0.05 - 1.00		0.04 - 3.00		
Luetkea pectinata	0.21 - 0.53		0.04 - 1.00		1.00 - 7.75
Paxistima myrsinites	0.11 - 0.75				
Penstemon davidsonii	0.21 - 1.35		0.13 - 2.17	0.50 - 0.50	
Petrophyton hendersonii					
Phyllodoce empetriformis					0.25 - 1.00
Phyllodoce glanduliflora					
Spiraea splendens		0.33 - 1.00			
Vaccinium deliciosum		1.00 - 3.00			
Vaccinium membranaceum				1.00 - 3.00	
HERBACEOUS					
Achillea millefolium	0.16 - 0.43	0.33 - 1.00	0.35 - 1.44		
Allium crenulatum			0.09 - 19.25		
Anaphalis margaritacea	0.11 - 1.65	0.33 - 3.00	0.04 - 0.50		
Anemone drummondii			0.09 - 1.75		
Antennaria microphylla	0.05 - 0.50	0.33 - 0.50	0.04 - 0.50		
Arenaria capillaris					
Arnica X diversifolia	0.05 - 3.00		0.04 - 3.00		
Astragalus cottonii					
Athyrium americanum	0.05 - 3.00				
Campanula piperi	0.05 - 0.10		0.04 - 0.50		
Campanula rotundifolia		0.33 - 0.50			
Carex nigricans		0.33 - 1.00			
Carex phaeocephala	0.16 - 0.87		0.09 - 0.30	0.50 - 0.50	
Carex spectabilis	0.42 - 1.76	0.67 - 3.00	0.04 - 3.00	0.50 - 0.50	0.25 - 3.00
Castilleja hispida					
Castilleja miniata	0.05 - 0.10		0.04 - 0.10		
Castilleja parviflora	0.05 - 0.10				0.50 - 5.50
Cerastium arvense ssp. strictum					
Cryptogramma acrostichoides	0.21 - 0.58		0.04 - 0.10		
Delphinium glareosum	0.21 - 0.40		1.00 - 11.17		
Douglasia laevigata	0.21 - 0.40		0.35 - 0.59		
Elmera racemosa	0.84 - 1.49		0.26 - 2.90		
Elymus elymoides	0.16 - 0.53		0.17 - 1.03		
Epilobium anagallidifolium	0.95 - 0.74	0.33 - 0.50	0.65 - 2.06		
Erigeron aureus					
Erigeron compositus			0.09 - 0.50		
Erigeron peregrinus	0.16 - 2.03	0.33 - 3.00	0.04 - 0.10	0.50 - 0.10	
Eriogonum pyrolifolium					1.00 - 8.25
Erysimum arenicola	0.11 - 0.50		0.39 - 0.28		
Eucephalus paucicapitatus	0.11 - 3.00		0.22 - 0.92		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	ELMRAC-(SENNEO) lithomorphic	VACDEL lithomorphic	DELGLA	LUPARC lithomorphic	ERIPYR lithomorphic
plots	19	3	23	2	4
Festuca brachyphylla			0.04 - 0.10		
Festuca roemeri					
Fragaria vesca					
Hedysarum occidentale					
Hieracium gracile	0.26 - 0.52	0.67 - 0.50			0.50 - 1.00
Juncus drummondii		0.33 - 1.00			
Juncus mertensianus	0.11 - 0.20				
Juncus parryi	0.16 - 1.13				0.75 - 1.00
Leptarrhena pyrolifolia					
Lomatium martindalei	0.32 - 0.30		0.70 - 1.04		0.25 - 3.00
Luina hypoleuca					
Lupinus (arcticus ssp. subalpinus, latifolius)	0.05 - 0.10	0.33 - 1.00	0.04 - 2.00	1.00 - 1.75	1.00 - 5.50
Lupinus sellulus var. lobbii	0.05 - 0.10				
Luzula piperi	0.05 - 0.30				
Luzula spicata					
Minuartia obtusiloba					
Minuartia rubella					
Oreostemma alpigenum		0.33 - 0.10			1.00 - 2.00
Packera flettii	0.16 - 0.37		0.30 - 0.69		
Parnassia fimbriata					
Penstemon procerus			0.04 - 0.50		
Phacelia hastata	0.21 - 1.13		0.39 - 6.03		
Phacelia sericea	0.05 - 0.30		0.26 - 0.30		
Phlox diffusa	0.32 - 0.72	0.33 - 0.50	0.17 - 0.40		
Poa cusickii	0.37 - 0.33		0.13 - 1.13		
Poa secunda	0.26 - 0.36				
Poa stenantha					
Polygonum bistortoides	0.11 - 0.50	0.67 - 3.00	0.04 - 0.10		0.75 - 1.67
Polygonum minimum					
Racomitrium elongatum					
Ranunculus eschscholtzii	0.05 - 0.50				
Saxifraga bronchialis	0.05 - 3.00		0.13 - 0.37		
Saxifraga tolmiei	0.05 - 3.00				
Sedum divergens	0.42 - 0.36		0.13 - 0.67		
Selaginella wallacei					
Senecio neowebsteri	0.53 - 2.50		0.35 - 4.00		
Silene parryi			0.04 - 3.00		
Smelowskia calycina			0.04 - 0.50		
Solidago multiradiata	0.05 - 0.10		0.09 - 0.10		
Solidago simplex					
Synthyris pinnatifida var. lanuginosa					
Trisetum spicatum	0.21 - 0.38				
Valeriana sitchensis	0.21 - 0.50	0.33 - 1.00	0.04 - 0.50		
Veronica cusickii	0.11 - 0.30	0.67 - 0.30			
Veronica wormskjoldii					
Viola adunca	0.05 - 0.50		0.04 - 0.10		
Viola flettii			0.04 - 0.50		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	LEPPRY lithomorphic	LUPSEL-(ERIAUR-MINOBT)	PAXMYR/ SEDDIV	ARNXDIV lithomorphic	ASTCOT lithomorphic
plots	3	21	13	5	48
TREES					
Abies lasiocarpa		0.10 - 3.00	0.08 - 0.50	0.60 - 1.20	0.02 - 0.50
SHRUBS					
Acer circinatum					
Cassiope mertensiana					
Dasiphora floribunda		0.38 - 4.19	0.08 - 0.50		0.25 - 1.75
Holodiscus discolor					
Juniperus communis		0.05 - 3.00	0.23 - 0.50		0.04 - 4.00
Luetkea pectinata	0.33 - 0.50	0.14 - 2.05	0.08 - 0.50	0.20 - 3.00	
Paxistima myrsinites			1.00 - 2.58		0.02 - 0.50
Penstemon davidsonii		0.33 - 2.60	0.62 - 1.03	0.20 - 0.50	0.10 - 1.00
Petrophyton hendersonii			0.23 - 1.33		0.02 - 1.00
Phyllodoce empetriformis	0.67 - 0.40				
Phyllodoce glanduliflora		0.05 - 3.00			
Spiraea splendens					
Vaccinium deliciosum			0.08 - 3.00		
Vaccinium membranaceum			0.15 - 0.50		
HERBACEOUS					
Achillea millefolium		0.38 - 1.44	0.38 - 0.42	1.00 - 1.00	0.50 - 1.00
Allium crenulatum			0.08 - 0.10	0.20 - 0.10	0.29 - 1.13
Anaphalis margaritacea			0.15 - 0.30		
Anemone drummondii		0.38 - 2.33		0.20 - 0.50	0.15 - 0.39
Antennaria microphylla		0.19 - 1.03	0.46 - 0.50		0.04 - 0.50
Arenaria capillaris		0.14 - 2.17		0.20 - 0.10	
Arnica X diversifolia			0.08 - 0.10	1.00 - 5.50	
Astragalus cottonii					1.00 - 3.46
Athyrium americanum					
Campanula piperi		0.05 - 0.50	0.15 - 0.50	0.20 - 0.50	0.29 - 0.50
Campanula rotundifolia		0.10 - 1.75			0.10 - 0.34
Carex nigricans	0.67 - 0.40	0.10 - 9.00			
Carex phaeocephala		0.81 - 3.16	0.08 - 0.50	0.40 - 0.50	
Carex spectabilis	0.67 - 1.65	0.24 - 2.39	0.15 - 0.30	0.20 - 0.50	
Castilleja hispida			0.23 - 0.50		0.02 - 0.10
Castilleja miniata		0.10 - 3.00	0.54 - 0.39	0.40 - 0.50	0.02 - 0.50
Castilleja parviflora					
Cerastium arvense ssp. strictum		0.05 - 0.50			0.02 - 0.50
Cryptogramma acrostichoides		0.05 - 3.00	0.85 - 0.43	0.20 - 0.10	
Delphinium glareosum		0.05 - 3.00		0.40 - 0.30	
Douglasia laevigata		0.10 - 0.50	0.62 - 0.81	0.80 - 1.13	0.19 - 0.46
Elmera racemosa	0.33 - 1.00			0.20 - 0.50	
Elymus elymoides		0.14 - 3.00	0.54 - 0.27	0.40 - 0.30	0.40 - 0.35
Epilobium anagallidifolium	1.00 - 1.50	0.10 - 3.00	0.38 - 0.42	0.40 - 0.30	0.06 - 0.50
Erigeron aureus		0.57 - 4.75			
Erigeron compositus		0.24 - 1.00	0.15 - 0.30		0.38 - 0.46
Erigeron peregrinus	0.67 - 3.00				
Eriogonum pyrolifolium		0.14 - 3.00			
Erysimum arenicola		0.10 - 0.30	0.69 - 0.73	0.20 - 0.50	0.25 - 0.23
Eucephalus paucicapitatus			0.38 - 0.50		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	LEPPRY lithomorphic	LUPSEL-(ERIAUR-MINOBT)	PAXMYR/ SEDDIV	ARNXDIV lithomorphic	ASTCOT lithomorphic
plots	3	21	13	5	48
Festuca brachyphylla		0.62 - 2.12		0.20 - 0.10	0.04 - 0.50
Festuca roemeri		0.10 - 1.75			0.35 - 1.36
Fragaria vesca					
Hedysarum occidentale			0.23 - 1.33		0.19 - 0.73
Hieracium gracile		0.05 - 3.00	0.08 - 0.50		
Juncus drummondii	0.67 - 1.25				
Juncus mertensianus	0.67 - 1.25				
Juncus parryi		0.10 - 3.00	0.08 - 0.50	0.20 - 0.50	
Leptarrhena pyrolifolia	1.00 - 11.17				
Lomatium martindalei		0.14 - 2.33	0.38 - 0.50	0.60 - 1.33	0.31 - 0.42
Luina hypoleuca		0.05 - 3.00	0.38 - 1.34		
Lupinus (arcticus ssp. subalpinus, latifolius)			0.23 - 1.33		0.02 - 0.10
Lupinus sellulus var. lobbii		1.00 - 15.58			0.10 - 0.50
Luzula piperi	0.33 - 2.00	0.05 - 3.00			
Luzula spicata		0.48 - 2.75		0.20 - 0.50	
Minuartia obtusiloba		0.67 - 7.29			
Minuartia rubella		0.29 - 2.17			0.02 - 0.50
Oreostemma alpigenum		0.05 - 3.00			
Packera flettii			0.08 - 0.50	0.40 - 0.30	
Parnassia fimbriata	0.67 - 1.65				
Penstemon procerus		0.57 - 3.95	0.08 - 0.50		
Phacelia hastata			0.46 - 1.20		0.21 - 0.71
Phacelia sericea		0.10 - 3.00	0.23 - 0.23		0.44 - 0.49
Phlox diffusa	0.33 - 0.50	0.48 - 3.50	1.00 - 2.62	0.60 - 0.37	0.71 - 1.75
Poa cusickii		0.05 - 3.00	0.08 - 0.10	0.40 - 0.50	
Poa secunda	0.33 - 3.00	0.29 - 2.17	0.38 - 0.34	0.60 - 0.23	0.04 - 0.30
Poa stenantha					
Polygonum bistortoides					
Polygonum minimum			0.08 - 0.50		
Racomitrium elongatum					
Ranunculus eschscholtzii	0.67 - 1.65				
Saxifraga bronchialis		0.10 - 3.00	0.62 - 1.70	0.40 - 8.00	0.04 - 0.50
Saxifraga tolmiei					
Sedum divergens		0.05 - 1.00	0.85 - 3.87	0.40 - 1.75	0.02 - 0.50
Selaginella wallacei			0.08 - 0.50		
Senecio neowebsteri				0.60 - 0.37	
Silene parryi		0.05 - 0.10	0.31 - 1.13	0.40 - 0.30	
Smelowskia calycina		0.19 - 1.13			
Solidago multiradiata	0.33 - 0.50	0.29 - 4.67	0.31 - 1.03	0.20 - 0.50	
Solidago simplex		0.43 - 3.00			
Synthyris pinnatifida var. lanuginosa		0.24 - 7.00			
Trisetum spicatum		0.29 - 2.04	0.31 - 0.20	0.20 - 0.50	0.02 - 0.50
Valeriana sitchensis					
Veronica cusickii	0.33 - 0.50				
Veronica wormskjoldii	0.67 - 1.25				
Viola adunca		0.05 - 0.50	0.54 - 0.33	0.20 - 0.10	0.10 - 0.26
Viola flettii					0.06 - 0.37

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	DASFLO lithomorphic	DASFLO-(PHLDIF)	JUNCOM lithomorphic	LUIHYP	PENDAV lithomorphic
plots	14	11	25	11	15
TREES					
Abies lasiocarpa	0.07 - 3.00	0.09 - 1.00	0.24 - 1.52	0.09 - 0.30	0.13 - 1.75
SHRUBS					
Acer circinatum					
Cassiope mertensiana			0.04 - 0.30		
Dasiphora floribunda	1.00 - 2.89	1.00 - 22.18	0.32 - 0.98		
Holodiscus discolor					
Juniperus communis	0.29 - 2.38	0.36 - 1.03	1.00 - 5.50	0.09 - 0.50	0.33 - 1.50
Luetkea pectinata			0.20 - 0.98	0.09 - 5.00	0.13 - 9.25
Paxistima myrsinites		0.09 - 0.50	0.20 - 1.50	0.55 - 1.68	0.13 - 0.50
Penstemon davidsonii	0.29 - 0.40		0.64 - 1.21	0.45 - 0.92	1.00 - 6.18
Petrophyton hendersonii				0.09 - 3.00	
Phyllodoce empetriformis			0.04 - 1.00		
Phyllodoce glanduliflora		0.09 - 1.00			
Spiraea splendens					0.07 - 3.00
Vaccinium deliciosum					0.07 - 0.50
Vaccinium membranaceum		0.09 - 0.50	0.08 - 1.75		0.40 - 1.27
HERBACEOUS					
Achillea millefolium	0.86 - 0.47	0.82 - 5.78	0.68 - 1.39	0.64 - 1.87	0.33 - 1.00
Allium crenulatum	0.07 - 0.10		0.16 - 0.93	0.55 - 1.07	0.13 - 0.50
Anaphalis margaritacea			0.04 - 5.00	0.27 - 0.43	0.07 - 0.50
Anemone drummondii	0.36 - 0.92	0.45 - 1.00	0.04 - 0.30	0.09 - 0.10	0.07 - 0.50
Antennaria microphylla	0.50 - 0.39	0.45 - 1.00	0.40 - 0.36	0.09 - 0.50	0.33 - 0.42
Arenaria capillaris	0.07 - 0.10	0.09 - 1.00	0.12 - 0.37	0.09 - 3.00	
Arnica X diversifolia			0.08 - 1.55		
Astragalus cottonii	0.14 - 0.50				
Athyrium americanum					
Campanula piperi	0.14 - 0.30		0.32 - 0.40	0.18 - 0.50	0.13 - 1.75
Campanula rotundifolia	0.07 - 0.50		0.08 - 0.20		
Carex nigricans		0.09 - 15.00			
Carex phaeocephala	0.43 - 0.37	0.64 - 0.80	0.36 - 0.71		0.40 - 0.37
Carex spectabilis		0.18 - 0.50	0.04 - 0.30	0.09 - 0.30	0.07 - 0.50
Castilleja hispida			0.04 - 3.00	0.45 - 1.00	0.13 - 0.30
Castilleja miniata			0.16 - 0.93	0.36 - 0.40	0.07 - 0.10
Castilleja parviflora					
Cerastium arvense ssp. strictum	0.29 - 0.30		0.04 - 1.00		
Cryptogramma acrostichoides	0.07 - 0.50		0.24 - 0.72	0.55 - 0.45	0.20 - 0.23
Delphinium glareosum	0.21 - 0.37		0.08 - 0.20		
Douglasia laevigata	0.36 - 1.00		0.64 - 1.70	0.45 - 2.00	0.60 - 1.06
Elmera racemosa			0.04 - 0.10	0.09 - 1.00	
Elymus elymoides	0.71 - 0.26	0.73 - 1.19	0.44 - 0.34	0.45 - 0.34	0.47 - 0.44
Epilobium anagallidifolium	0.21 - 0.37		0.28 - 0.30	0.27 - 1.37	0.20 - 1.33
Erigeron aureus		0.09 - 3.00			
Erigeron compositus	0.93 - 0.94	0.55 - 1.33	0.36 - 0.46	0.09 - 0.10	0.07 - 0.10
Erigeron peregrinus			0.04 - 0.30		
Eriogonum pyrolifolium					
Erysimum arenicola	0.50 - 0.21	0.45 - 0.34	0.48 - 0.68	0.27 - 0.23	0.53 - 0.45
Eucephalus paucicapitatus			0.08 - 0.30	0.45 - 1.88	0.20 - 0.10

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	DASFLO lithomorphic	DASFLO-(PHLDIF)	JUNCOM lithomorphic	LUIHYP	PENDAV lithomorphic
plots	14	11	25	11	15
Festuca brachyphylla	0.43 - 0.85	0.55 - 0.72	0.52 - 0.30		0.33 - 0.34
Festuca roemeri	0.43 - 0.29	0.36 - 4.25	0.08 - 1.75	0.09 - 3.00	0.07 - 0.50
Fragaria vesca					
Hedysarum occidentale	0.07 - 0.50		0.04 - 0.50	0.27 - 3.00	0.13 - 0.50
Hieracium gracile			0.04 - 0.10		0.13 - 0.30
Juncus drummondii				0.09 - 0.30	
Juncus mertensianus					
Juncus parryi			0.08 - 3.00	0.18 - 0.10	0.07 - 0.50
Leptarrhena pyrolifolia					
Lomatium martindalei	0.14 - 0.10		0.52 - 0.33	0.64 - 1.57	0.53 - 0.45
Luina hypoleuca			0.12 - 2.17	1.00 - 14.32	0.07 - 0.10
Lupinus (arcticus ssp. subalpinus, latifolius)			0.24 - 0.97	0.36 - 1.65	0.33 - 0.42
Lupinus sellulus var. lobbii	0.21 - 0.27	0.18 - 8.00	0.04 - 0.50		0.13 - 3.00
Luzula piperi					
Luzula spicata	0.43 - 0.43	0.45 - 1.00	0.20 - 0.30		0.13 - 0.50
Minuartia obtusiloba	0.29 - 2.38	0.45 - 3.40			0.07 - 3.00
Minuartia rubella	0.21 - 0.50	0.45 - 1.50			
Oreostemma alpigenum					
Packera flettii			0.12 - 0.17	0.36 - 4.78	
Parnassia fimbriata					
Penstemon procerus	0.21 - 0.50		0.08 - 0.40	0.09 - 0.50	0.13 - 1.75
Phacelia hastata			0.08 - 0.30	0.36 - 1.75	0.13 - 1.75
Phacelia sericea	0.79 - 0.49	0.55 - 0.92	0.32 - 0.61	0.09 - 0.10	0.13 - 0.50
Phlox diffusa	0.93 - 1.73		0.80 - 2.28	0.82 - 10.78	0.87 - 1.85
Poa cusickii	0.07 - 0.10	0.82 - 5.22	0.32 - 0.30	0.09 - 0.50	0.13 - 0.50
Poa secunda	0.57 - 0.46		0.24 - 0.85	0.27 - 1.20	0.13 - 0.30
Poa stenantha					
Polygonum bistortoides				0.18 - 0.50	0.13 - 0.30
Polygonum minimum				0.09 - 0.10	
Racomitrium elongatum					
Ranunculus eschscholtzii					
Saxifraga bronchialis	0.29 - 0.63		0.68 - 2.45	0.27 - 1.33	0.13 - 1.75
Saxifraga tolmiei					
Sedum divergens	0.14 - 0.30		0.56 - 1.28	0.64 - 1.57	0.47 - 0.74
Selaginella wallacei	0.14 - 0.75				
Senecio neowebsteri	0.07 - 0.50				0.07 - 0.50
Silene parryi		0.45 - 0.60	0.08 - 2.05	0.64 - 1.21	0.27 - 0.30
Smelowskia calycina	0.64 - 1.21	0.55 - 3.42	0.24 - 0.85		
Solidago multiradiata	0.29 - 1.03	0.36 - 4.88	0.28 - 0.39	0.09 - 0.50	0.20 - 1.23
Solidago simplex		0.09 - 15.00			
Synthyris pinnatifida var. lanuginosa	0.43 - 1.61		0.04 - 0.50		0.07 - 3.00
Trisetum spicatum	0.14 - 0.50	0.27 - 0.37	0.48 - 0.45	0.36 - 0.98	0.07 - 0.10
Valeriana sitchensis				0.09 - 0.30	
Veronica cusickii			0.04 - 0.10		
Veronica wormskjoldii					
Viola adunca	0.21 - 0.23		0.40 - 0.26	0.45 - 0.10	0.07 - 0.50
Viola flettii	0.14 - 0.30		0.20 - 0.18		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	PETHEN	PHLDIF lithomorphic	SAXBRO lithomorphic	PHLDIF-ALLCRE lithomorphic	POASTE-CERARV
plots	4	21	3	11	1
TREES					
Abies lasiocarpa		0.05 - 0.10	0.33 - 0.50	0.09 - 0.50	1.00 - 0.30
SHRUBS					
Acer circinatum					
Cassiope mertensiana					
Dasiphora floribunda		0.10 - 0.50	0.33 - 0.50		
Holodiscus discolor					
Juniperus communis		0.14 - 0.50		0.18 - 0.30	
Luetkea pectinata		0.14 - 0.50		0.09 - 3.00	
Paxistima myrsinites	0.25 - 3.00	0.48 - 0.46		0.09 - 0.50	1.00 - 0.30
Penstemon davidsonii		0.29 - 0.50	0.67 - 0.50	0.09 - 0.50	1.00 - 0.30
Petrophyton hendersonii	1.00 - 12.38				
Phyllodoce empetriformis					
Phyllodoce glanduliflora					
Spiraea splendens		0.05 - 0.50			
Vaccinium deliciosum		0.05 - 0.10			
Vaccinium membranaceum		0.10 - 0.50	0.33 - 0.50		
HERBACEOUS					
Achillea millefolium		0.38 - 0.45	1.00 - 1.20	0.27 - 5.37	1.00 - 15.00
Allium crenulatum		0.24 - 0.34	0.33 - 0.10	0.91 - 4.63	1.00 - 0.30
Anaphalis margaritacea		0.05 - 3.00			
Anemone drummondii		0.14 - 0.37		0.18 - 0.08	
Antennaria microphylla		0.43 - 0.46	0.33 - 0.50	0.09 - 0.10	1.00 - 0.30
Arenaria capillaris		0.05 - 0.10		0.55 - 2.12	
Arnica X diversifolia		0.05 - 0.50			
Astragalus cottonii		0.05 - 0.50			
Athyrium americanum					
Campanula piperi		0.14 - 0.50	0.33 - 0.50	0.09 - 0.50	
Campanula rotundifolia		0.05 - 0.50		0.55 - 0.64	1.00 - 4.00
Carex nigricans	0.25 - 0.50				
Carex phaeocephala		0.14 - 0.37	0.33 - 0.50		
Carex spectabilis		0.05 - 0.50		0.09 - 0.50	1.00 - 3.00
Castilleja hispida	0.25 - 3.00	0.14 - 0.23			
Castilleja miniata	0.50 - 0.50	0.24 - 0.42		0.09 - 0.10	
Castilleja parviflora		0.05 - 0.50			
Cerastium arvense ssp. strictum					1.00 - 15.00
Cryptogramma acrostichoides	0.50 - 0.50	0.19 - 0.40	0.33 - 0.50		1.00 - 1.00
Delphinium glareosum		0.05 - 0.50			1.00 - 1.00
Douglasia laevigata	0.25 - 3.00	0.71 - 1.00	0.67 - 0.30	0.18 - 0.50	
Elmera racemosa		0.05 - 0.50			
Elymus elymoides		0.57 - 0.23	0.33 - 0.10	0.64 - 0.21	
Epilobium anagallidifolium	0.50 - 0.30	0.38 - 0.40		0.27 - 0.23	1.00 - 2.00
Erigeron aureus					
Erigeron compositus		0.24 - 0.76	0.67 - 0.50	0.36 - 0.23	
Erigeron peregrinus		0.05 - 0.50			1.00 - 1.00
Eriogonum pyrolifolium					
Erysimum arenicola	0.25 - 0.50	0.57 - 0.47	0.33 - 0.10	0.36 - 0.30	
Eucephalus paucicapitatus	0.25 - 0.50	0.24 - 0.42		0.36 - 0.30	

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	PETHEN	PHLDIF lithomorphic	SAXBRO lithomorphic	PHLDIF-ALLCRE lithomorphic	POASTE-CERARV
plots	4	21	3	11	1
Festuca brachyphylla	0.25 - 0.50	0.10 - 0.50	0.33 - 0.50	0.09 - 0.10	
Festuca roemeri		0.24 - 0.42		0.73 - 2.86	
Fragaria vesca					
Hedysarum occidentale	0.50 - 1.75	0.14 - 1.33		0.09 - 0.50	
Hieracium gracile		0.10 - 0.75			1.00 - 0.30
Juncus drummondii					
Juncus mertensianus					
Juncus parryi		0.05 - 0.50	0.33 - 0.10		1.00 - 3.00
Leptarrhena pyrolifolia					
Lomatium martindalei	0.25 - 0.50	0.62 - 0.47	0.67 - 0.30	0.73 - 1.37	1.00 - 1.00
Luina hypoleuca	0.25 - 0.50	0.19 - 1.65		0.45 - 0.84	
Lupinus (arcticus ssp. subalpinus, latifolius)		0.24 - 0.50			
Lupinus sellulus var. lobbii				0.18 - 0.50	
Luzula piperi					
Luzula spicata		0.05 - 0.10	0.33 - 0.50		
Minuartia obtusiloba				0.18 - 0.08	
Minuartia rubella			0.33 - 0.10		
Oreostemma alpigenum					
Packera flettii		0.10 - 0.30		0.09 - 0.10	
Parnassia fimbriata					
Penstemon procerus	0.25 - 0.50	0.33 - 0.80		0.09 - 3.00	
Phacelia hastata	0.50 - 0.30	0.38 - 1.44		0.45 - 1.50	1.00 - 1.00
Phacelia sericea		0.33 - 0.80	0.67 - 0.10	0.36 - 0.09	
Phlox diffusa	0.50 - 1.75	1.00 - 3.00	0.67 - 1.75	1.00 - 2.87	1.00 - 5.00
Poa cusickii		0.19 - 0.40	0.33 - 0.10	0.09 - 0.50	
Poa secunda	0.25 - 0.50	0.24 - 0.18	0.67 - 0.30	0.36 - 0.30	1.00 - 4.00
Poa stenantha					1.00 - 15.00
Polygonum bistortoides		0.14 - 0.50	0.33 - 0.10	0.09 - 3.00	1.00 - 1.00
Polygonum minimum		0.10 - 0.50			
Racomitrium elongatum					
Ranunculus eschscholtzii					1.00 - 1.00
Saxifraga bronchialis	0.50 - 1.75	0.24 - 0.50	1.00 - 3.00	0.27 - 0.43	
Saxifraga tolmiei					
Sedum divergens	0.50 - 0.30	0.48 - 1.25	0.67 - 1.55	0.45 - 1.42	1.00 - 1.00
Selaginella wallacei				0.36 - 0.09	
Senecio neowebsteri					
Silene parryi		0.19 - 0.40	0.33 - 0.10	0.45 - 0.34	1.00 - 1.00
Smelowskia calycina		0.10 - 0.50		0.18 - 0.08	
Solidago multiradiata		0.14 - 0.50		0.09 - 0.10	
Solidago simplex					
Synthyris pinnatifida var. lanuginosa				0.18 - 0.08	
Trisetum spicatum		0.43 - 0.41			1.00 - 5.00
Valeriana sitchensis		0.05 - 0.50			
Veronica cusickii		0.05 - 0.50		0.09 - 0.50	1.00 - 2.00
Veronica wormskjoldii					
Viola adunca	0.50 - 0.30	0.48 - 0.30	0.33 - 0.10	0.18 - 0.50	1.00 - 2.00
Viola flettii	0.25 - 0.50	0.05 - 0.50			

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	POLMIN-RACELO lithomorphic	SAXTOL-(LUZPIP) lithomorphic
plots	1	11
TREES		
Abies lasiocarpa		
SHRUBS		
Acer circinatum		
Cassiope mertensiana		
Dasiphora floribunda		
Holodiscus discolor		
Juniperus communis		
Luetkea pectinata		0.64 - 1.93
Paxistima myrsinites		
Penstemon davidsonii		0.09 - 1.00
Petrophyton hendersonii		
Phyllodoce empetriformis		0.09 - 1.00
Phyllodoce glanduliflora		
Spiraea splendens		
Vaccinium deliciosum		
Vaccinium membranaceum		
HERBACEOUS		
Achillea millefolium		
Allium crenulatum		
Anaphalis margaritacea		
Anemone drummondii		
Antennaria microphylla		
Arenaria capillaris		0.09 - 1.00
Arnica X diversifolia		
Astragalus cottonii		
Athyrium americanum		
Campanula piperi		
Campanula rotundifolia		
Carex nigricans		0.55 - 2.00
Carex phaeocephala		0.09 - 0.30
Carex spectabilis		0.55 - 1.13
Castilleja hispida		
Castilleja miniata		
Castilleja parviflora		0.09 - 1.00
Cerastium arvense ssp. strictum		
Cryptogramma acrostichoides		
Delphinium glareosum		
Douglasia laevigata		
Elmera racemosa		
Elymus elymoides		
Epilobium anagallidifolium		0.18 - 0.65
Erigeron aureus		
Erigeron compositus		
Erigeron peregrinus		
Eriogonum pyrolifolium		
Erysimum arenicola		
Eucephalus paucicapitatus		

Appendix C. Synthesis tables of associations with species constancy and average cover.
Nonvascular Sparse Vascular Rock Class: North Pacific Montane Massive Bedrock, Cliff and Talus and North Pacific Alpine and Subalpine Bedrock and Scree Groups.

Species / Association	POLMIN-RACELO lithomorphic	SAXTOL-(LUZPIP) lithomorphic
plots	1	11
Festuca brachyphylla		
Festuca roemeri		
Fragaria vesca		
Hedysarum occidentale		
Hieracium gracile		
Juncus drummondii		0.45 - 1.44
Juncus mertensianus		0.18 - 1.00
Juncus parryi	1.00 - 1.00	0.18 - 1.63
Leptarrhena pyrolifolia		
Lomatium martindalei		0.09 - 1.00
Luina hypoleuca		
Lupinus (arcticus ssp. subalpinus, latifolius)		
Lupinus sellulus var. lobbii		
Luzula piperi		0.09 - 3.00
Luzula spicata		
Minuartia obtusiloba		
Minuartia rubella		
Oreostemma alpigenum		
Packera flettii		
Parnassia fimbriata		
Penstemon procerus		
Phacelia hastata		
Phacelia sericea		
Phlox diffusa		
Poa cusickii		
Poa secunda		
Poa stenantha		
Polygonum bistortoides		
Polygonum minimum	1.00 - 8.00	
Racomitrium elongatum	1.00 - 90.00	
Ranunculus eschscholtzii		0.09 - 0.30
Saxifraga bronchialis		
Saxifraga tolmiei		1.00 - 8.95
Sedum divergens	1.00 - 3.00	
Selaginella wallacei		
Senecio neowebsteri		
Silene parryi		
Smelowskia calycina		
Solidago multiradiata		
Solidago simplex		
Synthyris pinnatifida var. lanuginosa		
Trisetum spicatum		
Valeriana sitchensis		0.09 - 1.00
Veronica cusickii		0.09 - 1.00
Veronica wormskjoldii		0.09 - 0.30
Viola adunca		
Viola flettii		

Appendix D. Environmental variables of plant associations sampled at Mount Rainier, North Cascades, and Olympic National Parks.

Appendix D summarizes selected environmental variables sampled with plant associations of Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks. Plant association names appear by their acronym (the first three letter of genus and species, for example **ACEMAC** = ***Ace*r *mac*rophyllum**) as listed below and in plant association descriptions in Appendix A. Plant associations in tables are arranged by the NVC hierarchy as listed in Appendix C and in the "Table of Contents" in Appendix A. The table was generated from VPro (MacKenzie and Klaussen 1999). The tables provide minimum, mean and maximum values for elevation (feet), aspect with number of plots in parentheses in eight classes, for example, NE (4), E (3), N (5), slope gradient of sample (degrees), percent cover of the surface of organic material, rocks, decayed wood, mineral soil and bedrock, and total percent cover of all vascular plants, the tree layer, herbaceous layer and moss/lichen layer. Park Service samples estimated Topographic Moisture (see Methods) and that estimate is provided as well. The number of missing values in a category is listed within parenthesis following Null. Empty cell indicates no data for that variable.

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN/ GAUSHA-HOLDIS	PSEMEN/ HOLDIS-ROSGYM/ FESOCC	PSEMEN-(ABIGRA)/ ACECIR-PAXMYR	PSEMEN-(TSUHET)/ ACECIR-PAXMYR	PSEMEN/ MAHNER/ CALRUB	PINCON/ PAXMYR/ CALRUB	PINCON/ VACMEM
plots	**3**	**18**	**4**	**3**	**6**	**1**	**2**
Elevation (feet)	900---1484---2068 (Null 1)	1200---2296---4010 (Null 2)	1968---2416---3425	3520---3520---3520 (Null 2)	1798---2114---2756	2965---2965---2965	2858---2991---3123
Aspect (plots)	SSE(1) SSW(1) WSW(1)	ENE(1) ESE(4) SSE(4) SSW(3) WSW(4) WNW(2)	SSE(1) SSW(1) WSW(2)	NNE(1) SSE(1) WSW(1)	NNE(1) SSE(1) SSW(1) WSW(2) WNW(1)	SSW(1)	SSW(1) WSW(1)
Slope Gradient (%)	26---50---75	5---55---120	30---53---72	30---38---44	2---45---72	2---2---2	7---10---13
%Substrate Org. Matter	2---3.0---4 (Null 1)	1---4.6---35 (Null 2)	2---2.5---3 (Null 2)	3---3.5---4 (Null 1)	1---2.8---4 (Null 1)	4---4.0---4	3---3.0---3
%Substrate Rocks	1---1.0---1 (Null 1)	0---4.3---55 (Null 1)	0---0.5---1 (Null 2)	1---1.0---1 (Null 1)	1---1.0---1 (Null 1)	1---1.0---1	1---1.0---1
%Substrate Dec. Wood	1---2.0---3 (Null 1)	1---2.2---3 (Null 4)	1---1.5---2 (Null 2)	2---2.5---3 (Null 1)	1---1.4---2 (Null 1)	1---1.0---1	1---1.5---2
%Substrate Mineral Soil	1---1.0---1 (Null 1)	0---1.5---10 (Null 1)	0---0.5---1 (Null 2)	1---1.0---1 (Null 1)	1---1.0---1 (Null 1)	0---0.0---0	0---0.5---1
%Substrate Bedrock	0---0.5---1 (Null 1)	0---1.3---4 (Null 3)	3---3.0---3 (Null 2)	1---1.0---1 (Null 1)	1---2.2---3 (Null 1)	1---1.0---1	2---2.0---2
Total Vascular Cover (%)	103---160.7---194	81---189.3---266	92---141.3---185	119---193.0---279	114---158.0---197	174---174.0---174	129---134.5---140
Tree Layer Cover (%)	55---58.0---63	15---72.1---110	31---51.8---60	38---73.0---101	4---51.3---80	82---82.0---82	26---28.0---30
Herb Layer Cover (%)	40---102.7---139	61---116.3---176	32---89.5---125	81---120.0---178	74---106.7---193	92---92.0---92	103---106.5---110
Moss LayerCover (%)	1---20.7---46	3---40.9---82 (Null 3)	40---52.5---65 (Null 2)		10---36.8---59 (Null 2)	11---11.0---11	7---19.5---32
Topographic Moisture	4.2---4.7---5.2 (Null 1)	2.6---3.6---5.2 (Null 3)	3.4---4.2---5 (Null 2)	5.1---5.3---5.4 (Null 1)	3.4---4.2---5.3 (Null 1)	4---4.0---4	4.6---4.6---4.6

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN/ VACCAE	PSEMEN/ VACMEM	PSEMEN-(PINPON)/ SYMALB	PSEMEN/ HOLDIS/ CALRUB	PINPON-PSEMEN/ PAXMYR-ARCUVA	PSEMEN/ PAXMYR-SPIBET	PSEMEN-PINPON/ ARCNEV
plots	1	5	3	4	1	1	4
Elevation (feet)	2037---2037---2037	2884---3340---3986 (Null 2)	1233---2342---3392	1906---2192---2660 (Null 1)	2413---2413---2413	2360---2360---2360	2165---2951---3737 (Null 2)
Aspect (plots)	NNW(1)	NNE(2) ENE(1) SSW(2)	SSW(2) WSW(1)	NNE(1) SSW(2) WSW(1)	WSW(1)	SSE(1)	ENE(2) WSW(1) WNW(1)
Slope Gradient (%)	15---15---15	12---36---60	22---28---40	35---46---61	43---43---43	60---60---60	11---38---59
%Substrate Org. Matter	1---1.0---1	1---3.4---4	2---2.5---3 (Null 1)	1---1.7---3 (Null 1)	3---3.0---3	4---4.0---4	3---3.5---4
%Substrate Rocks	1---1.0---1	0---0.4---1	1---1.0---1 (Null 1)	0---0.7---1 (Null 1)	1---1.0---1	1---1.0---1	1---1.3---2
%Substrate Dec. Wood	2---2.0---2	1---2.0---3 (Null 1)	2---2.5---3 (Null 1)	1---1.3---2 (Null 1)	1---1.0---1	1---1.0---1	1---1.3---2
%Substrate Mineral Soil	0---0.0---0	0---0.6---1	1---1.0---1 (Null 1)	1---1.0---1 (Null 1)	2---2.0---2	1---1.0---1	0---0.8---1
%Substrate Bedrock	2---2.0---2	1---1.4---2	1---1.5---2 (Null 1)	1---2.0---3 (Null 1)	2---2.0---2	2---2.0---2	1---2.0---3
Total Vascular Cover (%)	120---120.0---120	90---163.8---239	139---160.0---184	139---159.5---177	121---121.0---121	168---168.0---168	83---130.8---197
Tree Layer Cover (%)	41---41.0---41	11---40.8---70	40---54.3---73	59---62.5---71	41---41.0---41	80---80.0---80	6---40.0---70
Herb Layer Cover (%)	79---79.0---79	30---123.0---173	89---105.7---117	79---97.0---117	80---80.0---80	88---88.0---88	66---90.8---127
Moss LayerCover (%)	55---55.0---55	4---24.3---80 (Null 1)	2---4.0---6 (Null 1)	35---65.0---80 (Null 1)	30---30.0---30	1---1.0---1	16---16.0---16 (Null 2)
Topographic Moisture	4.8---4.8---4.8	4---4.6---5.8	2.9---3.9---4.9 (Null 1)	2.7---4.3---5.3 (Null 1)	3---3.0---3	5.2---5.2---5.2	3.6---3.9---4.1

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PINALB-(ABILAS)/ VACSCO/ LUZGLA	PINALB/ JUNCOM	LARLYA/ CASMER-LUEPEC	LARLYA/ VACDEL	LARLYA/ LUZGLA	POPTRE shrub	POPTRE/ CORNUT
plots	2	1	3	3	5	1	1
Elevation (feet)	6250---6426---6601	6225---6225---6225	5830---6082---6257	6407---6535---6644	6470---6743---7218	3429---3429---3429	1177---1177---1177
Aspect (plots)	WSW(2)	SSW(1)	NNE(1) ENE(1) WNW(1)	ESE(1) SSW(1) WNW(1)	ENE(2) WSW(3)	SSE(1)	ENE(1)
Slope Gradient (%)	48---58---67	12---12---12	10---26---45	25---40---55	15---32---47	53---53---53	3---3---3
%Substrate Org. Matter	2---2.5---3		2---3.0---4 (Null 1)	3---3.3---4	2---3.5---4 (Null 1)	3---3.0---3	
%Substrate Rocks	2---2.0---2		1---1.0---1 (Null 1)	0---0.7---1	1---1.0---1 (Null 1)	1---1.0---1	0---0.0---0
%Substrate Dec. Wood	1---1.0---1		1---1.5---2 (Null 1)	1---1.7---2	1---1.5---2 (Null 1)	1---1.0---1	
%Substrate Mineral Soil	1---2.0---3		1---1.0---1 (Null 1)	0---1.7---3	1---1.0---1 (Null 1)	0---0.0---0	0---0.0---0
%Substrate Bedrock	1---2.5---4		2---3.0---4 (Null 1)	1---1.7---3	1---1.5---2 (Null 1)	4---4.0---4	
Total Vascular Cover (%)	150---153.0---156	92---92.0---92	77---140.0---234	138---149.0---160	87---140.4---188	112---112.0---112	181---181.0---181
Tree Layer Cover (%)	4---11.5---19	20---20.0---20	3---19.7---40	16---23.7---29	30---53.6---93		95---95.0---95
Herb Layer Cover (%)	131---141.5---152	72---72.0---72	61---120.3---194	109---125.3---134	57---86.8---133	112---112.0---112	86---86.0---86
Moss LayerCover (%)	3---3.0---3 (Null 1)		10---19.5---29 (Null 1)	2---5.7---9	2---2.0---2 (Null 2)	9---9.0---9	
Topographic Moisture	3---3.6---4.2		4.9---5.3---5.6 (Null 1)	2.7---4.4---6.2	3.6---4.6---5.1 (Null 1)	4.8---4.8---4.8	

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ABILAS-(PSEMEN)/ VACMEM/ CALRUB	PICSIT/ GAUSHA	PICSIT/ MAIDIL	PICSIT-TSUHET/ POLMUN	PICSIT-TSUHET/ POLMUN-OXAORE	THUPLI-TSUHET/ VACOVA	TSUHET/ GAUSHA/ POLMUN-BLESPI
plots	3	3	3	11	35	17	2
Elevation (feet)	3960---5135---5880	24---63---102 (Null 1)	58---122---205	3---183---345 (Null 2)	395---704---1100	38---166---328 (Null 7)	188---188---188 (Null 1)
Aspect (plots)	ESE(1) SSW(2)	WNW(3)	WNW(2) WSW(1)	SSW(2) WSW(5) WNW(2) (Null 2)	NNE(4) ESE(3) SSE(5) SSW(9) WSW(5) WNW(5) NNW(4)	NNE(3) ENE(1) ESE(1) SSE(3) SSW(1) WSW(2) WNW(4) (Null 2)	ENE(1) WNW(1)
Slope Gradient (%)	18---40---62	0---0---1	0---2---5	2---13---31 (Null 2)	0---7---30	0---3---15	4---8---11
%Substrate Org. Matter	3---3.0---3 (Null 2)	2---3.0---4	1---2.0---4	3---3.4---4 (Null 3)	1---13.3---45 (Null 1)	2---3.2---4 (Null 1)	2---2.5---3
%Substrate Rocks	1---1.0---1 (Null 2)	0---0.0---0	0---0.0---0	0---0.2---1 (Null 1)	0---1.5---15 (Null 3)	0---0.1---1	0---0.0---0
%Substrate Dec. Wood	2---2.0---2 (Null 2)	3---3.0---3	2---2.3---3	1---2.6---4 (Null 3)	1---1.0---1 (Null 33)	1---2.3---3 (Null 1)	2---2.5---3
%Substrate Mineral Soil	2---2.0---2 (Null 2)	0---0.3---1	0---0.0---0	0---0.8---2 (Null 1)	0---2.2---25 (Null 2)	0---0.4---1	0---0.5---1
%Substrate Bedrock	2---2.0---2 (Null 2)	0---0.0---0	0---0.0---0	0---0.0---0 (Null 3)	0---1.5---3 (Null 33)	0---0.1---1 (Null 1)	0---0.0---0
Total Vascular Cover (%)	148---175.3---199	134---171.3---203	146---166.3---182	104---161.3---211	130---252.7---407	112---177.4---259	99---133.0---167
Tree Layer Cover (%)	49---66.3---90	56---68.7---80	74---78.3---81	70---83.8---100	20---67.3---140	6---54.4---90	46---63.5---81
Herb Layer Cover (%)	88---109.0---150	78---102.7---123	66---88.0---101	18---77.5---128	8---100.5---239	81---123.0---189	53---69.5---86
Moss LayerCover (%)	22---22.0---22 (Null 2)	2---9.0---14	5---62.0---101	3---15.1---47	8---90.4---171	4---22.1---50	21---21.0---21
Topographic Moisture	3.8---3.8---3.8 (Null 2)	5---5.9---6.4	3.5---5.1---6.1	4---5.2---6.2 (Null 4)	5.6---6.5---7 (Null 32)	5---5.9---7 (Null 2)	6.1---6.6---7

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	TSUHET/ POLMUN-BLESPI	TSUHET/ POLMUN-OXAORE	TSUHET/ VACALA/ OXAORE	TAXBRE/ PAXMYR	PSEMEN-(THUPLI-ABIGRA)/ VACMEM	PSEMEN/ ACECIR/ MAHNER	PSEMEN/ ACHTRI
plots	1	13	3	1	3	13	3
Elevation (feet)	2507---2507---2507	600---979---1600 (Null 1)	660---841---960	3872---3872---3872	1944---2340---2736 (Null 1)	442---2049---2785 (Null 1)	2450---4019---4900
Aspect (plots)	ENE(1)	ESE(2) SSE(2) SSW(3) WSW(2) WNW(2) NNW(2)	ESE(1) WSW(2)	SSE(1)	NNE(1) SSE(1) WNW(1)	ESE(1) SSE(2) SSW(2) WSW(7) NNW(1)	SSE(2) SSW(1)
Slope Gradient (%)	41---41---41	2---28---80	2---15---32	64---64---64	23---33---52	24---53---90	10---50---72
%Substrate Org. Matter	4---4.0---4	2---20.7---35	3---5.3---10	2---2.0---2	1---1.7---3	1---3.0---4 (Null 3)	3---5.5---8 (Null 1)
%Substrate Rocks	0---0.0---0	0---5.7---35	0---0.0---0	1---1.0---1	0---0.7---1	0---0.8---1 (Null 3)	1---7.7---20
%Substrate Dec. Wood	1---1.0---1	2---2.0---2 (Null 12)	2---2.5---3 (Null 1)	1---1.0---1	1---1.3---2	1---2.2---3 (Null 3)	1---1.0---1 (Null 2)
%Substrate Mineral Soil	1---1.0---1	0---4.7---40	0---0.0---0	1---1.0---1	0---0.7---1	1---1.1---2 (Null 3)	1---26.0---75
%Substrate Bedrock	1---1.0---1	1---1.0---1 (Null 12)	0---0.0---0 (Null 1)	4---4.0---4	1---1.0---1	0---1.2---3 (Null 3)	1---1.0---1 (Null 2)
Total Vascular Cover (%)	195---195.0---195	141---246.8---368	167---232.3---293	103---103.0---103	118---168.3---265	90---186.5---234	80---92.7---108
Tree Layer Cover (%)	90---90.0---90	59---77.2---90	83---93.0---106		29---57.3---77	40---80.5---161	20---51.0---90
Herb Layer Cover (%)	105---105.0---105	55---83.1---98	65---135.3---187	103---103.0---103	56---111.0---188	50---106.0---135	18---41.7---60
Moss LayerCover (%)	12---12.0---12	11---75.2---107 (Null 1)	11---53.7---91	2---2.0---2	70---79.7---89	7---51.7---91 (Null 4)	1---25.3---60
Topographic Moisture	3.5---3.5---3.5	6---6.0---6 (Null 12)	3.6---4.4---5.2 (Null 1)	4---4.0---4	3---4.5---5.6	2.9---4.0---5 (Null 3)	3.3---3.3---3.3 (Null 2)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN/ GAUSHA-VACPAR	PSEMEN/ MAHNER/ ACHTRI	PSEMEN-ABIGRA/ MAHNER-GAUSHA/ POLMUN	PSEMEN-TSUHET/ ACHTRI	PSEMEN-TSUHET/ GAUSHA/ POLMUN	PSEMEN-TSUHET/ GAUSHA-VACPAR	PSEMEN-TSUHET/ MAHNER
plots	**10**	**9**	**1**	**18**	**9**	**22**	**20**
Elevation (feet)	1440---2724---3720 (Null 1)	828---2263---3178 (Null 1)	980---980---980	1330---2217---3841 (Null 8)	1230---1656---1900 (Null 3)	1150---1891---2680 (Null 12)	1740---2456---3000 (Null 1)
Aspect (plots)	ESE(1) SSW(5) WSW(3) WNW(1)	ESE(1) SSE(3) SSW(2) WSW(3)	SSW(1)	NNE(1) ENE(1) SSE(1) SSW(5) WSW(3) WNW(6) NNW(1)	NNE(1) ESE(1) SSE(2) SSW(1) WSW(1) WNW(2) (Null 1)	NNE(2) ESE(1) SSE(3) SSW(3) WSW(5) WNW(7) NNW(1)	NNE(1) ENE(4) ESE(2) SSE(3) SSW(2) WSW(3) WNW(1) NNW(4)
Slope Gradient (%)	45---60---87	0---47---81	15---15---15	0---26---75	8---62---100 (Null 1)	0---32---70	-1---29---70
%Substrate Org. Matter	3---29.9---95 (Null 2)	1---2.7---4	3---3.0---3	1---4.1---20 (Null 1)	2---29.7---95 (Null 2)	2---22.8---95 (Null 7)	2---8.2---65 (Null 8)
%Substrate Rocks	0---10.1---40	0---0.7---1	1---1.0---1	0---1.4---15 (Null 1)	0---4.1---25 (Null 1)	0---2.5---20 (Null 7)	0---0.5---1 (Null 7)
%Substrate Dec. Wood	2---2.3---3 (Null 7)	1---1.3---3	2---2.0---2	1---1.7---3 (Null 4)	2---2.0---2 (Null 6)	1---1.6---3 (Null 13)	1---2.2---3 (Null 9)
%Substrate Mineral Soil	0---8.6---40	0---1.3---3	1---1.0---1	0---4.8---70 (Null 1)	0---0.6---1 (Null 1)	0---0.8---2 (Null 8)	0---0.5---1 (Null 7)
%Substrate Bedrock	1---1.7---3 (Null 7)	0---1.1---3	0---0.0---0	0---0.6---3 (Null 4)	0---0.7---1 (Null 6)	0---0.7---2 (Null 13)	0---0.9---2 (Null 9)
Total Vascular Cover (%)	100---152.6---206	126---193.7---298	198---198.0---198	84---167.2---292	112---187.8---236	70---152.5---218	110---176.6---310
Tree Layer Cover (%)	35---62.0---80	40---77.4---110	84---84.0---84	53---75.1---138	55---81.2---100	33---66.2---110	37---91.9---140
Herb Layer Cover (%)	40---80.8---138	60---116.2---188	114---114.0---114	23---82.3---160	35---79.7---132	20---81.1---178	23---80.3---191
Moss LayerCover (%)	2---22.1---70 (Null 1)	5---37.5---82 (Null 3)	53---53.0---53	3---62.2---110 (Null 7)	8---41.6---104	2---40.9---145 (Null 2)	6---51.2---158 (Null 9)
Topographic Moisture	4.2---4.2---4.2 (Null 7)	3.1---4.1---5.8	3.6---3.6---3.6	3.8---5.1---7 (Null 6)	4.2---5.0---5.7 (Null 7)	3.7---4.8---6.1 (Null 14)	3.8---4.6---5.6 (Null 9)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN-TSUHET/ PAXMYR/ LINBOR	PSEMEN-TSUHET/ RHOMAC/ POLMUN	TSUHET-(PSEMEN)/ VACALA/ CORUNA	TSUHET-(PSEMEN)/ VACALA-MAHNER-(GAUSHA)	TSUHET-PSEMEN/ MAHNER-CHIMEN	TSUHET-PSEMEN/ VACALA/ OXAORE	TSUHET-THUPLI/ TAXBRE
plots	**6**	**1**	**12**	**15**	**20**	**7**	**1**
Elevation (feet)	2244---2856---3940	2790---2790---2790	593---2571---3907 (Null 1)	815---1937---3199 (Null 3)	1562---2670---3970 (Null 5)	680---997---1900	2780---2780---2780
Aspect (plots)	NNE(1) ENE(2) WSW(1) WNW(1) NNW(1)	WSW(1)	ENE(2) SSE(1) SSW(2) WSW(3) WNW(2) NNW(2)	NNE(3) ENE(1) SSE(3) SSW(4) WSW(1) WNW(2) NNW(1)	NNE(5) ESE(1) SSE(3) SSW(1)) WSW(1) WNW(5) NNW(3 (Null 1)	ESE(1) SSE(1) NNW(5)	ENE(1)
Slope Gradient (%)	21---42---80	65---65---65	1---36---95	10---46---90	0---36---65	2---19---79	40---40---40
%Substrate Org. Matter	2---2.5---3 (Null 4)	20---20.0---20	0---16.9---60 (Null 2)	1---6.3---20 (Null 2)	1---10.9---95 (Null 4)	1---12.0---35	2---2.0---2
%Substrate Rocks	0---0.5---1 (Null 4)	100---100.0---100	0---3.6---35 (Null 1)	0---2.5---20 (Null 2)	0---4.2---65 (Null 3)	0---2.3---8	0---0.0---0
%Substrate Dec. Wood	1---1.5---2 (Null 4)		1---2.2---4 (Null 6)	1---1.5---3 (Null 11)	1---2.2---3 (Null 6)		3---3.0---3
%Substrate Mineral Soil	0---0.5---1 (Null 4)	1---1.0---1	0---1.2---5 (Null 1)	0---3.4---35 (Null 1)	0---0.6---1 (Null 3)	0---3.4---20	0---0.0---0
%Substrate Bedrock	1---2.0---3 (Null 4)		0---0.2---1 (Null 6)	1---1.0---1 (Null 11)	0---0.9---3 (Null 6)		1---1.0---1
Total Vascular Cover (%)	113---139.2---171	201---201.0---201	100---166.9---301	112---191.0---231	47---114.0---216	183---252.4---327	229---229.0---229
Tree Layer Cover (%)	56---81.5---130	80---80.0---80	43---70.1---98	39---76.4---130	13---92.5---198	55---67.1---85	110---110.0---110
Herb Layer Cover (%)	23---57.7---101	75---75.0---75	34---81.6---141	54---88.9---155	8---22.9---95	70---89.3---95	119---119.0---119
Moss LayerCover (%)	44---57.5---71 (Null 4)		8---46.2---95 (Null 1)	3---56.8---155	2---29.3---95 (Null 5)	68---95.4---135	96---96.0---96
Topographic Moisture	3.6---3.9---4.1 (Null 4)		4.4---5.5---6.3 (Null 6)	4.1---4.3---4.6 (Null 11)	2.9---4.6---6 (Null 6)		3.6---3.6---3.6

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	BETPAP-(THUPLI)/ ACECIR-MAHNER	PINCON-PSEMEN/ GAUSHA	PSEMEN-(PINCON)/ ARCUVA/ RACCAN	PSEMEN/ ARCNEV Dep.	PSEMEN/ VACMEM/ HYLSPL	PSEMEN-(TSUHET)/ Dep.	PSEMEN/ GAUSHA-MAHNER/ POLMUN
plots	6	10	12	1	1	22	5
Elevation (feet)	1280---1898---2669	1990---3102---6775	570---2855---4572	2678---2678---2678	2667---2667---2667	1065---2792---4820 (Null 4)	880---1667---2834
Aspect (plots)	WNW(2) WSW(4)	SSW(2) WSW(6) WNW(1) NNW(1)	ENE(1) SSE(2) SSW(5) WSW(4)	SSW(1)	SSE(1)	NNE(2) SSE(2) SSW(5) WSW(4) WNW(3) NNW(6)	SSE(1) SSW(2) WSW(1) WNW(1)
Slope Gradient (%)	22---28---39	5---23---63	8---50---95	5---5---5	2---2---2	1---36---84	38---66---80
%Substrate Org. Matter	4---4.0---4	1---2.8---4 (Null 2)	1---9.4---50 (Null 2)	1---1.0---1	2---2.0---2	1---9.8---98 (Null 6)	3---17.3---60 (Null 1)
%Substrate Rocks	0---0.5---1	0---1.0---2	1---6.2---50 (Null 1)	1---1.0---1	1---1.0---1	0---4.9---85 (Null 3)	0---7.4---35
%Substrate Dec. Wood	1---1.8---3	1---1.9---3 (Null 2)	1---2.1---3 (Null 5)	1---1.0---1	1---1.0---1	1---1.9---4 (Null 8)	1---2.0---3 (Null 2)
%Substrate Mineral Soil	0---0.8---1	0---0.7---1	0---3.1---25	1---1.0---1	1---1.0---1	0---0.6---1 (Null 3)	1---1.2---2
%Substrate Bedrock	0---1.2---2	0---1.3---2 (Null 2)	1---2.1---4 (Null 5)	3---3.0---3	1---1.0---1	0---1.1---3 (Null 8)	1---1.3---2 (Null 2)
Total Vascular Cover (%)	177---217.2---318	118---152.0---184	69---128.9---214	74---74.0---74	81---81.0---81	67---109.4---188	189---225.6---276
Tree Layer Cover (%)	38---108.7---167	43---53.9---71	26---46.4---65	53---53.0---53	60---60.0---60	55---93.8---180	70---90.6---110
Herb Layer Cover (%)	20---108.5---178	70---98.1---131	19---78.8---154	21---21.0---21	21---21.0---21	1---16.8---70	95---126.4---173
Moss LayerCover (%)	2---14.8---51 (Null 1)	6---36.9---89	4---39.4---102 (Null 2)	71---71.0---71	110---110.0---110	1---46.9---116 (Null 5)	5---36.2---100
Topographic Moisture	4.4---5.2---5.8	3.1---3.7---4.6 (Null 2)	2.6---3.4---4.4 (Null 5)	6.8---6.8---6.8	6.2---6.2---6.2	2.1---4.8---6.2 (Null 8)	3.4---4.3---5.1 (Null 2)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN-TSUHET/ GAUSHA/ XERTEN	PSEMEN-TSUHET/ GAUSHA-MAHNER	PSEMEN-TSUHET/ RHOMAC	PSEMEN-TSUHET/ VACALA/ XERTEN	PSEMEN-(ALNRUB-TSUHET)/ RUBSPE	PSEMEN-TSUHET/ (ACECIR)/ POLMUN	PSEMEN-TSUHET/ MAHNER-POLMUN
plots	**1**	**17**	**25**	**5**	**9**	**1**	**20**
Elevation (feet)	1806---1806---1806	1450---2218---3388 (Null 3)	1350---2662---4650	3430---3818---4282 (Null 2)	68---610---1383 (Null 4)	1449---1449---1449	1040---1836---2600 (Null 8)
Aspect (plots)	WSW(1)	ENE(1) ESE(1) SSE(5) SSW(4) WSW(4) WNW(1) NNW(1)	NNE(3) ENE(3) ESE(2) SSE(2) SSW(7) WSW(1) WNW(3) NNW(4)	SSE(3) SSW(1) WSW(1)	NNE(1) SSE(2) SSW(1) WNW(1) NNW(2) (Null 2)	SSE(1)	NNE(3) ENE(3) ESE(1) SSE(5) SSW(4) WSW(1) WNW(1) NNW(2)
Slope Gradient (%)	35---35---35	3---41---80	3---40---70	7---48---85	0---11---23	73---73---73	0---47---85
%Substrate Org. Matter	3---3.0---3	1---10.6---80 (Null 1)	2---26.6---90	3---34.0---95 (Null 2)	1---1.9---4	3---3.0---3	2---39.6---95 (Null 6)
%Substrate Rocks	0---0.0---0	0---0.9---5	0---12.4---60 (Null 1)	1---1.3---2 (Null 2)	0---0.2---1	0---0.0---0	0---21.6---100 (Null 4)
%Substrate Dec. Wood	2---2.0---2	1---1.8---3 (Null 5)	1---1.3---2 (Null 22)	1---1.0---1 (Null 3)	1---2.4---3	2---2.0---2	1---1.6---3 (Null 15)
%Substrate Mineral Soil	0---0.0---0	0---1.8---20	0---5.6---25	0---0.7---1 (Null 2)	0---0.8---1	2---2.0---2	0---1.0---4 (Null 4)
%Substrate Bedrock	1---1.0---1	0---0.7---2 (Null 5)	0---0.0---0 (Null 22)	1---1.0---1 (Null 3)	0---0.3---1	1---1.0---1	0---1.0---2 (Null 15)
Total Vascular Cover (%)	185---185.0---185	115---178.8---260	108---204.7---343	113---131.4---171	120---170.1---236	201---201.0---201	79---199.8---364
Tree Layer Cover (%)	78---78.0---78	36---73.1---92	20---71.0---95	46---68.8---86	22---52.4---90	143---143.0---143	31---110.1---210
Herb Layer Cover (%)	107---107.0---107	23---92.5---156	15---79.1---139	33---58.4---82	80---117.7---198	58---58.0---58	17---73.4---181
Moss LayerCover (%)	14---14.0---14	2---46.4---107 (Null 3)	4---44.5---95	2---19.8---40	5---32.6---84	23---23.0---23	3---42.4---85 (Null 2)
Topographic Moisture	4.2---4.2---4.2	3.1---4.2---6.3 (Null 5)	5---5.3---5.6 (Null 21)	3.3---3.5---3.6 (Null 3)	4.5---5.4---6.1	5.1---5.1---5.1	4.6---5.2---5.7 (Null 16)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN-TSUHET/ POLMUN-OXAORE	TSUHET-(PSEMEN)/ TIATRI-GYMDRY	TSUHET-(PSEMEN)/ VACALA/ POLMUN	TSUHET-(PSEMEN-THUPLI)/ OPLHOR/ POLMUN	TSUHET-ABIAMA-(THUPLI)/ VACALA/ BLESPI	TSUHET-ABIAMA/ BLESPI-TIATRI-POLMUN	TSUHET-ABIAMA/ OXAORE-BLESPI
plots	11	16	2	7	3	4	7
Elevation (feet)	770---1393---2173 (Null 2)	561---2298---3680 (Null 3)	200---1300---2400	1726---2151---2956 (Null 1)	752---1620---3078	1450---1557---1664 (Null 2)	1270---2166---2950
Aspect (plots)	NNE(1) ENE(1) ESE(2) SSE(2) SSW(2) WNW(1) NNW(2)	NNE(1) ENE(4) ESE(2) SSE(2) SSW(1) WSW(2) WNW(1) NNW(3)	SSE(1) SSW(1)	ESE(1) SSW(2) WSW(2) WNW(1) NNW(1)	ENE(1) SSW(1) WSW(1)	NNE(1) ENE(1) WSW(1) WNW(1)	NNE(1) ESE(3) WNW(1) NNW(2)
Slope Gradient (%)	3---47---168	2---33---65	5---38---70	2---11---28	15---45---76	11---26---45	15---61---90
%Substrate Org. Matter	1---9.5---30	1---32.0---98 (Null 4)	3---29.0---55	2---9.0---45	0---0.0---0 (Null 2)	2---2.0---2 (Null 3)	10---63.7---99 (Null 1)
%Substrate Rocks	0---3.1---25	0---5.4---65 (Null 2)	1---1.5---2	0---0.7---2	0---0.0---0 (Null 2)	0---0.5---1 (Null 2)	0---1.5---5 (Null 1)
%Substrate Dec. Wood	1---1.3---2 (Null 7)	1---2.3---3 (Null 9)	3---3.0---3 (Null 1)	1---1.7---3 (Null 1)	3---3.0---3 (Null 2)	3---3.0---3 (Null 3)	
%Substrate Mineral Soil	0---3.5---30	0---0.9---3 (Null 2)	1---2.0---3	0---2.3---15	2---2.0---2 (Null 2)	1---1.0---1 (Null 2)	0---0.8---3 (Null 1)
%Substrate Bedrock	0---0.5---1 (Null 7)	1---1.0---1 (Null 9)	0---0.0---0 (Null 1)	0---0.5---2 (Null 1)	1---1.0---1 (Null 2)	1---1.0---1 (Null 3)	
Total Vascular Cover (%)	115---254.9---332	109---156.8---279	161---165.5---170	199---255.0---327	136---163.7---178	124---139.0---173	93---175.4---254
Tree Layer Cover (%)	40---87.0---180	73---102.6---198	70---75.0---80	25---71.9---110	81---87.0---90	64---77.0---93	50---72.1---90
Herb Layer Cover (%)	65---114.9---231	9---43.6---103	40---60.5---81	95---168.4---251	55---76.7---88	44---62.0---80	15---80.6---194
Moss LayerCover (%)	6---58.7---160 (Null 1)	5---44.8---98 (Null 5)	33---45.5---58	9---45.7---81	26---45.3---60	6---18.7---39 (Null 1)	2---26.7---80 (Null 1)
Topographic Moisture	5.7---6.1---6.2 (Null 7)	3.6---5.1---6.3 (Null 9)	6.4---6.4---6.4 (Null 1)	5.3---6.1---6.8 (Null 1)	6---6.1---6.3	4---5.0---6.1 (Null 1)	6.2---6.2---6.2 (Null 6)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	TSUHET-ABIAMA/ VACALA/ RUBPED	TSUHET-ABIAMA/ VACALA/ TIATRI	ABIAMA-(PSEMEN)/ ACHTRI-TIATRI	ABIAMA-(PSEMEN-TSUHET)/ RHOMAC	ABIAMA-PSEMEN/ ACHTRI	ABIAMA-TSUHET/ Dep.	ABIAMA-TSUHET/ RUBPED-TIATRI
plots	**12**	**7**	**4**	**3**	**10**	**8**	**18**
Elevation (feet)	1200---2955---4000 (Null 1)	648---2495---3170 (Null 1)	2913---4014---4880 (Null 1)	1950---2700---3100	2500---3350---4720 (Null 5)	2233---2902---3975	2200---3373---5170 (Null 3)
Aspect (plots)	SSE(2) SSW(5) WSW(3) WNW(1) (Null 1)	NNE(3) ESE(1) SSE(1) WNW(1) NNW(1)	SSE(2) WNW(1) NNW(1)	NNE(1) ESE(1) SSE(1)	ESE(4) SSE(1) SSW(1) WSW(1) WNW(1) NNW(1) (Null 1)	ENE(2) ESE(1) SSW(1) WSW(1) WNW(2) NNW(1)	ENE(2) ESE(2) SSE(1) SSW(3) WSW(2) WNW(4) NNW(4)
Slope Gradient (%)	0---31---65	18---34---64	30---46---65	16---31---48	18---37---65	2---24---50	1---28---67
%Substrate Org. Matter	3---40.5---95 (Null 8)	2---2.5---3 (Null 5)		35---36.7---40	3---9.3---15 (Null 7)	1---6.4---25 (Null 3)	2---2.6---4 (Null 13)
%Substrate Rocks	0---2.8---5 (Null 8)	0---0.0---0 (Null 5)	1---1.0---1 (Null 2)	15---37.5---60 (Null 1)	0---13.4---65 (Null 5)	0---0.8---2 (Null 3)	0---0.4---1 (Null 10)
%Substrate Dec. Wood	1---1.5---2 (Null 10)	2---2.5---3 (Null 5)			1---1.0---1 (Null 9)	1---2.8---4 (Null 4)	1---1.8---2 (Null 13)
%Substrate Mineral Soil	1---7.3---20 (Null 9)	0---0.0---0 (Null 5)	0---0.5---1 (Null 2)	0---6.7---15	0---1.2---3 (Null 5)	1---8.8---40 (Null 3)	0---0.5---1 (Null 10)
%Substrate Bedrock	0---0.0---0 (Null 10)	0---0.0---0 (Null 5)			1---1.0---1 (Null 9)	1---1.3---2 (Null 4)	0---0.4---1 (Null 13)
Total Vascular Cover (%)	144---175.8---223	117---167.3---236	119---177.3---221	146---154.7---167	100---158.4---221	87---119.0---183	87---143.9---217
Tree Layer Cover (%)	60---76.1---86	46---72.4---98	70---92.3---133	85---90.0---95	14---67.0---95	64---91.9---133	46---82.0---150
Herb Layer Cover (%)	20---89.4---153	58---94.9---173	36---85.0---114	45---75.0---95	39---96.8---158	1---23.0---55	15---61.9---147
Moss LayerCover (%)	7---55.2---98 (Null 1)	11---34.3---80	3---7.5---12 (Null 2)	35---70.0---90	8---33.9---75 (Null 3)	17---54.3---89 (Null 2)	1---46.1---110 (Null 9)
Topographic Moisture	4.4---5.3---6.1 (Null 3)	4.2---5.5---6.4 (Null 1)	5.1---5.1---5.1 (Null 3)		4---4.6---6 (Null 5)	4.2---5.5---7 (Null 3)	3.1---4.8---6.8 (Null 8)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	TSUHET-ABIAMA-(PSEMEN)/VACALA	TSUHET-ABIAMA-PSEMEN/GAUSHA	TSUHET-ABIAMA-PSEMEN/MAHNER	ABIAMA-(PSEMEN)/VACMEM/ACHTRI	ABIAMA-(PSEMEN-ABIPRO)/VACMEM/XERTEN	ABIAMA-(TSUHET)/VACMEM	ABIAMA-(TSUHET)/VACMEM-VACALA
plots	**20**	**8**	**5**	**2**	**7**	**6**	**5**
Elevation (feet)	2050---2898---4000 (Null 7)	1700---2225---2750 (Null 6)	2490---3155---3836 (Null 2)	4090---4245---4400	4030---4781---5686 (Null 1)	3504---4069---4917	2441---3576---4100
Aspect (plots)	NNE(2) ENE(1) ESE(1) SSE(1) SSW(3) WSW(3) WNW(6) NNW(2) (Null 1)	NNE(2) ESE(2) SSE(1) WSW(3)	ENE(1) ESE(2) SSE(1) WNW(1)	SSE(1) SSW(1)	SSE(3) SSW(2) WSW(1) NNW(1)	NNE(1) ENE(2) SSW(3)	SSE(2) SSW(2) WSW(1)
Slope Gradient (%)	0---31---80	4---25---50	24---59---94	35---46---56	34---45---60	22---52---92	16---38---70
%Substrate Org. Matter	2---69.6---98 (Null 10)	35---35.0---35 (Null 6)	35---35.0---35 (Null 4)	95---97.0---99	3---34.0---95 (Null 4)	2---11.0---20 (Null 4)	35---35.0---35 (Null 4)
%Substrate Rocks	0---2.1---5 (Null 9)	2---3.5---5 (Null 6)	30---30.0---30 (Null 4)	0---1.0---2	0---1.4---5 (Null 2)	1---3.7---8 (Null 3)	1---3.0---5 (Null 3)
%Substrate Dec. Wood	3---3.0---3 (Null 19)				1---1.0---1 (Null 5)	1---1.0---1 (Null 5)	
%Substrate Mineral Soil	0---2.3---15 (Null 10)	1---1.0---1 (Null 6)	15---15.0---15 (Null 4)	0---1.0---2	0---0.8---1 (Null 2)	1---9.0---25 (Null 3)	2---4.5---7 (Null 3)
%Substrate Bedrock	1---1.0---1 (Null 19)				0---0.0---0 (Null 5)	1---1.0---1 (Null 5)	
Total Vascular Cover (%)	98---136.2---212	89---179.1---271	104---219.0---287	210---223.0---236	100---139.0---213	86---157.3---235	163---204.0---232
Tree Layer Cover (%)	60---79.0---95	55---88.8---160	51---108.0---210	80---82.5---85	44---68.4---118	53---97.3---160	35---76.2---103
Herb Layer Cover (%)	2---42.4---132	33---81.3---111	20---79.8---147	35---55.0---75	35---67.7---95	8---43.3---124	60---109.2---172
Moss LayerCover (%)	2---44.7---117 (Null 1)	14---53.8---90 (Null 2)	2---33.5---93 (Null 1)	3---14.5---26	6---18.0---30 (Null 5)	3---46.7---77 (Null 3)	1---28.2---71
Topographic Moisture	3.7---5.0---6.9 (Null 15)	4---5.1---6.1 (Null 3)	3.2---4.5---5.4 (Null 1)		2.6---3.3---3.7 (Null 4)	4.7---5.2---5.6 (Null 4)	3.3---5.1---6 (Null 2)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ABIAMA/ MENFER	ABIAMA/ RHOALB	ABIAMA/ VACMEM/ RUBLAS	ACEMAC-(PSEMEN)/ POLMUN	ACEMAC/ PAXMYR	ACEMAC/ SYMALB	ALNRUB/ ALNVIR
plots	6	10	11	9	1	4	3
Elevation (feet)	2350---3518---4579 (Null 1)	4721---5056---5527	3500---4611---5372	534---1639---2272 (Null 2)	3100---3100---3100	1149---1716---2560	2608---2756---2950
Aspect (plots)	NNE(2) ESE(1) SSW(1) WSW(1) WNW(1)	NNE(1) ENE(1) ESE(2) SSE(1) SSW(1) WSW(1) WNW(2) NNW(1)	ENE(2) ESE(2) SSE(2) SSW(2) WNW(2) NNW(1)	ENE(1) ESE(3) SSE(2) SSW(1) WSW(1) NNW(1)	SSW(1)	ENE(1) ESE(1) SSE(1) SSW(1)	NNW(1) SSE(1) WSW(1)
Slope Gradient (%)	9---37---91	0---42---76	9---36---52	19---51---140	72---72---72	3---25---39	5---12---18
%Substrate Org. Matter	2---8.5---15 (Null 4)	2---22.6---99 (Null 5)	4---72.0---99 (Null 7)	3---4.7---10 (Null 3)	2---2.0---2	4---4.0---4 (Null 2)	2---3.0---4
%Substrate Rocks	0---0.5---1 (Null 4)	0---0.3---1 (Null 4)	0---1.0---2 (Null 7)	0---1.3---5 (Null 2)	1---1.0---1	0---0.8---2	0---0.3---1
%Substrate Dec. Wood	2---2.0---2 (Null 5)	1---1.0---1 (Null 6)	1---1.0---1 (Null 10)	1---1.6---2 (Null 4)	1---1.0---1	1---1.5---2 (Null 2)	1---1.3---2
%Substrate Mineral Soil	0---2.5---5 (Null 4)	0---0.8---1 (Null 4)	0---1.0---3 (Null 7)	1---1.1---2 (Null 2)	1---1.0---1	0---0.8---1	0---1.7---4
%Substrate Bedrock	0---0.0---0 (Null 5)	0---0.8---1 (Null 6)	1---1.0---1 (Null 10)	0---1.4---3 (Null 4)	4---4.0---4	0---1.0---2 (Null 2)	1---1.7---3
Total Vascular Cover (%)	117---205.2---331	86---146.0---249	86---191.1---314	175---221.9---261	144---144.0---144	163---204.0---242	124---145.0---166
Tree Layer Cover (%)	56---87.5---113	39---62.7---100	31---68.2---110	60---98.6---150		53---72.0---90	50---70.7---92
Herb Layer Cover (%)	44---91.7---151	32---83.1---210	6---90.3---212	92---111.6---136	144---144.0---144	97---132.0---171	74---74.3---75
Moss LayerCover (%)	10---47.0---94 (Null 1)	1---6.1---19 (Null 3)	1---19.4---75 (Null 6)	4---7.3---15 (Null 1)	3---3.0---3		1---21.7---60
Topographic Moisture	4.9---5.3---6 (Null 2)	3.1---3.6---4 (Null 3)	4.1---5.0---6.2 (Null 7)	2.3---4.2---6.2 (Null 4)	4.7---4.7---4.7	4---4.9---5.7 (Null 2)	5.6---6.2---6.8

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ALNRUB/ POLMUN	POPBAL/ GAUSHA/ POLMUN	POPBAL-ALNRUB/ RUBURS-EQUARV	ABILAS-(PINCON)/ LUPARC	ABILAS/ VACSCO/ VALSIT	ABILAS-(ABIAMA)/ MENFER	ABILAS-(ABIAMA)/ VACMEM/ VALSIT
plots	4	1	1	5	3	2	37
Elevation (feet)	75---1144---2789	2462---2462---2462	2539---2539---2539	5000---5534---5821	6100---6303---6540	5669---5795---5920	3133---4849---5920 (Null 2)
Aspect (plots)	NNE(1) SSE(2) WSW(1)	ESE(1)	SSW(1)	ESE(1) SSE(1) SSW(1) WSW(2)	ESE(1) SSW(1) WSW(1)	NNW(1) WNW(1)	ESE(2) SSE(11) SSW(7) WSW(9) WNW(6) NNW(2)
Slope Gradient (%)	24---35---52	5---5---5	2---2---2	50---59---78	55---61---65	8---22---35	10---32---65
%Substrate Org. Matter	1---2.8---4	4---4.0---4	4---4.0---4	3---34.8---90		2---2.0---2 (Null 1)	1---28.5---99 (Null 22)
%Substrate Rocks	0---1.0---2	0---0.0---0	0---0.0---0	2---26.8---80	1---1.0---1 (Null 1)	1---2.0---3	0---3.9---50 (Null 17)
%Substrate Dec. Wood	1---1.5---2	1---1.0---1	1---1.0---1	1---1.0---1 (Null 4)		2---2.0---2 (Null 1)	1---1.8---3 (Null 28)
%Substrate Mineral Soil	0---1.3---2	0---0.0---0	0---0.0---0	1---5.0---15	1---2.0---3 (Null 1)	1---1.0---1	0---1.1---5 (Null 17)
%Substrate Bedrock	0---1.3---3	0---0.0---0	0---0.0---0	2---2.0---2 (Null 4)		0---0.0---0 (Null 1)	0---1.7---2 (Null 28)
Total Vascular Cover (%)	184---202.5---214	210---210.0---210	221---221.0---221	60---89.8---120	128---144.7---167	199---213.5---228	99---185.7---411
Tree Layer Cover (%)	80---84.0---90	72---72.0---72	61---61.0---61	33---45.6---60	33---53.7---70	76---87.0---98	28---61.6---150
Herb Layer Cover (%)	94---118.5---134	138---138.0---138	160---160.0---160	15---42.4---77	69---91.0---134	123---126.5---130	35---108.9---197
Moss LayerCover (%)	3---10.3---20	16---16.0---16	3---3.0---3	3---9.0---15 (Null 3)		26---26.0---26 (Null 1)	1---10.0---61 (Null 14)
Topographic Moisture	4.1---5.2---6.4	7.2---7.2---7.2	7.4---7.4---7.4	2.6---2.6---2.6 (Null 4)		3.4---3.4---3.4 (Null 1)	3.1---4.9---6.3 (Null 18)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ABILAS-(PSEMEN)/VACMEM	ABILAS-(ABIAMA)/VACMEM/XERTEN	ABILAS/ERYMON	ABILAS/RHOALB/PHYEMP	ABILAS/RHOALB/RUBLAS	ABILAS/VACALA/LUPARC	ABILAS/VACMEM/LUPARC
plots	**1**	**6**	**4**	**1**	**8**	**1**	**5**
Elevation (feet)	3274---3274---3274	4000---4608---5789	4723---5415---5840	4065---4065---4065	4650---5132---6000	5450---5450---5450	5292---5539---5850
Aspect (plots)	WNW(1)	SSE(2) SSW(1) WSW(3)	ESE(2) SSE(2)	WNW(1)	NNE(1) ENE(1) ESE(4) WSW(1) WNW(1)	SSW(1)	SSE(2) SSW(2) WSW(1)
Slope Gradient (%)	14---14---14	15---41---60	23---51---70	36---36---36	11---48---70	36---36---36	28---48---55
%Substrate Org. Matter	4---4.0---4	3---62.7---99	2---22.3---80	4---4.0---4	3---48.1---99		1---18.8---65
%Substrate Rocks	0---0.0---0	0---11.8---65	1---2.0---5	0---0.0---0	0---20.3---70	1---1.0---1	1---20.2---70
%Substrate Dec. Wood	2---2.0---2	2---2.0---2 (Null 5)	1---1.3---2 (Null 1)	1---1.0---1	1---1.3---2 (Null 5)		1---1.0---1 (Null 2)
%Substrate Mineral Soil	1---1.0---1	0---1.0---2	1---2.3---5	0---0.0---0	0---15.1---75	2---2.0---2	1---5.0---15
%Substrate Bedrock	1---1.0---1	1---1.0---1 (Null 5)	0---1.3---3 (Null 1)	0---0.0---0	0---0.5---2 (Null 4)		1---1.3---2 (Null 2)
Total Vascular Cover (%)	213---213.0---213	120---134.0---173	93---143.0---176	240---240.0---240	99---130.3---167	70---70.0---70	101---111.4---129
Tree Layer Cover (%)	17---17.0---17	30---57.5---80	20---46.3---58	46---46.0---46	30---43.9---65	13---13.0---13	24---38.8---70 (Null 1)
Herb Layer Cover (%)	196---196.0---196	20---55.8---80	73---86.5---103	194---194.0---194	25---76.9---123	57---57.0---57	35---72.8---120
Moss LayerCover (%)	5---5.0---5	1---29.8---100 (Null 2)	1---1.0---1 (Null 3)	3---3.0---3	1---22.2---73 (Null 3)	4---4.0---4	2---3.0---4 (Null 2)
Topographic Moisture	4.6---4.6---4.6	4.6---4.6---4.6 (Null 5)	2.9---3.2---3.6 (Null 1)	4.4---4.4---4.4	4.6---5.1---5.9 (Null 5)		2.6---4.2---5.2 (Null 2)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ABILAS/ VALSIT	ABILAS/ VERVIR	ABILAS-CUPNOO/ MAHNER/ VALSIT	ABILAS-PSEMEN/ MAHNER	KRUMM ABILAS	KRUMM CUPNOO	KRUMM TSUMER
plots	18	4	1	3	5	3	3
Elevation (feet)	3494---5350---6396	6150---6335---6600	5190---5190---5190	3493---4002---4789	5610---6311---6960	6400---6454---6483	5060---5589---5900
Aspect (plots)	ENE(1) ESE(3) SSE(4) SSW(6) WSW(2) WNW(1) (Null 1)	SSW(2) WNW(1) (Null 1)	SSE(1)	ESE(1) SSE(1) WSW(1)	ESE(1) SSE(1) SSW(1) WSW(1) NNW(1)	SSE(1) WSW(1) WNW(1)	NNE(1) ESE(1) WSW(1)
Slope Gradient (%)	9---33---68	20---38---57	48---48---48	40---53---60	1---30---60	35---68---90	21---32---45
%Substrate Org. Matter	2---28.2---99 (Null 5)	S(1) (Null 3)	90---90.0---90	1---2.0---3	4---4.0---4 (Null 3)	3---21.0---50	4---61.0---99
%Substrate Rocks	0---6.8---65 (Null 2)	0---0.0---0 (Null 3)	25---25.0---25	0---1.3---2	0---0.8---1 (Null 1)	0---23.3---60	0---0.3---1
%Substrate Dec. Wood	1---1.6---3 (Null 10)	1---1.0---1 (Null 3)		2---2.0---2	1---1.5---2 (Null 3)	2---2.0---2 (Null 2)	1---1.0---1 (Null 2)
%Substrate Mineral Soil	0---4.6---55 (Null 1)	1---1.0---1 (Null 3)	2---2.0---2	1---1.0---1	0---1.5---3 (Null 1)	1---11.0---30	1---1.0---1 (Null 1)
%Substrate Bedrock	0---0.8---2 (Null 10)	0---0.0---0 (Null 3)		1---2.3---4	1---1.0---1 (Null 3)	1---1.0---1 (Null 2)	0---0.0---0 (Null 2)
Total Vascular Cover (%)	92---157.9---241	125---194.8---294	133---133.0---133	188---226.7---300	97---134.0---180	66---97.0---130	113---186.0---305
Tree Layer Cover (%)	37---56.2---90	30---35.7---40 (Null 1)	95---95.0---95	63---77.7---100	3---3.0---3 (Null 3)	65---77.5---90 (Null 1)	60---79.5---99 (Null 1)
Herb Layer Cover (%)	25---92.2---201	88---168.0---264	25---25.0---25	122---149.0---200	97---132.8---177	3---46.0---130	10---81.7---140
Moss LayerCover (%)	1---11.8---35 (Null 6)		5---5.0---5	2---24.7---64	1---1.0---1 (Null 4)	3---3.0---3 (Null 2)	1---4.7---10
Topographic Moisture	3.2---4.4---5.4 (Null 10)	3.3---3.3---3.3 (Null 3)		3.1---3.8---4.9	3.1---3.2---3.2 (Null 3)	4.2---4.2---4.2 (Null 2)	3.6---3.6---3.6 (Null 2)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	CUPNOO/ STRLAN	CUPNOO/ VALSIT	CUPNOO-PSEMEN/ ACECIR	ABIAMA-TSUMER/ MENFER	ABIAMA-TSUMER/ STRLAN	ABIAMA-TSUMER/ VACMEM/ RUBLAS	ABILAS-TSUMER/ VACSCO
plots	3	5	1	11	15	18	1
Elevation (feet)	3844---4186---4722	4822---5272---6210	3378---3378---3378	3444---4393---5010 (Null 4)	3350---4379---5440 (Null 5)	4150---4996---5880	5550---5550---5550
Aspect (plots)	SSE(2) SSW(1)	SSE(2) SSW(1) WSW(2)	SSW(1)	ENE(2) ESE(1) SSE(2) SSW(1) NNW(1) (Null 4)	NNE(1) ESE(1) SSE(1) SSW(1) WSW(1) WNW(1) NNW(4) (Null 5)	NNE(1) ESE(2) SSE(4) SSW(4) WSW(3) WNW(4)	ENE(1)
Slope Gradient (%)	42---58---68	36---56---87	60---60---60	5---31---65	10---37---70	7---32---65	5---5---5
%Substrate Org. Matter	2---3.0---4	4---34.3---99 (Null 1)	4---4.0---4	2---3.6---4 (Null 6)	4---27.6---95 (Null 10)	4---60.2---95 (Null 7)	
%Substrate Rocks	0---0.3---1	0---17.5---70 (Null 1)	1---1.0---1	0---0.0---0 (Null 6)	0---8.0---20 (Null 10)	0---7.5---50 (Null 7)	
%Substrate Dec. Wood	2---2.0---2	2---2.5---3 (Null 3)	2---2.0---2	1---1.6---2 (Null 6)	1---1.5---2 (Null 13)	1---1.0---1 (Null 15)	
%Substrate Mineral Soil	0---0.3---1	0---1.5---3 (Null 1)	1---1.0---1	0---0.2---1 (Null 6)	0---19.4---55 (Null 10)	0---9.9---80 (Null 6)	
%Substrate Bedrock	0---2.0---3	0---0.5---1 (Null 3)	1---1.0---1	0---0.8---1 (Null 6)	1---1.5---2 (Null 13)	1---1.3---2 (Null 15)	
Total Vascular Cover (%)	117---173.3---206	114---155.6---189	171---171.0---171	133---186.4---265 (Null 4)	106---146.4---206 (Null 5)	104---136.4---244	142---142.0---142
Tree Layer Cover (%)	20---60.0---80	70---80.6---95	130---130.0---130	1---422.3---944	1---484.7---100	55---78.3---110	70---70.0---70
Herb Layer Cover (%)	97---113.3---126	30---72.0---109	41---41.0---41	53---115.4---186 (Null 4)	39---60.0---100 (Null 5)	5---40.8---87	72---72.0---72
Moss LayerCover (%)	8---15.0---27	3---6.3---10 (Null 2)		8---34.6---70 (Null 6)	1---13.6---35 (Null 10)	2---30.9---80 (Null 9)	
Topographic Moisture	3.4---3.9---4.6	4.9---5.4---5.8 (Null 3)	5.3---5.3---5.3	3.2---4.9---5.9 (Null 5)		3---3.3---3.8 (Null 15)	

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ABILAS-ABIAMA/ LUZGLA	TSUMER-(ABIAMA-ABILAS)/ LUZGLA	TSUMER-ABIAMA/ Dep.	TSUMER-ABIAMA/ RHOALB	TSUMER-ABIAMA/ ERYMON	TSUMER-ABIAMA/ VACALA/ RUBPED	TSUMER-ABIAMA/ VACMEM/ XERTEN
plots	1	1	4	66	1	11	10
Elevation (feet)	5376---5376---5376	5679---5679---5679	3400---3834---4500	3240---4741---5910 (Null 23)	5150---5150---5150	3250---3730---4188 (Null 1)	3930---4799---5863
Aspect (plots)	SSW(1)	SSW(1)	NNW(1) WSW(1) WNW(2)	NNE(3) ENE(6) ESE(6) SSE(3) WSW(11) WNW(8) NNW(8) (Null 21)	SSW(1)	NNE(2) ESE(1) SSW(4) WSW(1) WNW(1) NNW(2)	NNE(1) ESE(1) SSE(1) SSW(5) WSW(2)
Slope Gradient (%)	35---35---35	36---36---36	20---48---80	3---39---115	60---60---60	3---39---95	2---48---75
%Substrate Org. Matter	4---4.0---4	4---4.0---4	70---88.0---99 (Null 1)	3---55.7---99 (Null 40)	98---98.0---98	3---59.3---99 (Null 1)	1---26.8---99 (Null 6)
%Substrate Rocks	0---0.0---0	1---1.0---1	2---11.7---30 (Null 1)	0---9.5---85 (Null 39)	1---1.0---1	0---7.7---30 (Null 2)	0---1.2---2 (Null 5)
%Substrate Dec. Wood	1---1.0---1	1---1.0---1		1---1.9---3 (Null 59)		1---1.5---2 (Null 9)	1---1.0---1 (Null 7)
%Substrate Mineral Soil	1---1.0---1	1---1.0---1	1---1.7---2 (Null 1)	0---3.4---40 (Null 41)		0---16.3---75 (Null 2)	1---1.8---4 (Null 5)
%Substrate Bedrock	0---0.0---0	0---0.0---0		0---0.9---2 (Null 59)		1---1.5---2 (Null 9)	0---1.0---2 (Null 7)
Total Vascular Cover (%)	150---150.0---150	168---168.0---168	87---130.8---191	86---184.5---323 (Null 21)	97---97.0---97	132---193.0---332	110---154.4---228
Tree Layer Cover (%)	23---23.0---23	40---40.0---40	46---76.5---95	1---401.7---910	60---60.0---60	45---68.7---90	36---72.4---120
Herb Layer Cover (%)	127---127.0---127	128---128.0---128	5---23.8---75	15---89.3---225 (Null 21)	20---20.0---20	25---69.4---105	10---80.5---148
Moss LayerCover (%)		1---1.0---1	2---30.0---75	1---23.9---85 (Null 40)	26---26.0---26	4---44.4---101	1---11.5---36 (Null 6)
Topographic Moisture	3.6---3.6---3.6	4.3---4.3---4.3		3.4---4.5---6.4 (Null 35)		4.6---5.4---6.2 (Null 9)	3.4---4.1---5.1 (Null 7)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	TSUMER-ABILAS/ ALNVIR	ABILAS-(TSUMER)/ FESVIR	ABILAS/ POLPUL-PEDRAC	ABILAS/ VACDEL	CUPNOO/ VACDEL	TSUMER/ PHYEMP-VACDEL	TSUMER-ABILAS/ VACDEL-PHYEMP
plots	1	4	6	11	1	11	40
Elevation (feet)	(Null 1)	5800---6252---6980	5050---5858---6856	5105---5765---6570 (Null 1)	5600---5600---5600	3563---5134---7000 (Null 2)	3650---5489---6720 (Null 2)
Aspect (plots)	WNW(1)	SSE(1) SSW(1) WSW(1) WNW(1)	SSE(1) SSW(2) WSW(2) WNW(1)	NNE(2) ESE(1) SSE(1) SSW(2) WSW(4) NNW(1)	WNW(1)	NNE(2) ENE(2) ESE(1) SSE(3) SSW(1) WSW(1) NNW(1)	NNE(3) ENE(2) ESE(3) SSE(4) SSW(3) WSW(10) WNW(12) NNW(2) (Null 1)
Slope Gradient (%)	45---45---45	32---46---75	38---49---70	0---33---80	50---50---50	1---28---55	0---27---88
%Substrate Org. Matter	3---3.0---3	2---2.0---2 (Null 3)	5---51.0---95 (Null 1)	2---2.8---4 (Null 6)	80---80.0---80	3---18.0---90 (Null 5)	1---55.5---99 (Null 21)
%Substrate Rocks	1---1.0---1	2---2.0---2 (Null 3)	0---18.2---65	1---1.0---1 (Null 6)	15---15.0---15	0---1.7---10 (Null 5)	0---4.9---25 (Null 19)
%Substrate Dec. Wood	1---1.0---1	1---1.0---1 (Null 3)		1---1.2---2 (Null 6)		1---1.2---2 (Null 6)	0---1.0---2 (Null 35)
%Substrate Mineral Soil	1---1.0---1	3---3.0---3 (Null 3)	0---10.8---25	1---1.4---2 (Null 6)	1---1.0---1	0---0.5---1 (Null 5)	0---4.4---40 (Null 21)
%Substrate Bedrock	2---2.0---2	0---0.0---0 (Null 3)		0---0.8---2 (Null 6)		0---1.4---3 (Null 6)	0---1.0---2 (Null 35)
Total Vascular Cover (%)	133---133.0---133	83---144.5---177	72---102.2---148	99---176.7---220	152---152.0---152	66---144.1---179	59---158.7---328 (Null 1)
Tree Layer Cover (%)	14---14.0---14	30---31.5---33 (Null 2)	21---41.8---85	30---49.1---80 (Null 1)	40---40.0---40	3---33.7---90	1---78.0---80
Herb Layer Cover (%)	119---119.0---119	53---128.8---177	8---42.7---95	64---132.1---180	80---80.0---80	19---113.0---155	19---96.5---229 (Null 1)
Moss LayerCover (%)			1---8.5---25 (Null 2)	1---4.7---9 (Null 8)	2---2.0---2	6---21.3---52 (Null 4)	1---28.0---75 (Null 22)
Topographic Moisture		3.9---3.9---3.9 (Null 3)		3.3---3.9---5 (Null 7)		3.2---4.2---5.7 (Null 2)	2.8---3.7---5 (Null 27)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PICSIT/ RUBSPE/ CAROBN-LYSAME	TSUHET-(THUPLI-ALNRUB)/ LYSAME-ATHFIL	TSUHET-THUPLI/ GAUSHA/ LYSAME	ALNRUB/ ATHFIL-LYSAME	ALNRUB/ GLYSTR	ACEMAC/ MAISTE	ACEMAC/ OXAORE
plots	2	3	4	2	1	1	9
Elevation (feet)	29---85---140	2142---2667---3688	88---1301---2063 (Null 1)	2165---2589---3012	1950---1950---1950	(Null 1)	117---833---1440
Aspect (plots)	WNW(1) (Null 1)	ENE(1) SSW(1) WNW(1)	ENE(1) SSE(1) WSW(1) WNW(1)	SSE(1) WSW(1)	WNW(1)	SSW(1)	ENE(1) ESE(1) SSE(5) SSW(1) WNW(1)
Slope Gradient (%)	2---3---4	3---4---4	0---1---2	2---4---5	5---5---5	25---25---25	0---6---17
%Substrate Org. Matter	2---2.5---3	1---2.3---3	2---2.3---3	1---2.0---3	2---2.0---2	4---4.0---4	2---3.8---8 (Null 3)
%Substrate Rocks	0---0.0---0	0---0.3---1	0---0.0---0	0---0.5---1	0---0.0---0	0---0.0---0	0---3.0---10 (Null 3)
%Substrate Dec. Wood	1---2.0---3	1---1.3---2	1---2.0---3	1---1.5---2	1---1.0---1	1---1.0---1	2---2.0---2 (Null 7)
%Substrate Mineral Soil	0---0.5---1	0---0.7---1	0---0.5---1	1---1.0---1	3---3.0---3	1---1.0---1	0---2.0---7 (Null 3)
%Substrate Bedrock	0---0.0---0	0---0.3---1	0---0.0---0	0---0.0---0	0---0.0---0	1---1.0---1	0---0.5---1 (Null 7)
Total Vascular Cover (%)	159---171.0---183	136---209.0---316	168---204.8---296	106---193.5---281	220---220.0---220	235---235.0---235	171---260.6---350
Tree Layer Cover (%)	39---49.5---60	41---51.0---61	50---100.3---163	82---82.0---82 (Null 1)	80---80.0---80	90---90.0---90	25---73.4---88
Herb Layer Cover (%)	120---121.5---123	85---158.0---255	78---104.5---133	106---152.5---199	140---140.0---140	145---145.0---145	85---115.7---204
Moss LayerCover (%)	12---26.0---40	16---29.7---53	25---49.8---75	3---10.0---17	4---4.0---4		10---31.1---60
Topographic Moisture	6.5---7.2---7.8	6.1---6.8---7.4	6---6.6---7.2	7.2---7.8---8.4	7.8---7.8---7.8	5.8---5.8---5.8	

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ACEMAC/ POLMUN-TOLMEN	ACEMAC/ RUBSPE	ALNRUB/ ACECIR/ CLASIB	ALNRUB/ ELYGLA	ALNRUB/ OPLHOR-RUBSPE	ALNRUB/ RUBSPE	ABIGRA/ BROVUL-POLMUN
plots	6	5	1	14	1	10	2
Elevation (feet)	320---646---1415	75---914---1900	2700---2700---2700	440---697---1540	2628---2628---2628	285---1189---2018 (Null 1)	1550---1550---1550
Aspect (plots)	NNE(1) ENE(1) SSW(2) WNW(1) NNW(1)	ESE(1) SSE(2) SSW(1) NNW(1)	WNW(1)	NNE(1) ESE(1) SSE(2) SSW(4) WSW(1) WNW(3) NNW(2)	SSE(1)	NNE(1) ESE(1) SSE(1) SSW(3) WSW(1) WNW(2) NNW(1)	ENE(2)
Slope Gradient (%)	0---3---12	2---14---30	10---10---10	0---2---4	4---4---4	1---5---16	2---2---2
%Substrate Org. Matter	2---3.0---4 (Null 1)	2---3.0---4		0---6.5---40	1---1.0---1	1---2.9---4 (Null 1)	2---2.0---2
%Substrate Rocks	0---0.5---1	0---0.6---1	3---3.0---3	0---16.0---80 (Null 2)	3---3.0---3	0---1.1---5	1---1.5---2
%Substrate Dec. Wood	1---1.6---3 (Null 1)	1---2.0---4		1---1.0---1 (Null 13)	1---1.0---1	1---2.0---4 (Null 2)	
%Substrate Mineral Soil	1---1.2---2	1---1.0---1	3---3.0---3	0---13.6---65 (Null 1)	3---3.0---3	0---0.9---2	2---2.5---3
%Substrate Bedrock	0---0.2---1 (Null 1)	0---0.8---1		0---0.0---0 (Null 13)	2---2.0---2	0---0.6---2 (Null 2)	
Total Vascular Cover (%)	163---202.7---257	164---232.6---343	202---202.0---202	80---236.8---409	105---105.0---105	150---261.3---414	261---332.5---404
Tree Layer Cover (%)	70---83.3---98	60---85.6---100	80---80.0---80	20---75.7---95	55---55.0---55	10---65.4---111	55---60.0---65
Herb Layer Cover (%)	86---119.3---167	84---147.0---245	122---122.0---122	30---89.4---257	50---50.0---50	95---165.0---214	95---97.5---100
Moss LayerCover (%)	3---18.7---73	4---9.8---19		1---29.7---78 (Null 2)	7---7.0---7	2---17.9---95	85---97.5---110
Topographic Moisture	5.3---6.1---6.4 (Null 1)	4.8---5.7---6.9		6.2---6.2---6.2 (Null 13)	7---7.0---7	5.6---6.2---7.4 (Null 2)	

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ALNRUB/ STACHA-TOLMEN	ALNRUB/ OXAORE	PICSIT-(ALNRUB)/ RUBSPE/ POLMUN	PICSIT/ SCIMIC	TSUHET-(PSEMEN-THUPLI)/ POLMUN-ATHFIL	POPBAL-ALNRUB/ CAROBN	POPBAL-PICSIT-(ACEMAC)/ OXAORE
plots	3	7	2	1	11	2	6
Elevation (feet)	256---1534---2785	162---996---2300 (Null 1)	103---103---103	580---580---580	355---1749---3075 (Null 2)	195---257---318	319---632---980
Aspect (plots)	NNE(1) ENE(1) NNW(1)	SSW(3) WSW(4)	NNE(1) SSW(1)	ESE(1)	ENE(1) NNE(1) NNW(2) SSE(1) SSW(2) WNW(1) WSW(3)	SSW(1) WSW(1)	NNE(2) SSE(1) WNW(1) NNW(2)
Slope Gradient (%)	0---1---2	0---2---4	12---29---45	4---4---4	7---33---80	0---0---0 (Null 1)	0---2---4
%Substrate Org. Matter	2---6.7---15	1---5.3---20 (Null 1)	4---4.0---4	15---15.0---15	1---7.5---25 (Null 1)	1---2.5---4	1---4.5---15
%Substrate Rocks	1---1.0---1	0---2.3---15	0---0.0---0	2---2.0---2	0---7.8---75	0---0.0---0	0---0.5---2
%Substrate Dec. Wood	1---2.0---3 (Null 1)	1---2.0---3 (Null 3)	1---2.0---3		1---1.8---3 (Null 5)	1---1.5---2	1---1.0---1 (Null 5)
%Substrate Mineral Soil	1---1.3---2	1---2.7---10	1---1.0---1	6---6.0---6	0---0.5---1	1---2.0---3	0---1.8---5
%Substrate Bedrock	1---1.0---1 (Null 1)	0---0.8---2 (Null 3)	0---0.0---0		0---0.8---2 (Null 5)	0---0.0---0	0---0.0---0 (Null 5)
Total Vascular Cover (%)	191---245.3---316	148---225.7---356	157---165.0---173	213---213.0---213	140---223.8---327	159---180.5---202	188---239.2---320
Tree Layer Cover (%)	85---90.0---94	35---84.0---121	73---83.0---93	25---25.0---25	51---83.5---150	50---50.0---50	50---73.5---91
Herb Layer Cover (%)	97---111.3---138	69---112.7---170	64---82.0---100	90---90.0---90	70---107.6---186	109---130.5---152	95---103.0---143
Moss LayerCover (%)	1---15.3---27	4---27.7---132	2---2.0---2 (Null 1)	18---18.0---18	9---61.8---115 (Null 1)	4---4.5---5	6---50.7---95
Topographic Moisture	5.8---6.3---6.7 (Null 1)	5.2---6.4---7.2 (Null 3)	4.6---5.0---5.4		4.4---5.6---6.2 (Null 5)	6.4---6.4---6.4	

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PSEMEN-PINPON-POPBAL/ ACECIR	ACECIR	ACECIR/ ATHFIL-TOLMEN	ALNVIR	ALNVIR-ACECIR	ALNVIR-OPLHOR	ALNVIR-RUBSPE/ ATHFIL
plots	1	14	18	8	6	7	27
Elevation (feet)	1252---1252---1252	1219---2838---3608 (Null 1)	550---2532---4070 (Null 1)	3216---4174---5354	2440---3316---4118	3703---4134---4512	2000---3669---4944
Aspect (plots)	SSW(1)	ENE(3) ESE(1) SSW(4) WSW(4) WNW(1) NNW(1)	NNE(2) ENE(4) ESE(3) SSE(1) SSW(3) WNW(2) NNW(3)	NNE(1) ESE(2) SSE(1) SSW(2) WSW(2)	NNE(1) ESE(2) SSE(2) WNW(1)	NNE(1) ENE(1) ESE(3) NNW(2)	NNE(2) ENE(2) ESE(7) SSE(3) SSW(5) WSW(1) WNW(4) NNW(3)
Slope Gradient (%)	0---0---0	1---49---90	2---43---70	12---38---60	34---59---85	1---35---65	5---40---80
%Substrate Org. Matter		2---3.5---4 (Null 4)	1---8.7---80 (Null 2)	2---26.3---95 (Null 2)	1---12.6---50 (Null 1)	2---3.2---4 (Null 2)	2---10.4---95 (Null 2)
%Substrate Rocks	1---1.0---1	0---0.8---4 (Null 1)	0---0.7---3 (Null 1)	1---7.3---45	0---9.3---50	0---1.4---3	0---1.1---5
%Substrate Dec. Wood		0---1.0---2 (Null 4)	1---1.4---3 (Null 5)	1---1.3---2 (Null 4)	1---1.5---2 (Null 2)	1---1.0---1 (Null 2)	1---1.2---2 (Null 4)
%Substrate Mineral Soil	0---0.0---0	0---0.5---3 (Null 1)	0---0.8---1 (Null 2)	0---1.0---3 (Null 1)	0---0.8---1	0---0.9---1	0---0.6---2
%Substrate Bedrock		1---2.5---4 (Null 4)	0---2.2---4 (Null 5)	1---1.8---2 (Null 4)	1---2.0---3 (Null 2)	1---2.0---3 (Null 2)	0---2.0---4 (Null 4)
Total Vascular Cover (%)	281---281.0---281	25---123.5---193	121---157.3---267	58---171.5---228	104---161.7---234	179---226.3---265	142---211.6---318
Tree Layer Cover (%)	75---75.0---75	3---6.8---8 (Null 10)	3---37.7---100 (Null 12)	5---5.0---5 (Null 7)	1---1.0---1 (Null 5)	3---7.0---11 (Null 5)	3---9.0---15 (Null 25)
Herb Layer Cover (%)	206---206.0---206	25---121.6---193	20---136.8---214	55---171.1---228	100---157.7---234	179---224.3---265	99---201.2---318
Moss LayerCover (%)		1---22.1---80 (Null 6)	1---27.6---80 (Null 2)	1---7.1---28 (Null 1)	40---40.0---40 (Null 5)	1---11.8---33 (Null 3)	1---6.2---25 (Null 10)
Topographic Moisture		4.2---4.8---6 (Null 4)	3.1---4.4---6 (Null 5)	4.9---5.7---6.2 (Null 4)	2.9---4.7---6.2 (Null 2)	4.2---5.0---6.2 (Null 2)	4---5.2---7.6 (Null 4)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	CORSER	OPLHOR	RUBSPE-RIBBRA	SALSIT/ EQUARV-PETFRI	SYMALB-MALFUS	ABIAMA/ RUBSPE-VACALA	ABIAMA-TSUHET/ OPLHOR
plots	1	2	3	1	2	1	11
Elevation (feet)	2292---2292---2292	3954---4018---4082	2251---3938---5169	4511---4511---4511	3825---3861---3897	1521---1521---1521	2034---2979---4200 (Null 2)
Aspect (plots)	SSE(1)	ENE(1) NNW(1)	ENE(1) NNW(2)	NNE(1)	ENE(1) ESE(1)	SSW(1)	NNE(4) ENE(2) ESE(2) SSE(1) WSW(1) WNW(1)
Slope Gradient (%)	18---18---18	31---35---38	9---33---58	1---1---1	18---24---30	5---5---5	2---18---60
%Substrate Org. Matter	4---4.0---4	1---1.5---2	2---2.0---2 (Null 1)	1---1.0---1	2---3.0---4		1---13.5---70 (Null 5)
%Substrate Rocks	0---0.0---0	0---0.5---1	0---1.3---4	1---1.0---1	1---1.0---1		0---1.8---10 (Null 5)
%Substrate Dec. Wood	1---1.0---1	2---2.0---2	1---1.0---1 (Null 1)	1---1.0---1	1---1.0---1		1---2.4---4 (Null 6)
%Substrate Mineral Soil	0---0.0---0	1---1.0---1	0---0.3---1	1---1.0---1	1---1.0---1		0---1.2---3 (Null 5)
%Substrate Bedrock	0---0.0---0	1---2.0---3	4---4.0---4 (Null 1)	1---1.0---1	1---2.0---3		0---0.6---1 (Null 6)
Total Vascular Cover (%)	219---219.0---219	154---176.5---199	118---144.0---175	180---180.0---180	134---144.5---155	203---203.0---203	143---254.1---412
Tree Layer Cover (%)		3---3.0---3 (Null 1)		3---3.0---3	8---8.0---8 (Null 1)	60---60.0---60	38---102.3---200
Herb Layer Cover (%)	219---219.0---219	151---175.0---199	118---144.0---175	177---177.0---177	126---140.5---155	143---143.0---143	58---130.3---193
Moss LayerCover (%)		4---4.0---4 (Null 1)	53---53.0---53 (Null 2)	11---11.0---11	3---3.0---3 (Null 1)	37---37.0---37	11---30.4---79 (Null 2)
Topographic Moisture	5.9---5.9---5.9	5.4---6.4---7.4	5.6---5.6---5.6 (Null 1)	6.8---6.8---6.8	5.3---5.5---5.6	6.7---6.7---6.7	5.1---6.1---7.4 (Null 2)

Appendix D: Environmental Table of Forest and Woodland associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ABIAMA-POPBAL/ OPLHOR	ABILAS/ RUBSPE
plots	1	1
Elevation (feet)	2622---2622---2622	3341---3341---3341
Aspect (plots)	ESE(1)	SSE(1)
Slope Gradient (%)	9---9---9	1---1---1
%Substrate Org. Matter		2---2.0---2
%Substrate Rocks		1---1.0---1
%Substrate Dec. Wood		2---2.0---2
%Substrate Mineral Soil		1---1.0---1
%Substrate Bedrock		1---1.0---1
Total Vascular Cover (%)	154---154.0---154	219---219.0---219
Tree Layer Cover (%)	118---118.0---118	58---58.0---58
Herb Layer Cover (%)	36---36.0---36	161---161.0---161
Moss LayerCover (%)	5---5.0---5	5---5.0---5
Topographic Moisture	6---6.0---6	5.8---5.8---5.8

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	BROSIT-CARPHA	HYDFEN	ARTLUD-LOMMAR	EUCPAU	PHAHAS	POLDAV
plots	2	8	15	13	24	4
Elevation (feet)	4800---5150---5500	5470---5658---6260 (1)	4932---5929---6510 (1)	4880---5585---6320	4930---5510---6960 (Null 4)	4830---5936---6975
Aspect (plots)	SSE(1) WSW(1)	ENE(1) ESE(1) SSE(3) SSW(1) WSW(1) (Null 1)	ESE(2) SSE(4) SSW(4) WSW(3) WNW(1) (Null 1)	ENE(2) ESE(6) SSE(4) WSW(1)	ESE(6) SSE(8) SSW(5) WSW(1) (Null 4)	SSW(1) WSW(1) (Null 2)
Slope Gradient (%)	55---63---70	26---33---41 (1)	26---37---70 (1)	29---44---99	28---39---68 (Null 4)	21---31---41 (Null 2)
%Substrate Org. Matter	60---77.5---95	0.5---56.8---99 (1)	0---35.6---99 (1)	0.1---0.6---3 (1)	0---14.6---99 (Null 5)	0.1---0.3---0.5 (Null 2)
%Substrate Rocks	1---1.5---2	0.5---31.2---85.5 (1)	2---52.8---85.5 (1)	3---44.2---98	2---46.9---98 (Null 5)	15.5---26.8---38 (Null 2)
%Substrate Dec. Wood			1---1.0---1 (14)			
%Substrate Mineral Soil	9---22.0---35	0---9.0---38 (1)	0---11.8---63 (1)	0.1---12.1---63	0---19.0---85.5 (Null 5)	38---73.5---98
%Substrate Bedrock		0---9.0---63 (1)	0---0.5---4 (1)	0---0.3---3 (1)	0---0.6---3 (Null 7)	0.5---0.5---0.5 (Null 2)
Total Vascular Cover (%)	81---111.0---141	40---84.6---135	6---56.6---117	17---54.9---96	6---47.0---128	4---33.5---86
Tree Layer Cover (%)	0---1.5---3				0---0.0---0 (Null 22)	
Herb Layer Cover (%)	60---75.0---90	40---84.6---135	6---56.6---117	17---54.9---96	6---46.8---128	4---33.5---86
Moss LayerCover (%)			3---3.0---3 (14)			
Topographic Moisture			3---3.0---3 (14)			

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ANTLAN	JUNPAR-(POLBIS)	CARSPE-(LUPARC-POLBIS)	HERMAX	LUPARC	PTEAQU
plots	8	14	64	7	47	3
Elevation (feet)	5775---6100---6510 (2)	4874---5911---6992	3400---5785---6750 (3)	4050---4795---5800	4300---5638---6350 (Null 1)	3900---4477---4780
Aspect (plots)	ENE(1) ESE(2) WNW(1) NNW(1) (Null 3)	ENE(2) ESE(3) SSE(3) SSW(4) WSW(1) WNW(1)	NNE(1) ENE(5) ESE(22) SSE(10) SSW(11) WSW(8) WNW(4) (Null 3)	NNE(1) SSE(3) SSW(2) WSW(1)	NNE(1) ENE(3) ESE(5) SSE(11) SSW(13) WSW(9) WNW(3) NNW(1) (Null 1)	ESE(1) SSW(2)
Slope Gradient (%)	1---14---36 (2)	3---25---75	0---34---80 (3)	26---54---80	5---33---80 (Null 1)	25---41---60
%Substrate Org. Matter	0.5---3.5---10 (4)	0---8.9---65	0---15.3---99 (14)	1---5.2---10 (1)	0---11.1---99 (Null 1)	0---30.0---70
%Substrate Rocks	0.5---41.6---85.5 (4)	0---13.7---63	0---29.8---90 (13)	1---30.2---85 (1)	0---34.5---85.5 (Null 1)	0---7.3---20
%Substrate Dec. Wood		0---0.8---1 (9)	0---0.5---1 (62)	0---0.0---0 (5)		
%Substrate Mineral Soil	0.5---5.4---15 (4)	0---8.2---30	0---6.4---63 (14)	0---17.7---70 (1)	0---11.6---75 (Null 1)	0---26.7---75
%Substrate Bedrock	0---0.0---0 (5)	0---6.1---38 (6)	0---3.5---63 (22)	1---1.5---2 (5)	0---5.0---63 (Null 10)	0---0.0---0 (2)
Total Vascular Cover (%)	23---53.0---99	30---83.7---134	17---76.8---210	51---172.6---270	8---70.9---163	120---145.7---163
Tree Layer Cover (%)	4---4.0---4 (7)	0---10.0---20 (12)	0---1.0---4 (60)	0---2.8---5 (3)	0---4.5---15 (Null 43)	0---49.0---98 (1)
Herb Layer Cover (%)	23---51.9---99	30---78.4---134	17---75.3---210	30---128.1---270	8---68.3---163	100---127.7---163
Moss LayerCover (%)		2---17.1---45 (6)	2---23.3---85 (60)		1---17.2---45 (Null 42)	
Topographic Moisture		2.2---4.0---6.4 (9)	3---4.7---6.4 (62)	3.2---3.7---4.1 (5)		

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	SAUAME-(HERMAX)	CARPSE	FESVIR-EUCLED	ELMRAC	FESVIR-LUPARC	LUEPEC
plots	5	1	19	1	27	71
Elevation (feet)	4500---5010---5600	5702---5702---5702	5059---5986---6700	5035---5035---5035	1956---6135---7060	0---5645---7280 (1)
Aspect (plots)	NNE(1) SSE(2) WSW(1) WNW(1)	SSE(1)	NNE(1) ENE(1) SSE(9) SSW(6) WSW(1) (Null 1)	ESE(1)	ESE(3) SSE(9) SSW(9) WSW(3) WNW(1) (Null 2)	NNE(12) ENE(7) ESE(16) SSE(6) SSW(5) WSW(5) WNW(11) NNW(6) (Null 3)
Slope Gradient (%)	15---45---60	10---10---10	3---44---82	30---30---30	0---31---72	0---33---99 (1)
%Substrate Org. Matter	15---72.6---95 (1)	4---4.0---4	4---4.0---4 (18)	3---3.0---3	2---2.4---3 (Null 22)	0---9.8---99 (17)
%Substrate Rocks	1---5.4---15.5 (1)	0---0.0---0	1---1.0---1 (18)	38---38.0---38	1---1.7---4 (Null 21)	1---54.1---100 (12)
%Substrate Dec. Wood		0---0.0---0	1---1.0---1 (18)		0---0.4---1 (Null 22)	
%Substrate Mineral Soil	0.5---21.6---80 (1)	1---1.0---1	1---1.0---1 (18)	3---3.0---3	1---2.2---4 (Null 21)	0---11.8---90 (12)
%Substrate Bedrock	0---0.0---0 (4)	0---0.0---0	1---1.0---1 (18)	0---0.0---0	0---1.2---3 (Null 22)	0---19.1---85.5 (29)
Total Vascular Cover (%)	31---161.8---277	118---118.0---118	53---123.9---179	150---150.0---150	10---101.0---169	6---48.5---209
Tree Layer Cover (%)	0---0.5---1 (3)					0---3.6---15 (62)
Herb Layer Cover (%)	31---77.6---95	118---118.0---118	53---123.9---179	150---150.0---150	10---101.0---169	3---44.0---118
Moss LayerCover (%)			4---4.0---4 (18)		2---30.8---100 (Null 23)	1---17.9---65 (64)
Topographic Moisture		6.6---6.6---6.6	3---3.0---3 (18)		2---3.9---6 (Null 22)	

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	CARSPE-PHLDIF	PHLDIF-(LOMMAR-CARPHA)	DANINT	PSESPI	LUZGLA-(LUPARC)	VALSIT-ATHFIL
plots	8	55	3	2	7	1
Elevation (feet)	5700---6034---6300	4700---5876---7200 (Null 6)	1480---1663---1846	1991---2052---2113	5600---6096---7120	4415---4415---4415
Aspect (plots)	ESE(2) SSW(2) WSW(4)	ENE(4) ESE(12) SSE(8) SSW(13) WSW(9) NNW(1) (Null 8)	ESE(1) SSE(1) SSW(1)	ESE(1) SSW(1)	NNW(1) SSE(1) SSW(1) WSW(1) WNW(3)	NNE(1)
Slope Gradient (%)	15---31---65	0---34---65 (Null 6)	12---36---50	44---53---62	0---34---70	98---98---98
%Substrate Org. Matter	0---9.3---35	0---13.3---99 (Null 14)	1---1.0---1	1---1.0---1		4---4.0---4
%Substrate Rocks	1---23.0---38	0.5---47.2---85.5 (Null 14)	1---1.0---1	1---1.5---2	0---0.0---0 (6)	1---1.0---1
%Substrate Dec. Wood		0---0.3---1 (Null 51)	0---0.7---1	1---1.0---1		1---1.0---1
%Substrate Mineral Soil	0.5---8.2---40	0---11.7---63 (Null 14)	1---1.0---1	1---1.0---1	2---2.0---2 (6)	1---1.0---1
%Substrate Bedrock	0---6.9---38 (Null 2)	0---7.0---85.5 (Null 17)	2---3.3---4	2---2.5---3		2---2.0---2
Total Vascular Cover (%)	48---74.6---104	21---52.5---129	21---67.0---109	45---85.0---125	18---87.1---132	122---122.0---122
Tree Layer Cover (%)	0---0.0---0 (Null 7)	0---0.0---0 (Null 54)			11---11.0---11 (6)	
Herb Layer Cover (%)	40---72.4---99	21---52.2---129	21---67.0---109	45---85.0---125	18---85.6---132	122---122.0---122
Moss LayerCover (%)	3---3.0---3 (Null 7)	3---9.3---17 (Null 52)	36---63.0---80	70---70.0---70 (1)		8---8.0---8
Topographic Moisture		2.8---3.3---4.2 (Null 51)	3.3---4.0---4.6	3.8---4.3---4.8		3.4---3.4---3.4

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	VALSIT-CARSPE	VALSIT-LIGGRA	VALSIT-VERVIR	AMEALN/CALRUB	JUNCOM-(PHLDIF)	PAXMYR/PHLDIF
plots	15	11	24	1	40	10
Elevation (feet)	4490---5370---5865 (Null 1)	5100---5739---6290	4010---5153---6706 (Null 1)	5020---5020---5020	4825---5869---7380 (Null 2)	5120---5581---6483 (Null 1)
Aspect (plots)	ENE(1) ESE(1) SSE(3) SSW(4) WNW(3) NNW(1) (Null 2)	NNE(1) ENE(1) ESE(3) SSW(1) WSW(2) WNW(2) (Null 1)	NNE(1) ENE(2) ESE(5) SSE(5) SSW(2) WSW(3) WNW(4) NNW(1) (Null 1)	SSW(1)	ESE(7) SSE(11) SSW(12) WSW(5) WNW(2) NNW(1) (Null 2)	ESE(4) SSE(2) SSW(1) WSW(2) WNW(1)
Slope Gradient (%)	1---40---65 (Null 1)	1---33---78	0---34---76	72---72---72	5---33---99 (Null 2)	32---49---65 (Null 1)
%Substrate Org. Matter	3---38.7---95 (Null 5)	0.1---2.0---3 (8)	0---17.2---85 (Null 1)	4---4.0---4	0---7.1---63 (Null 8)	0.5---21.3---99
%Substrate Rocks	0---8.7---30 (Null 4)	1---6.2---15.5 (8)	0---9.6---38 (Null 1)	1---1.0---1	0---29.6---85.5 (Null 6)	1---46.6---85.5
%Substrate Dec. Wood	0---0.5---1 (Null 13)	1---1.0---1 (9)	0---0.8---2 (Null 14)	0---0.0---0	0---0.5---1 (Null 38)	0---0.7---1 (Null 7)
%Substrate Mineral Soil	0---3.4---15 (Null 4)	1---5.8---15.5 (8)	0---3.2---25 (Null 1)	1---1.0---1	0---5.3---63 (Null 6)	0.1---7.5---15.5
%Substrate Bedrock	1---1.5---2 (Null 13)	0---0.7---1 (8)	0---0.6---3 (Null 9)	0---0.0---0	0---8.1---38 (Null 11)	0---19.7---85.5
Total Vascular Cover (%)	57---123.9---224	44---113.5---170	58---153.1---315	218---218.0---218	34---80.7---137	30---80.6---149
Tree Layer Cover (%)	0---4.6---10 (Null 10)	8---8.0---8 (10)	0---3.4---10 (Null 16)			
Herb Layer Cover (%)	55---94.3---152	44---112.8---170	58---115.8---245	218---218.0---218	0---0.0---0 (Null 39)	30---80.6---149
Moss LayerCover (%)	15---20.0---25 (Null 13)	1---1.0---1 (9)	1---15.9---60 (Null 14)		34---79.8---137	3---3.7---4 (Null 7)
Topographic Moisture	3.6---4.0---4.4 (Null 13)	4.9---5.6---6.2 (9)	2.6---5.2---8.4 (Null 14)	3---3.0---3	3.4---3.4---3.4 (Null 38)	3.4---3.6---3.8 (Null 7)

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	RUBPAR-RUBSPE	RUBPAR/CHAANG	SPISPL	SYMHES	VACCAE/FESVIR	VACCAE/XERTEN
plots	2	2	5	1	3	1
Elevation (feet)	3136---3884---4632	2510---3130---3750	2731---4721---5843	3600---3600---3600	6262---6532---6788	4900---4900---4900
Aspect (plots)	ENE(1) SSE(1)	SSE(2)	ESE(1) SSE(2) SSW(2)	SSW(1)	ENE(1) SSW(2)	SSE(1)
Slope Gradient (%)	28---44---59	23---30---37	15---53---70	22---22---22	10---16---24	36---36---36
%Substrate Org. Matter	4---4.0---4 (Null 1)	3---3.5---4	1---2.8---4 (Null 1)	1---1.0---1	3---3.3---4	0.5---0.5---0.5
%Substrate Rocks	0---1.5---3	1---1.0---1	0---1.2---3	4---4.0---4	0---0.7---1	0.5---0.5---0.5
%Substrate Dec. Wood	1---1.0---1 (Null 1)	1---1.0---1	0---0.5---1 (Null 1)		0---0.3---1	
%Substrate Mineral Soil	0---0.5---1	1---1.5---2	0---1.6---3	3---3.0---3	1---1.3---2	3---3.0---3
%Substrate Bedrock	1---1.0---1 (Null 1)	1---1.5---2	0---2.0---3 (Null 1)		0---0.7---1	0---0.0---0
Total Vascular Cover (%)	79---91.0---103	145---172.5---200	99---137.0---191	238---238.0---238	133---160.0---193	107---107.0---107
Tree Layer Cover (%)				1---1.0---1		
Herb Layer Cover (%)	79---91.0---103	145---172.5---200	99---137.0---191	95---95.0---95		
Moss LayerCover (%)		1---2.0---3	3---4.7---8 (Null 2)	2---2.0---2	133---160.0---193	107---107.0---107
Topographic Moisture	5.2---5.2---5.2 (Null 1)	4.4---5.2---5.9	3.1---4.2---5.6 (Null 1)		3.3---3.8---4	

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	VACDEL/FESVIR	VACSCO	VACSCO/FESVIR	VACMEM/PHLDIF	VACMEM	VACMEM/CALRUB
plots	6	4	3	8	25	1
Elevation (feet)	5165---5782---6050	5602---5864---6220	5933---6381---6928	5105---5480---6000	0---4872---5990	(Null 1)
Aspect (plots)	NNE(1) ESE(1) SSE(4)	SSW(4)	WSW(3)	ESE(5) SSE(2) SSW(1)	NNE(1) ESE(5) SSE(4) SSW(6) WSW(5) WNW(4)	SSW(1)
Slope Gradient (%)	0---21---56	15---46---73	30---38---52	22---33---40	19---43---80	60---60---60
%Substrate Org. Matter	1---2.0---3 (Null 3)	2---2.5---3 (Null 2)	3---3.0---3	0---37.9---99	0---11.7---99 (Null 3)	3---3.0---3
%Substrate Rocks	1---1.7---3 (Null 3)	0---0.5---1 (Null 2)	1---1.3---2	0---33.9---85.5	0---13.3---63	1---1.0---1
%Substrate Dec. Wood	1---1.0---1 (Null 3)	1---1.0---1 (Null 2)	1---1.0---1		1---1.2---2 (Null 16)	1---1.0---1
%Substrate Mineral Soil	1---2.7---4 (Null 3)	1---2.0---3 (Null 2)	1---1.7---2	0---17.6---38	0.5---6.2---38	2---2.0---2
%Substrate Bedrock	0---0.3---1 (Null 3)	0---1.0---2 (Null 2)	0---0.7---1	0---11.9---63	0---3.4---15.5 (Null 6)	2---2.0---2
Total Vascular Cover (%)	116---135.8---175	113---129.0---148	121---145.7---173	76---103.6---155	39---114.8---223	200---200.0---200
Tree Layer Cover (%)					3---12.6---25 (Null 18)	
Herb Layer Cover (%)	3---3.0---3 (Null 4)	1---8.0---13 (Null 1)		76---103.6---155	39---107.7---214	200---200.0---200
Moss LayerCover (%)	116---134.8---172	112---123.0---138	121---145.7---173		1---3.2---8 (Null 19)	1---1.0---1
Topographic Moisture	4.3---4.7---5.3 (Null 3)	4.1---4.7---5.3 (Null 3)	3.9---3.9---4		2---3.8---5 (Null 16)	3.2---3.2---3.2

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	VACMEM/VACDEL	ARC(NEV, UVA)-JUNCOM	ARC(NEV, UVA)/PAXMYR	ARCUVA-FRAVIR-(FESROE)	BROVUL-FESSUB	FESROE-CERARV-KOEMAC
plots	6	2	2	1	1	2
Elevation (feet)	4690---5153---5768	2543---3927---5310	2667---3024---3380	1965---1965---1965	3250---3250---3250	2484---2557---2630
Aspect (plots)	NNE(1) ENE(1) SSW(2) WSW(1) WNW(1)	SSW(1) WSW(1)	SSE(1) WNW(1)	WSW(1)	WSW(1)	SSW(1) WSW(1)
Slope Gradient (%)	34---39---42	15---18---20	12---25---37	68---68---68	50---50---50	40---47---54
%Substrate Org. Matter	0.5---19.0---90	1---2.0---3	2---2.5---3	1---1.0---1	90---90.0---90	1---1.0---1
%Substrate Rocks	0.5---6.8---15.5	1---19.5---38	1---1.0---1	1---1.0---1	1---1.0---1	1---1.0---1
%Substrate Dec. Wood	1---1.0---1 (Null 5)	1---1.0---1 (Null 1)	1---1.5---2	1---1.0---1		0---0.0---0
%Substrate Mineral Soil	0.5---4.2---15.5	1---8.3---15.5	1---1.0---1	1---1.0---1	10---10.0---10	1---1.0---1
%Substrate Bedrock	0---0.7---3 (Null 1)	0.1---0.6---1	1---1.5---2	4---4.0---4		3---3.0---3
Total Vascular Cover (%)	121---154.5---227	42---74.0---106	91---120.0---149	51---51.0---51	134---134.0---134	31---46.5---62
Tree Layer Cover (%)	3---4.5---6 (Null 4)				15---15.0---15	
Herb Layer Cover (%)	95---132.0---183	42---74.0---106		51---51.0---51	90---90.0---90	31---46.5---62
Moss LayerCover (%)	3---4.5---6 (Null 4)	90---90.0---90 (Null 1)	91---120.0---149	63---63.0---63	80---80.0---80	60---66.5---73
Topographic Moisture	3.8---3.8---3.8 (Null 5)	3.8---3.8---3.8 (Null 1)	1---2.8---4.6	1.6---1.6---1.6		1.7---2.0---2.3

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	KOLMAC-(AGRPAL)	LOMMAR sparse	BLESPI	ARCCOL	CEAVEL	LEDGRO-KALMIC/SPHAGN
plots	2	1	1	4	10	1
Elevation (feet)	2123---2263---2402	3028---3028---3028		2086---3940---8038	2579---3436---4275	125---125---125
Aspect (plots)	SSW(1) WSW(1)	SSW(1)		SSW(2) WNW(2)	SSE(6) SSW(2) WSW(2)	ESE(1)
Slope Gradient (%)	44---65---85	45---45---45		30---49---80	20---36---58	0---0---0
%Substrate Org. Matter	2---2.5---3	1---1.0---1		1---1.0---1	1---2.7---4 (Null 3)	0.5---0.5---0.5
%Substrate Rocks	1---1.0---1	1---1.0---1		1---1.8---3	0---1.2---3	0---0.0---0
%Substrate Dec. Wood	1---1.5---2	0---0.0---0		1---1.3---2	1---1.7---3 (Null 3)	
%Substrate Mineral Soil	1---1.0---1	0---0.0---0		1---1.8---2	0---1.1---2	0---0.0---0
%Substrate Bedrock	2---2.5---3	1---1.0---1		2---2.5---3	0---1.3---3 (Null 3)	0---0.0---0
Total Vascular Cover (%)	102---123.5---145	28---28.0---28	98---98.0---98	74---88.5---116	77---186.8---436	80---80.0---80
Tree Layer Cover (%)				3---8.0---13 (Null 2)	9---10.5---12 (Null 8)	
Herb Layer Cover (%)	102---123.5---145	28---28.0---28	98---98.0---98	74---84.5---116	77---184.7---436	80---80.0---80
Moss LayerCover (%)	61---70.5---80	90---90.0---90	4---4.0---4	10---48.0---70	1---4.2---13 (Null 5)	
Topographic Moisture	4.1---4.8---5.4	5.9---5.9---5.9		1---2.0---3.1	2.8---4.0---5.9 (Null 3)	

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	TSUHET-(THUPLI)/LEDGRO/SPHAGN	CUPNOO-TSUMER/CALLEP	KALMIC-CARNIG	SALCOM	SPIDOU	SPIDOU/CARAQUD
plots	5	1	11	20	3	1
Elevation (feet)	102---253---663	3700---3700---3700	5200---6109---6750	3880---4650---5792	2050---3088---4161	2116---2116---2116
Aspect (plots)	SSE(3) SSW(1) NNW(1)	ESE(1)	NNW(1) WNW(1) (Null 10)	NNE(4) ENE(4) ESE(3) SSE(2) WSW(1) WNW(1) NNW(5)	ESE(1) SSE(1) WSW(1)	(Null 1)
Slope Gradient (%)	0---1---3	48---48---48	0---3---20 (Null 1)	0---9---44	0---9---15	2---2---2
%Substrate Org. Matter	1---2.2---3	20---20.0---20		1---45.5---99 (Null 1)	4---4.0---4	0---0.0---0
%Substrate Rocks	0---0.0---0	15---15.0---15		0---4.6---40 (Null 3)	0---3.7---10	0---0.0---0
%Substrate Dec. Wood	0---0.8---1			0---0.7---1 (Null 11)	0---0.5---1 (Null 1)	0---0.0---0
%Substrate Mineral Soil	0---0.0---0	15---15.0---15	10---10.0---10 (Null 10)	1---2.7---10 (Null 2)	0---1.7---3	4---4.0---4
%Substrate Bedrock	0---0.0---0			0---0.7---2 (Null 11)	0---1.5---3 (Null 1)	0---0.0---0
Total Vascular Cover (%)	135---187.2---223	119---119.0---119		73---152.7---245	109---137.3---176	119---119.0---119
Tree Layer Cover (%)	1---8.0---15 (Null 1)	35---35.0---35		0---27.0---100 (Null 16)	2---2.0---2 (Null 2)	
Herb Layer Cover (%)	135---180.8---210	80---80.0---80		73---116.1---180	95---132.7---176	119---119.0---119
Moss LayerCover (%)	26---51.4---98	25---25.0---25	85---124.0---181	9---49.6---85 (Null 2)	1---4.7---10	
Topographic Moisture	5.8---7.0---7.8 (Null 1)			4.4---6.2---8.1 (Null 11)	5.1---5.3---5.4 (Null 1)	6.4---6.4---6.4

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	SPISPL/CARLEN	CARMER	CARNIG	CARSPE-CARNIG-(POTFLA)	CALLEP	CAR (AQD,NIG)-CALLEP
plots	2	2	40	34	3	8
Elevation (feet)	4688---4692---4695	4190---4245---4300	4200---5838---7000	4110---5592---6895 (Null 1)	3350---4872---6000	4597---5573---5855
Aspect (plots)	NNE(1) ESE(1)	SSW(1) WNW(1)	NNE(6) ENE(4) ESE(1) SSE(2) SSW(3) WSW(6) WNW(5) NNW(4) (Null 9)	NNE(3) ENE(2) ESE(2) SSE(4) SSW(3) WSW(9) WNW(1) NNW(2) (Null 7)	ENE(1) SSW(1) WSW(1)	ENE(1) SSW(1) WSW(4) WNW(2)
Slope Gradient (%)	2---5---7	5---10---15	0---11---52 (6)	1---20---58 (Null 7)	10---34---65	2---23---61
%Substrate Org. Matter	1---2.0---3	50---50.0---50 (1)	1---52.2---99 (26)	0---36.9---99 (Null 23)	4---4.0---4 (Null 2)	3---43.4---98 (3)
%Substrate Rocks	0---0.0---0	2---2.0---2 (1)	0---19.9---90 (22)	2---13.8---50 (Null 21)	45---45.0---45 (Null 2)	0---3.8---10 (3)
%Substrate Dec. Wood	0---0.5---1					0---0.5---1 (6)
%Substrate Mineral Soil	1---1.5---2	2---2.0---2 (1)	0---3.8---30 (22)	0---9.4---75 (Null 22)	6---6.0---6 (Null 2)	0---1.0---2 (3)
%Substrate Bedrock	0---0.0---0		0---0.0---0 (39)	0---0.0---0 (Null 30)		1---1.0---1 (6)
Total Vascular Cover (%)	143---156.5---170	128---129.5---131	14---85.3---134	27---100.4---192	121---152.7---181	97---137.0---176
Tree Layer Cover (%)					2---6.0---10 (Null 1)	0---0.0---0 (6)
Herb Layer Cover (%)	143---156.5---170	1---1.0---1 (1)	0---0.0---0 (29)	0---2.5---5 (Null 32)	70---112.3---146	95---131.4---176
Moss LayerCover (%)	3---22.0---41	99---113.5---128	14---83.9---134	25---94.9---173	40---40.0---40 (Null 2)	4---48.5---90 (4)
Topographic Moisture	5.6---6.4---7.1					7---7.1---7.2 (6)

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	CARAQD	CARATH	CARLEN-SYMFOL	CARNEU	CAROBN	CARUTR
plots	1	1	2	1	1	1
Elevation (feet)	2116---2116---2116	1601---1601---1601	4043---4050---4056	4100---4100---4100	580---580---580	3870---3870---3870
Aspect (plots)	ESE(1)		SSW(1) WSW(1)	WNW(1)	WNW(1)	NNE(1)
Slope Gradient (%)	2---2---2		1---3---5	40---40---40	5---5---5	0---0---0
%Substrate Org. Matter	2---2.0---2	1---1.0---1	0---2.0---4	95---95.0---95	99---99.0---99	
%Substrate Rocks	0---0.0---0	1---1.0---1	0---0.0---0	1---1.0---1	0---0.0---0	0---0.0---0
%Substrate Dec. Wood	0---0.0---0	1---1.0---1	0---0.5---1			
%Substrate Mineral Soil	4---4.0---4	1---1.0---1	1---2.0---3	3---3.0---3		1---1.0---1
%Substrate Bedrock	0---0.0---0	1---1.0---1	0---0.0---0			
Total Vascular Cover (%)	98---98.0---98	128---128.0---128	123---143.5---164	176---176.0---176	232---232.0---232	173---173.0---173
Tree Layer Cover (%)				10---10.0---10	5---5.0---5	
Herb Layer Cover (%)	98---98.0---98	128---128.0---128	123---143.5---164	95---95.0---95	99---99.0---99	173---173.0---173
Moss LayerCover (%)			3---41.5---80			8---8.0---8
Topographic Moisture	6.4---6.4---6.4	8.1---8.1---8.1	7---7.5---8			

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	DESCAE	EQUARV	JUNEFF	MIMLEW	PETFRI	RANESC
plots	1	1	1	3	1	1
Elevation (feet)	5980---5980---5980	5650---5650---5650	1180---1180---1180	4870---5317---6000	3950---3950---3950	5020---5020---5020
Aspect (plots)		SSW(1)	WSW(1)	ENE(1) WSW(1) NNW(1)	NNW(1)	ENE(1)
Slope Gradient (%)	1---1---1	40---40---40	11---11---11	4---20---35	6---6---6	25---25---25
%Substrate Org. Matter		90---90.0---90	15---15.0---15	1---2.0---3 (Null 1)	3---3.0---3	3---3.0---3
%Substrate Rocks		2---2.0---2	2---2.0---2	90---95.0---100 (Null 1)	0.5---0.5---0.5	15.5---15.5---15.5
%Substrate Dec. Wood						
%Substrate Mineral Soil		8---8.0---8	2---2.0---2	1---1.0---1 (Null 1)	0.1---0.1---0.1	3---3.0---3
%Substrate Bedrock					0---0.0---0	0---0.0---0
Total Vascular Cover (%)	91---91.0---91	146---146.0---146	244---244.0---244	16---27.3---42	41---41.0---41	64---64.0---64
Tree Layer Cover (%)			6---6.0---6	0---0.0---0 (Null 1)		
Herb Layer Cover (%)	91---91.0---91	95---95.0---95	95---95.0---95	25---34.0---42	41---41.0---41	64---64.0---64
Moss LayerCover (%)		15---15.0---15	26---26.0---26	1---2.5---4 (Null 1)		
Topographic Moisture						

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	SCIMIC	SENTRI	SPAEUR	TRICAE	ARCUVA-(DASFLO)	EMPNIG-LUPSEL
plots	2	1	1	3	8	13
Elevation (feet)	699---700---700	4174---4174---4174	2050---2050---2050	3877---3988---4049	5900---6464---7300	6050---6727---7200 (Null 2)
Aspect (plots)	SSE(1) SSW(1)	NNE(1)	ESE(1)	SSW(2) WSW(1)	SSE(2) SSW(2) WSW(3) WNW(1)	NNE(3) WNW(2) NNW(7) (Null 1)
Slope Gradient (%)	0---1---1	40---40---40	0---0---0	2---3---3	0---19---30	10---19---33 (Null 1)
%Substrate Org. Matter	3---4.0---5	1---1.0---1		2---3.3---4	1---1.0---1 (Null 7)	8.6---8.6---8.6 (Null 12)
%Substrate Rocks	1---8.0---15	2---2.0---2		0---0.0---0	2---2.0---2 (Null 7)	12.75---12.8---12.75 (Null 12)
%Substrate Dec. Wood		1---1.0---1		0---0.0---0	1---1.0---1 (Null 7)	
%Substrate Mineral Soil	20---25.0---30	1---1.0---1		1---1.0---1	2---2.0---2 (Null 7)	6.8---6.8---6.8 (Null 12)
%Substrate Bedrock		4---4.0---4		0---0.0---0	1---1.0---1 (Null 7)	38.4---38.4---38.4 (Null 12)
Total Vascular Cover (%)	187---214.0---241	71---71.0---71	29---29.0---29	113---129.7---146	102---147.0---186	34---124.3---199
Tree Layer Cover (%)	15---17.5---20		0---0.0---0			
Herb Layer Cover (%)	65---77.5---90	71---71.0---71	25---25.0---25	113---129.7---146		
Moss LayerCover (%)	25---29.0---33	2---2.0---2		1---17.7---51	102---147.4---186	34---124.3---199
Topographic Moisture		5.5---5.5---5.5		7---7.3---8	3.8---3.8---3.8 (Null 7)	

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	CASMER-PHYEMP	PHYEMP-(VACDEL)/LUPARC	PHYEMP-VACDEL-CASMER	PHYGLA-(CASMER)	PHYEMP - CASMER	SORSIT/PHYEMP-VACDEL
plots	65	16	102	13	2	4
Elevation (feet)	4560---5876---7150 (Null 2)	4870---5924---7075	3820---5655---6700 (Null 1)	6300---6746---7000 (Null 3)	5660---5670---5680	4932---5137---5338
Aspect (plots)	NNE(6) ENE(14) ESE(6) SSE(5) SSW(2) WSW(4) WNW(9) NNW(14) (Null 5)	NNE(2) ESE(7) SSW(3) WSW(1) WNW(3)	NNE(3) ENE(16) ESE(28) SSE(7) SSW(10) WSW(15) WNW(11) NNW(9) (Null 3)	NNE(1) ESE(1) SSE(2) SSW(2) WSW(1) WNW(2) (Null 4)	ENE(2)	ENE(1) ESE(1) SSE(1) SSW(1)
Slope Gradient (%)	0---29---90 (Null 3)	12---35---75	0---27---74 (Null 3)	2---23---78 (Null 3)	50---55---59	25---47---66
%Substrate Org. Matter	0---23.2---99 (Null 28)	0---13.6---60 (Null 7)	0---33.5---99 (Null 39)	1.6---21.0---99 (Null 7)	0.5---1.8---3	4---4.0---4 (Null 3)
%Substrate Rocks	0---30.9---98 (Null 25)	3---23.9---63 (Null 6)	0---14.2---63 (Null 32)	0---24.7---63 (Null 7)	85.5---85.5---85.5	0---0.0---0 (Null 3)
%Substrate Dec. Wood	1---1.0---1 (Null 62)		1---1.0---1 (Null 100)			1---1.0---1 (Null 3)
%Substrate Mineral Soil	0---8.0---55 (Null 26)	0.5---4.4---15.5 (Null 6)	0---6.3---90 (Null 36)	0---10.5---30 (Null 3)	0.5---1.8---3	1---1.0---1 (Null 3)
%Substrate Bedrock	0---11.5---63 (Null 42)	0---6.4---38 (Null 9)	0---4.5---63 (Null 69)	0---5.8---30.65 (Null 7)	63---74.3---85.5	1---1.0---1 (Null 3)
Total Vascular Cover (%)	24---89.0---183	37---108.4---209	15---101.8---211	28---85.5---151	21---25.5---30	118---138.0---153
Tree Layer Cover (%)						
Herb Layer Cover (%)	0---7.0---15 (Null 54)	0---2.5---5 (Null 14)	0---5.8---20 (Null 76)		21---25.5---30	
Moss LayerCover (%)	24---87.9---172	37---94.6---155	15---92.6---211	28---85.5---151		118---138.0---153
Topographic Moisture						

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	VACMEM/XERTEN	VACDEL	VACMEM-PHYEMP	CARBRE	CARPHA	FESBRA
plots	9	52	7	1	6	2
Elevation (feet)	4331---4894---5960	0---5222---6350	3500---5243---5810		5420---6274---7020	5340---5340---5340 (1)
Aspect (plots)	ESE(1) SSE(2) SSW(4) WSW(2)	ENE(3) ESE(17) SSE(10) SSW(10) WSW(6) WNW(5) NNW(1) (Null 1)	ENE(3) ESE(2) WNW(2)		SSE(2) SSW(3) WNW(1)	SSW(1) (1)
Slope Gradient (%)	24---55---80	2---34---88 (Null 1)	17---35---65		8---20---40	18---18---18 (1)
%Substrate Org. Matter	2---3.4---5 (Null 4)	0---22.9---99 (Null 9)	0.5---42.3---99	11.4---11.4---11.4	0---0.6---2 (1)	0.5---1.2---1.8
%Substrate Rocks	0---1.4---5	0---8.7---63 (Null 6)	1---19.8---63	2.4---2.4---2.4	25---64.4---85.5 (1)	3---28.6---54.25
%Substrate Dec. Wood	0---0.8---1 (Null 5)	0---0.7---1 (Null 46)				
%Substrate Mineral Soil	0---1.7---3	0---3.8---38 (Null 8)	0.5---6.2---15.5 (Null 1)	4.4---4.4---4.4	0.1---6.8---25 (1)	0.5---7.7---14.95
%Substrate Bedrock	1---1.3---2 (Null 5)	0---1.2---15.5 (Null 18)	0---4.7---15.5 (Null 3)	0.8---0.8---0.8	0---0.8---3 (2)	0---11.0---21.95
Total Vascular Cover (%)	89---129.7---162	45---108.2---197	50---97.1---159	65---65.0---65	20---42.2---93	6---20.5---35
Tree Layer Cover (%)	3---8.2---15 (Null 3)		10---15.0---20 (Null 4)		10---10.0---10 (5)	
Herb Layer Cover (%)	85---123.1---162	0---4.3---10 (Null 46)	50---80.1---159	65---65.0---65	20---42.7---83	6---20.5---35
Moss LayerCover (%)	1---1.0---1 (Null 8)	45---99.3---191	2---20.3---55 (Null 4)			
Topographic Moisture	2---3.4---4.3 (Null 5)	3.4---4.4---5.8 (Null 43)				

Appendix D: Environmental Table of Shrub associations. Values in cells are Maximum -- Mean -- Minimum.

Association	FESROE-(PHLDIF-ARECAP)	PHLDIF-LUPSEL-(PEDCON)	SELWAL-(FESROE,FESBRA)
plots	52	15	10
Elevation (feet)	4850---5613---6400 (36)	6200---6726---7400 (Null 1)	3081---3081---3081 (9)
Aspect (plots)	ENE(3) ESE(3) SSE(5) SSW(6) WSW(1) WNW(2) (Null 32)	NNW(2) SSE(1) WSW(3) WNW(3) (Null 6)	SSW(1) WSW(2) WNW(1) NNW(1) (Null 5)
Slope Gradient (%)	5---29---70 (32)	3---11---30 (Null 5)	4---14---28 (5)
%Substrate Org. Matter	0---2.8---15 (33)	0.5---1.8---3 (Null 13)	1---3.6---6.6 (5)
%Substrate Rocks	0.5---21.1---85.5 (36)	42.9---53.0---63 (Null 13)	0---0.0---0 (9)
%Substrate Dec. Wood			0---0.0---0 (9)
%Substrate Mineral Soil	0---16.1---63 (32)	0.5---3.7---6.8 (Null 13)	1---32.4---73 (5)
%Substrate Bedrock	0---2.6---15.5 (38)	0---10.5---20.9 (Null 13)	1---1.0---1 (9)
Total Vascular Cover (%)	35---83.4---142	26---125.8---236	26---56.2---97
Tree Layer Cover (%)			
Herb Layer Cover (%)	35---82.7---142	26---125.8---236	27---61.4---97
Moss LayerCover (%)			3---3.0---3 (9)
Topographic Moisture			6.5---6.5---6.5 (9)

Appendix D: Environmental Table of Nonvascular and Sparse vascular vegetation associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ACECIR - (HOLDIS) sparse	CAMPIP sparse	ATHAME - CRYACR	CARSPE sparse	CARSPE - (PHYGLA - LUPSEL)	ELMRAC - (SENNEO) sparse	VACDEL sparse
plots	4	6	3	22	2	19	3
Elevation (feet)	3447---3859---4510	4820---5450---6400	4291---4590---4900	0---5536---6300	6450---6450---6450 (Null 1)	4880---5872---6500	0---3993---6000
Aspect (plots)	NNE(1) ENE(1) SSE(2)	ENE(2) ESE(1) SSE(1) SSW(2)	ESE(1) SSE(1) WNW(1)	ENE(4) ESE(8) SSW(4) WNW(4) NNW(2)	ESE(1) (Null 1)	NNE(4) ENE(3) ESE(4) SSE(2) WSW(1) WNW(3) NNW(2)	ESE(1) SSE(1) NNW(1)
Slope Gradient (%)	52---98---180 (Null 1)	28---42---66	35---44---60	19---36---65	29---29---29 (Null 1)	10---33---64	23---38---65
%Substrate Org. Matter	0---0.7---1 (Null 1)	0---0.5---3	1---1.7---3	0---0.4---3 (Null 2)	0.1---1.5---2.9	0---16.0---99	0.5---1.8---3 (Null 1)
%Substrate Rocks	1---37.5---100	15.5---75.9---98	1---67.0---100	10---60.6---85.5 (Null 2)	39.5---62.5---85.5	15---82.3---100	15.5---39.3---63 (Null 1)
%Substrate Dec. Wood	1---1.0---1 (Null 3)		2---2.0---2 (Null 2)				
%Substrate Mineral Soil	0---1.8---5	0---0.6---3	1---1.0---1	0.5---9.4---90 (Null 2)	2.7---2.9---3	0---11.7---85	0---1.5---3 (Null 1)
%Substrate Bedrock	4---4.0---4 (Null 3)	0---55.8---98	4---4.0---4 (Null 2)	0---9.1---85.5 (Null 4)	0---20.6---41.1	0---0.6---3 (Null 3)	0---0.0---0 (Null 1)
Total Vascular Cover (%)	6---23.3---55	7---16.3---25	28---42.7---65	3---16.2---39	7---10.5---14	3---10.9---32	18---23.7---30
Tree Layer Cover (%)	0---1.0---2 (Null 2)		0---0.0---0 (Null 1)	0---0.5---1 (Null 20)		1---2.5---4 (Null 17)	
Herb Layer Cover (%)	1---20.8---50	7---16.3---25	20---41.7---65	3---15.9---39	7---10.5---14	2---10.4---26	18---23.7---30
Moss LayerCover (%)	15---23.0---31 (Null 2)		1---6.3---15			35---35.0---35 (Null 18)	
Topographic Moisture	2.4---2.4---2.4 (Null 3)		6---6.0---6 (Null 2)				

Appendix D: Environmental Table of Nonvascular and Sparse vascular vegetation associations. Values in cells are Maximum -- Mean -- Minimum.

Association	LUPARC sparse	DELGLA	ERIPYR sparse	LEPPRY sparse	LUPSEL - (ERIAUR - MINOBT)	PAXMYR/ SEDDIV	ARNXDIV sparse
plots	2	23	4	3	21	13	5
Elevation (feet)	5910---5975---6040	3054---5910---6500 (Null 2)	6560---6618---6640	4555---5020---5815	4384---6626---7500 (Null 2)	5000---5770---6600	5840---6248---6855
Aspect (plots)	SSE(2)	ESE(2) SSE(3) SSW(6) WSW(5) WNW(3) NNW(2) (Null 2)	SSE(2) WSW(2)	NNE(1) ENE(1) WNW(1)	NNE(1) SSE(1) SSW(1) WSW(4) WNW(1) (Null 13)	ESE(3) SSE(4) SSW(1) WSW(2) WNW(3)	NNE(3) ENE(1) ESE(1)
Slope Gradient (%)	35---36---37	27---42---195 (Null 2)	10---14---25	11---29---41	1---10---32 (Null 5)	28---44---66	30---35---42 (Null 1)
%Substrate Org. Matter	0.1---0.3---0.5	0---23.6---99 (Null 2)		3---35.3---63	0.1---1.0---3.25 (Null	0---23.2---99	0---0.7---3
%Substrate Rocks	85.5---85.5---85.5	0---72.2---98 (Null 2)		15---15.3---15.5	1---62.6---98 (Null 11)	63---77.8---98	63---76.5---85.5
%Substrate Dec. Wood		1---1.0---1 (Null 22)			1---1.0---1 (Null 20)		
%Substrate Mineral Soil	3---3.0---3	0---14.1---85.5 (Null 2)		0.5---27.8---45	0---6.5---38 (Null 11)	0.5---8.8---38	0.5---11.5---38
%Substrate Bedrock	0---19.0---38	0---0.6---3 (Null 4)		0---0.0---0 (Null 1)	0---3.8---18.6 (Null	0---42.0---98	0---3.7---15.5
Total Vascular Cover (%)	4---5.5---7	3---25.2---59	14---33.0---44	26---35.7---41	19---59.1---124	12---19.5---36	5---18.0---33
Tree Layer Cover (%)					3---3.0---3 (Null 20)		
Herb Layer Cover (%)	4---5.5---7	3---25.0---59	14---33.0---44	26---35.3---40	19---65.2---188	12---19.5---36	5---18.0---33
Moss LayerCover (%)		93---93.0---93 (Null 22)		18---18.0---18 (Null 2)	90---90.0---90 (Null 20)		
Topographic Moisture		7.1---7.1---7.1 (Null 22)			4.2---4.2---4.2 (Null 20)		

Appendix D: Environmental Table of Nonvascular and Sparse vascular vegetation associations. Values in cells are Maximum -- Mean -- Minimum.

Association	ASTCOT sparse	DASFLO - (PHLDIF)	DASFLO sparse	JUNCOM sparse	LUIHYP	PENDAV sparse	PETHEN
plots	48	11	14	25	11	15	4
Elevation (feet)	4825---5492---6160 (Null 5)	5400---6164---7150 (Null 1)	5440---5691---6740 (Null 3)	4700---5930---6720 (Null 1)	4000---5354---6475	4700---5560---6205 (Null 1)	5190---5489---5800
Aspect (plots)	ESE(5) SSE(13) SSW(21) WSW(8) WNW(1)	ESE(2) SSE(1) SSW(2) WSW(3) WNW(2) (Null 1)	NNE(1) ESE(3) SSE(4) SSW(6) WSW(3) WNW(2) (Null 2)	NNE(1) ENE(4) ESE(2) SSE(5) SSW(7) WSW(2) WNW(3) (Null 1)	ENE(1) ESE(3) SSE(4) SSW(2) WNW(1)	NNE(1) ESE(2) SSE(3) SSW(2) WSW(4) WNW(1) NNW(1) (Null 1)	ESE(1) SSE(1) WSW(1) WNW(1)
Slope Gradient (%)	16---28---36 (Null 2)	2---23---56 (Null 2)	11---25---37 (Null 2)	3---35---85 (Null 1)	25---47---99	20---38---52 (Null 1)	40---55---70
%Substrate Org. Matter	0---8.4---99	0---13.0---99 (Null 3)	0---5.5---99 (Null 2)	0---13.6---99 (Null 2)	0---27.5---99	0---0.2---0.7	0.5---29.1---99.9
%Substrate Rocks	38---80.8---98	4---58.7---85.5 (Null 2)	38---77.9---98 (Null 3)	5---71.1---98 (Null 1)	15.5---60.7---98	15.5---58.1---98	85.5---95.4---99.9
%Substrate Dec. Wood							
%Substrate Mineral Soil	0---10.4---38	0---2.6---15.5 (Null 2)	0---11.7---92 (Null 2)	0---16.5---90 (Null 1)	0.5---11.6---38	0.1---12.3---38	0---25.6---99
%Substrate Bedrock	0---4.1---48	0---2.8---15.5 (Null 3)	0---4.6---40 (Null 3)	0---40.9---98 (Null 9)	0---40.5---85.5 (Null 1)	0---29.3---85.5	85.5---92.2---99.9
Total Vascular Cover (%)	1---10.7---30		7---15.6---39	8---21.6---39	23---44.1---86	1---19.4---58	4---19.5---37
Tree Layer Cover (%)				0---1.0---2 (Null 20)	5---5.0---5 (Null 10)		
Herb Layer Cover (%)	1---10.7---30		7---15.6---39	5---21.6---50	23---43.9---86	1---19.4---58	4---19.5---37
Moss LayerCover (%)		22---57.0---191		5---6.0---7 (Null 23)	50---50.0---50 (Null 10)		
Topographic Moisture							

Appendix D: Environmental Table of Nonvascular and Sparse vascular vegetation associations. Values in cells are Maximum -- Mean -- Minimum.

Association	PHLDIF sparse	SAXBRO sparse	PHLDIF - ALLCRE sparse	POASTE - CERARV	POLMIN - RACELO sparse	SAXTOL - (LUZPIP) sparse
plots	21	3	11	1	1	11
Elevation (feet)	5030---5863---6630	4920---5513---6240	4920---5458---6250 (Null 5)	5100---5100---5100	3858---3858---3858	4594---6121---7200 (Null 1)
Aspect (plots)	ENE(5) ESE(4) SSE(5) SSW(3) WNW(4)	ESE(1) SSW(1) NNW(1)	ENE(2) ESE(2) SSE(1) SSW(2) WNW(1) (Null 3)	ESE(1)	SSW(1)	NNE(1) WNW(3) NNW(3) (Null 4)
Slope Gradient (%)	18---39---51	0---23---39	14---149---999 (Null 3)	45---45---45	18---18---18	2---26---60 (Null 4)
%Substrate Org. Matter	0---19.1---99	0.1---0.4---0.5	0---1.0---4.6 (Null 3)	65---65.0---65	1---1.0---1	0---0.5---1 (Null 7)
%Substrate Rocks	0---61.4---98	63---78.0---85.5	38---75.9---98 (Null 5)	25---25.0---25	0---0.0---0	5---65.8---100 (Null 7)
%Substrate Dec. Wood					1---1.0---1	
%Substrate Mineral Soil	0---16.1---85.5	0.5---6.3---15.5	3---35.4---88 (Null 3)	10---10.0---10	1---1.0---1	1---68.8---95 (Null 5)
%Substrate Bedrock	0---24.3---85.5	0---33.7---85.5	0---28.3---85.5 (Null 5)		2---2.0---2	0---0.0---0 (Null 10)
Total Vascular Cover (%)	5---12.5---28	6---9.7---15	9---20.5---48	115---115.0---115	15---15.0---15	4---19.5---49
Tree Layer Cover (%)				4---4.0---4		0---0.0---0 (Null 8)
Herb Layer Cover (%)	5---12.5---28	6---9.7---15	9---20.5---48	75---75.0---75	15---15.0---15	5---21.5---49
Moss LayerCover (%)				2---2.0---2	95---95.0---95	1---1.5---2 (Null 9)
Topographic Moisture					4.4---4.4---4.4	

Appendix E. Legacy plot data evaluated at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

Appendix E summarizes acquired legacy plot data from Mount Rainier, North Cascades, and Olympic National Parks. The criteria used to evaluate plot data as appropriate for classification analysis include: 1) a near complete vascular species list, 2) plot size scaled to vegetation type (e.g larger for forests), and 3) cover values for all vascular species. See Methods section of document for details.

Appendix E. Legacy plot data evaluated at Mount Rainier, North Cascades, and Olympic National Parks.

Park	Project Name	Citation/Contact	Met Criteria?	Comments
NOCA	Vegetation Cover Types of the North Cascades	J.K Agee and S.G. Pickford 1985. Vegetation and Fuel Mapping of North Cascades National Park Service Complex. NPS CPSU, College of Forest Resources, UW, Seattle, WA 98185	No	Top eight species recorded in cover classes
OLYM	West Twin and Hoh Lake Study	Edmonds, R.L, R.D. Blew, J.L Marra, J. Blew, A.K. Barg, G. Murray, T.B. Thomas. 1998. Vegetation patterns, hydrology, and water chemistry in small watersheds in the Hoh River Valley, Olympic National Park. Scientific Monograph. NPSD/NRUSGS/NRSM-98/02. United States Department of the Interior, National Park Service.	No	No cover data for trees, only basal area and density
MORA	Edward Thesis Data	The Alpine Vegetation of Mount Rainier National Park: Structure, development and contraints. Ph. D University of Washington, 1980. 280pp	No	Summary tables in thesis, plot data has been destroyed
OLYM	Gavin Thesis Data	Gavin, Daniel. 1997. Soil pollen records of a subalpine meadow in the northeastern Olympic Mountains, Washington. Master's Thesis. University of Washington.	No	Plots too small
MORA	Henderson Thesis Data		No	No plot locations available for data at time of analysis
NOCA	NPS NOCA Amphibian study	R. Holmes, NPS, unpublished data	No	Understory species list incomplete
NOCA	NPS NOCA Arthropod Surveys	R. Holmes, NPS, unpublished data	No	Plots too small- no tree cover recorded
MORA, NOCA, OLYM	PMR Vegetation and Landform Database Development Study	National Park Service -- Pacific Northwest Region Vegetation and Landform Database Development Study Final Report. 1996. 65pp	No	Top three species recorded
OLYM	deFerrari Exotics Study	Deferrari, C; Naiman, R A . 1994. multi-scale assessment of the occurrence of exotic plants on the Olympic Peninsula, Washington. Journal of Vegetation Science 5: 247- 258	No	Sampling focus on exotic species
OLYM	Lezberg Thesis data	Lezberg, A.L. 1998. Survival of herbaceous species after canopy closure: role of below-ground traits. Master of Science Thesis. University of Washington.	No	Understory cover in 100m2 plots, canopy structure

Appendix E. Legacy plot data evaluated at Mount Rainier, North Cascades, and Olympic National Parks.

Park	Project Name	Citation/Contact	Met Criteria?	Comments
OLYM	Ozette Survey	Gill, S. Botanical survey of the northwest Olympic Peninsula, Washington. 1983. Washington State University. Pullman, WA. 150 pp	No	Species list but no cover values, largely outside OLYM
OLYM	NPS Forest Carnivore Study	P. Happe, NPS, unpublished data	No	
OLYM	NPS OLYM Coastal Wetland Inventory	S. Acker, NPS, unpublished data	No	Species list but cover in broad categories
OLYM	USGS/NPS OLYM Deer Telemetry Data	K. Jenkins, USGS, unpublished data	No	Top 4 species recorded by physiognomic group
OLYM	USGS/NPS OLYM Bat Habitat Survey	K. Jenkins, USGS, unpublished data	No	Canopy cover by PMR structure classes, understory cover
NOCA	Grizzly Bear Habitat	Almack, J.A., W.L. Gaines, R.H. Naney, P.H. Morrison, J.R. Eby, G.F. Wooten, M.C. Snyder, S.H. Fitkin, E.R. Garcia (1993). North Cascades Grizzly Bear Ecosystem Evaluation. Report to the Interagency Grizzly Bear Committee in fulfillment of requirements identified in the 1982 Grizzly Bear Recovery Plan	No	Sampling stratified on spectra, not clear if homogeneous areas consistently sampled
NOCA, OLYM	Glew Thesis Data	Glew, K. 1998. Distribution and Diversity of Alpine lichens: Biotic and abiotic factors influencing Alpine lichen communities in the northeast Olympic and North Cascade Mountains. Ph. D. Dissertation. University of Washington.	No	Plot size too small
NOCA, OLYM	Climet Ecoplot Data	D. Peterson http://wa-node.gis.washingtc	No	Understory cover, canopy structure
NOCA	NRCS Plot data from Thunder Valley	C. Briggs, NRCS, unpublished data	No	Top three species recorded
NOCA	Susan Pritchard Thesis data	Prichard, S.J. 2003. Spatial and Temporal Dynamics of Fire and Vegetation Change in Thunder Creek Watershed, North Cascades National Park, Washington. Ph.D. Dissertation, University of Washington, Seattle.	No	Canopy structure only

Appendix E. Legacy plot data evaluated at Mount Rainier, North Cascades, and Olympic National Parks.

Park	Project Name	Citation/Contact	Met Criteria?	Comments
OLYM	Belsky	Belsky, J. and Del Moral, R. 1982. Ecology of an alpine-subalpine meadow complex in the Olympic Mountains, Washington. Canadian Journal of Botany. 60: 779-788	Yes	
MORA	Ola Edward's Mt. Rainier Vegetation Plots	G. Rochefort, NPS, unpublished data	Yes	Additional plots now sampled long term
OLYM	Goat/Reconnaissance plots	D.B. Houston, E.G. Schreiner, B.M. Moorhead. 1994. Mountain goats in Olympic National Park: Biology and Management of an introduced species. Scientific Monograph NPS/NROLYM/NRSM-94/25. National Park Service	Yes	
MORA	Hamann Thesis Data	Hamann, Marcia Joanne. 1972. Vegetation of alpine and subalpine meadows of Mount Rainier National Park, Washington. Master's Thesis, Botany. Washington State University.	Yes	
MORA	Franklin Data	The Forest Communities of Mount. Rainier National Park, 1988. J. Franklin et. al, eds. Scientific Monograph Series No. 19. USDI-NPS Washington D.C	Yes	Understory primarily used, basal area/density converted to cover
MORA, NOCA, OLYM	M. Jennings	Composition and function of vegetation alliances in the Interior Northwest, USA http://vegbank.org/cite/VB.Ob.17712.INW29199	Yes	
OLYM	Woodward LTEM Vegetation Survey- Elwha River	A. Woodward, USGS, Unpublished Data	Yes	
OLYM	L. Kunze	Coastal Wetland Inventory	Yes	
OLYM	Henderson-Smith Hoh Dosewallips Data	Henderson, J. A., B.G. Smith, and R.L. Mauk. 1979. Plant communities of the Hoh and Dosewallips drainages, Olympic National Park, Washington. Unpubl. Progress Rep., Dept. of Forestry and Outdoor Rec., Utah St. Univ., Logan, UT.	Yes	

Appendix F: Literature cited in descriptions of plant associations of the Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

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Appendix G. Sampling instructions and field forms used at Mount Rainier, North Cascades including the Chelan National Recreation Area, and Olympic National Parks.

A Basic Guide for Field Work
USGS/NPS Vegetation Mapping Program

Instructions for filling out fields

A: IDENTIFICATION AND LOCATION
Park: OLYM, NOCA or MORA

Plot Number: Code indicating the specific plot. We will use a 2 letter code to indicate the general type of vegetation, followed by a plot number. If you are working in teams of two, coordinate with the crew leader to determine if you are using odd or even numbers for the plots.

R- recon (MR, NR and OR for park)	DS- dwarf shrubland
DF- deciduous forest	H- herbaceous
CF- conifer forest/woodland	BS- bryophyte and sparse
S- shrubland	O- other

Survey Date: Date the survey was taken; day, month, year (07)

Surveyors: Names or initials of surveyors

Watershed: Name of drainage, if known.

Provisional Association Name:
Using the 2007 draft classification, assign the name of the vegetation type that most closely resembles the type you are surveying. In fact, *none* of the names may be a good fit; you may have found a new type. If you have a new type, circle **new?** and create a provisional name with the dominant and diagnostic species.

Name notes: Record any comments about the choice of name, whether selected from the description or created in the field.
Key worked?: Y. - Circle yes if you could key out the association with little or no difficulty. Indicate in the notes any feedback on using the key.

Description good?: Y. Circle yes if you feel that the description completely reflects the overstory and generally reflects the understory species. Match the descriptive words (sometimes, always, predominate, etc) to the cover of the species in the plots. Indicate in the notes any major differences between the description and what you find on the ground.

Field UTM X and UTM Y (YOU MUST RECORD THIS IN THE FIELD!!!!!!!)
Use GPS if at all possible. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used. A *minimum* of 100 collection points or three minutes of collection is a general guideline.

GPS Error : Note the error in the GPS reading off the unit**. If you are using the Mobilemapper you do not need to fill this in.**

PDOP: Note the average PDOP for the time you have been collecting the point.

Plot type: Enter CIRC for circular, SQUAR for square, RECT for rectangular and IRREG for irregularly shaped plot.

Plot Length and Plot Width
For the classification plots, enter the radius for circular plots and width and length dimensions for square or rectangular plots. Choose the appropriate plot size based on the following:

If you're in a ...	**You should usually make your plot...**	**plot area of... (min plot area)**
Forest/Woodland (i.e., trees have their crowns overlapping, usually forming 60-100% cover)	11.3 m radius OR 20 m x 20 m	400 m^2 (200 m^2)
Subalpine Parkland (i.e., open stands of trees with crowns usually not touching. Mosaiced vegetation	8.0 m radius OR 14 x 14 or 10x20	200 m^2 (100 m^2)
Shrubland (i.e., shrubs **greater** than 0.5 m tall are dominant, usually forming more	5.6 m radius OR	100 m^2

than 25% cover OR exceeding tree, dwarf-shrub, herb, and nonvascular cover)	10 m x 10 m	(50 m^2)
Dwarf-shrubland (heath) (i.e., Shrubs **less** than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, shrub, herb, and nonvascular cover).	4.0 m radius OR 7.1 x 7.1 or 5x 10	50 m^2 (25 m^2)
Herbaceous (i.e., Herbs dominant, usually forming more than 25 percent cover OR exceeding tree, shrub, dwarf-shrub, and nonvascular cover).	4.0 m radius OR 7.1 x 7.1 or 5x 10	50 m^2 (25 m^2)
Sparse vegetation (i.e., less than 10% vegetation cover)	4.0m radius OR 7.1 x 7.1 or 5x 10	50 m^2 (25 m^2)
Nonvascular (i.e., nonvascular cover dominant, usually forming more than 25% cover).	2.8 m radius OR 5 m x 5 m	25 m^2 (10 m^2)

If you are on a slope greater than about 25% you will need to correct the plot size to account for the slope. The easiest thing is to use the Impulse to measure the plot radius because it automatically corrects for slope. Or, you can use the slope correction table to determine the expansion factor needed. Slope distance = horizontal distance * Expansion factor

Slope Correction Table: Slope distance = horizontal distance * Expansion factor

% Slope	EF	% Slope	EF	% Slope	EF	% Slope	EF
5	1.000	42	1.085	79	1.275	116	1.532
6	1.001	43	1.089	80	1.281	117	1.539
7	1.002	44	1.093	81	1.287	118	1.547
8	1.003	45	1.097	82	1.293	119	1.554
9	1.004	46	1.101	83	1.300	120	1.562
10	1.005	47	1.105	84	1.306	121	1.567
11	1.006	48	1.110	85	1.312	122	1.578
12	1.007	49	1.114	86	1.319	123	1.585
13	1.008	50	1.118	87	1.325	124	1.593
14	1.009	51	1.123	88	1.332	125	1.601
15	1.010	52	1.127	89	1.338	126	1.609
16	1.012	53	1.132	90	1.345	127	1.617
17	1.014	54	1.136	91	1.352	128	1.624
18	1.016	55	1.141	92	1.359	129	1.621
19	1.018	56	1.146	93	1.365	130	1.640
20	1.020	57	1.151	94	1.372	131	1.648
21	1.022	58	1.156	95	1.379	132	1.656
22	1.024	59	1.161	96	1.386	133	1.664
23	1.026	60	1.166	97	1.393	134	1.672
24	1.028	61	1.172	98	1.400	135	1.680
25	1.031	62	1.177	99	1.407	136	1.688
26	1.034	63	1.183	100	1.414	137	1.696
27	1.036	64	1.188	101	1.421	138	1.704
28	1.039	65	1.194	102	1.428	139	1.712
29	1.041	66	1.199	103	1.436	140	1.720
30	1.044	67	1.205	104	1.443	141	1.728
31	1.047	68	1.210	105	1.450	142	1.736
32	1.050	69	1.216	106	1.457	143	1.745
33	1.054	70	1.221	107	1.464	144	1.753
34	1.057	71	1.227	108	1.472	145	1.761
35	1.060	72	1.233	109	1.479	146	1.769
36	1.063	73	1.238	110	1.486	147	1.778
37	1.067	74	1.244	111	1.494	148	1.786
38	1.070	75	1.250	112	1.501	149	1.795
39	1.074	76	1.256	113	1.509	150	1.803
40	1.077	77	1.262	114	1.516		
41	1.081	78	1.269	115	1.524		

Photographs taken? Circle Y for yes and note the (i) numbers and/or time stamp of each photo.

Directions to Plot
Give general directions to the plot using landmarks (e.g., a named point on the topo map, road, trail or structure) readily locatable on a 7.5 minute topo map. Give distances and bearings if possible. Do not take more than a couple of minutes to fill this out.

B. ENVIRONMENTAL FEATURES. ***Evaluate the features from the center of the plot:***

Aspect (degrees)
Measure the slope aspect using a compass which has been pre-set to an average declination for the park.

Slope: Measure the slope in % using a clinometer or the Impulse. Measure to the top of the plot, then to the bottom and take the average of the two measurements.

Elevation: Elevation of the plot. Specify whether in feet or meters (this will depend on the units used on the GPS or on the topographic map being used).

Elevation Source: Circle whether you used GPS, Altimeter, Map or GIS to determine the elevation.

Landform: Enter the landform from the table below that best describes the site.

LANDFORM (from J. Reidel)

- High elevation landforms (primarily erosional in genesis)

H = Horn, summit ringed by cirques with no evidence of overriding by Cordilleran Ice Sheet
A = Arete, ridge with jagged form, not modified by CIS
C = Cirque, glacial landform with flat floor and amphitheater shape
O = Other, lower summit modified by CIS
R = Ridge top, lower elevation with rounded form, modified by CIS
P = Pass, low point between horns and aretes
LM= Little Ice age moraine. Ridge of till deposited by glacier movement from 700-100 yrs bp.
PG= Patterned ground.
PK= Parkland (MORA only) gentle terrain surrounded by steeper.

-Valley slope landforms (primarily erosional genesis)

VW = Valley Wall
RC = River Canyon- Vshaped valley incised in bedrock
BB = Bedrock Bench, glacial landform found along lower valley walls at junctions of glaciated valleys, ass. with small rock falls and topples

-Transitional landforms between valley slope (erosion) and valley floor (deposition).

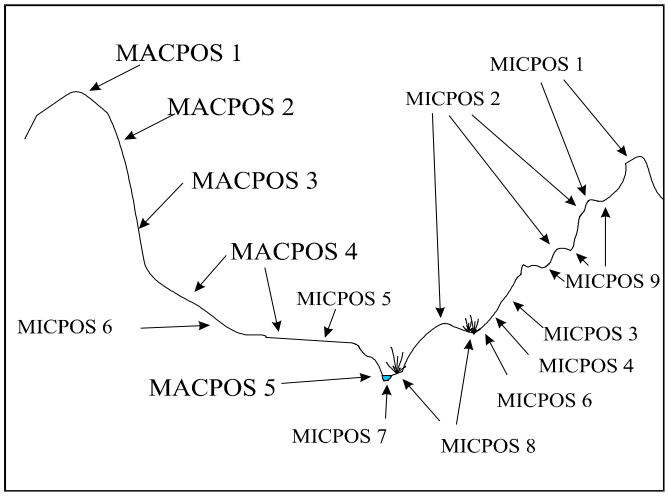
MM-A =Debris avalanche, large landslide includes rock and debris
MM-F = Rock Falls or Topple- accumulation of falling rock in single events. Usually void.
MM-DA = Rock and debris avalanches (large size, rapid)
MM-S = Slumps and Creeps- landslide of saturated ground material.
MM-SG= Sackung- fissures or spreading at ridgetops
MM-DT = Debris Torrents- channelized debris flow, usually void.
DA = Debris Apron- zone of debris accumulation at base of slope
DC = Debris Cones (inactive part of debris torrent, slopes $>10^0$, often have levees, large boulders, on 1st and 2nd order tributaries
Elwha specific: PD= Perched delta- relict delta formed under past Lake Elwha conditions. **PDC**- perched debris cone.
PDCT- Perched debris cone terrace

-Valley bottom landforms (primarily depositional genesis)

FP = Floodplain, valley floor to elevation 4000 ft.
VB = Valley Bottom, valley floor 'flats' above 4000 ft.,where floodplain and associated cut and fill terraces are absent
T = Terraces- flat surface that grades downstream.
FT = Alluvial Fan Terrace, relict parts of alluvial fans that stand above the active fan surface
SAIL= snow avalanche impact landform
L= Lahar
DF= debris fan-located where stream gradient decreases
D= delta- fan shaped deposit where stream meets still water
SH= shoreline
AF = Alluvial Fan, large tributaries, surface slopes $< 5^o$
M = Glacial Moraines
PM = Pleistocene Moraine- ridge of till deposited by glacier

-Other landforms

U = Undifferentiated, usually glacial drift
Co = Coast



Macroposition (MACROPOS) – the landscape containing the plot relative to the features at the mountain scale

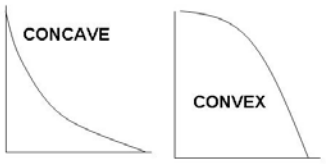
1 = ridgetop	3 = midslope	5 = bottom
2 = upperslope	4 = lower slope	

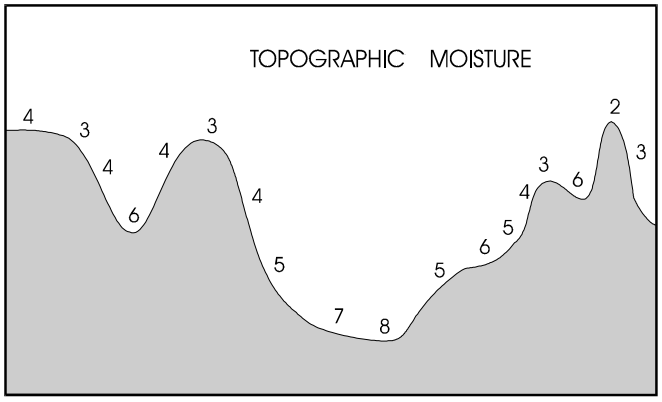
Microposition (MICROPOS) the landscape in the near vicinity of the plot

1 = ridgetop	4 = lower 1/3	7 = river bottom
2 = upper 1/3	5 = bench, flat	8 = edge of or in basin or wetland
3 = mid 1/3	6 = toe of slope	9 = draw, intermittent stream bottom

Microconfiguration (**MCONFIGv** = vertical which is the same direction as the aspect and the slope measurements and **MCONFIGh** = horizontal is perpendicular to the slope and parallel to the contour.)

1 = convex	2 = straight	3 = concave	4 = undulating





Topographic Moisture TM= redistribution of water by gravity (values in 0.1)

Topographic moisture is a concept used to describe and analyze the movement or redistribution of water by gravity through the soil and bedrock (Henderson et al. 1992). As precipitation is absorbed by litter or soil, it is immediately affected by the downward pull of gravity. The water in the soil that is free to move is therefore redistributed downward

from ridgetops, steep slopes and convex surfaces to lower slopes, toeslopes and valley bottoms. **Consider this redistribution as unaffected by aspect, vegetation type or soil type**. It is evaluated at the mountain scale. We use a scale from 1-9 where a "1" represents a very dry site where water immediately begins moving downhill. At the other extreme is code "9" which represents a body of open water. TM code 5 represents a modal site where the effect of topography results in neither an accumulation nor deficit of soil water. This coding system is illustrated in the figure above, and examples are shown in the table below. Record values to 0.1 units, **but don't use even halves** (e.g. 4.5, 5.5). Note that the range 4-5 actually includes values 3.6 to 5.4.

1 = extremely dry (ridgetop)
2 = very dry
3 = dry, well-drained
4 = dry mesic
5 = mesic
6 = moist mesic
7 = moist, well-watered
8 = wet
9 = standing water

TOPOGRAPHIC MOISTURE

	Convex				
	0//5%	6//30%	31//65%	65//120%	>120%
POSITION					
Cliff/Rock	2-3	1-3	1-2	1-2	1-2
Ridgetop	3-4	3-4	3	2-3	1-2
Upperslope	3-4	3-4	3-4	2-3	1-2
Midslope		4	3-4	2-3	2
Lowerslope	4-5	4-5	3-4	3-4	2-3
Bench/flat	4	4			
Valley bottom	5	4-5			
Draw,creek,cove					
Wetland		7-8			
Lake/pond/river					

	Straight				
	0//5%	6//30%	31//65%	65//120%	>120%
POSITION					
Cliff/Rock	2-3	1-3	1-2	1-2	1-2
Ridgetop	3-4	3-4	2-4	1-3	1
Upperslope	4-5	4-5	3-4	2-3	1-2
Midslope	4-5	4-5	4-5	3-4	1-2
Lowerslope	5-6	5-6	5-6	4-5	2-3
Bench/flat	5-6	5-6	5-6		
Valley bottom	5-7	5-6	5-6		
Draw,creek,cove	6-7	6-7	6-7		
Wetland	7-8	7-8	7-8	7-8	
Lake/pond/river	9				

	Concave				
	0//5%	6//30%	31//65%	65//120%	>120%
POSITION					
Cliff/Rock		1-3	1-2	1-2	1-2
Ridgetop	5	5-6	5-6		
Upperslope	5	5-6	5-6	5	4
Midslope	5-6	6	6	5	4
Lowerslope	6-7	6-7	6	5	4
Bench/flat	5-7	6-7	6		
Valley bottom	6-7	6-7	6-7		
Draw,creek,cove	6-7	6-7	6-7	5-6	
Wetland		7-8	7-8	7-8	
Lake/pond/river	9				

Environmental notes: If you had any questions about filling in any environmental features, please indicate them here.

Soil Description (Classification plots only): Dig a small hole in a representative area of the plot. Record the depth of each horizon and color (dry and moist). If substrate is organic muck or peat, record that on form instead of soil texture. Record the % of rock fragments (greater than 2mm). Fill in the hole when done.

Horizon	Criteria
O	Organic soil materials other than limnic materials. The mineral fraction is commonly a small percent by volume and is less than 80% by weight. The O horizon INCLUDES the duff layer. There is typically no O horizon in grasslands.
A	Mineral soil, formed at surface or below O, little remnant rock structure with a recognizable accumulation of humified organic matter but dominated by mineral matter. Excludes recent eolian or alluvial deposits that retain stratification. The humified material in A horizons often color the horizon a dark color (brown
E	The 'E' horizon gets its E from the word Eluvial (emigrated out of). It is a horizon of mineral soil that has leached out (lost) clay, iron, aluminum, and/or organic matter, leaving a net concentration of sand and silt; little remnant rock structure; typically lighter color (higher value chroma) and coarser texture than A. E horizon is a feature of Spodosols. In Spodosols, the E horizon is usually grey or white, and is a common horizon in coniferous forests at middle to upper elevations. Do not confuse E horizons with layers of ash from volcanic eruptions. Ash layers in soil can be identified by placing grains from the horizon between one's teeth. The mineral grains of ash are glass, and can be chewed into smaller particles. Sand cannot be broken down into smaller particles and will resist chewing.
B	B horizons are dominated by mineral soil but have some soil development. They typically formed below O, A, or E; little or no rock structure; and one or more of the following: 1) illuvial (downward migration from upper layers) accumulation of silicate clay, Fe, Al, humus, carbonate, gypsum, silica, or salt more soluble than gypsum (one or more); 2) removal of carbonates, gypsum or more soluble salts; 3) residual accumulation of sesquioxides (aluminum-oxygen molecule); 4) sesquioxide coatings; 5) alterations that form silicate clays or liberates oxides and forms pedogenic structure; 6) Strong gleying (red or grey spots mixed with clay) in the presence of aquic (inundated by water) conditions (or artificial drainage); Layers with gleying, but no other pedogenic change are not B horizons. Most B horizons are or were subsurface horizons. Some formed at the surface by accumulation of evaporites. Cemented and brittle layers that have other evidence of pedogenesis are included as B horizons.
C	C horizons are mineral soil or soft bedrock with no soil development. The layer is little affected by pedogenesis and lack properties of O, A, E, or B horizons. This horizon is in its original form from when it first appeared at the site (when it was originally deposited, or uplifted, etc). May or may not be related to parent material of the developed soil horizons. C horizons are usually devoid of biological activity
R	Hard bedrock. Unbroken rock.
TRANSITIONAL AB BA BC Etc…	Transitional horizons have characteristics of the horizons above and below the horizon. For example: a horizon with some characteristics of the A horizon above it AND characteristics from the B horizon below it would be designated an AB horizon. If this horizon is designated a BA, then it signifies that the transitional horizon is dominated by characteristics from the adjacent B horizon.

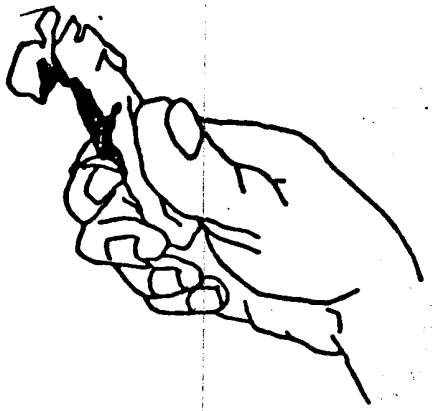
MOIST CAST TEST:
Place a small amount of soil in the palm of your hand and moisten. Soil is at the proper consistency when it is moldable like putty. Attempt to form a ball or rod. Toss the cast from hand to hand to test for strength.

RIBBON TEST:
Moist soil is kneaded by hand then rolled into a rod shape. Squeeze the soil between the thumb and forefinger to form the thinnest ribbon possible. Form a ribbon of uniform thickness and width. Allow the ribbon to extend over the forefinger and break from its own weight.

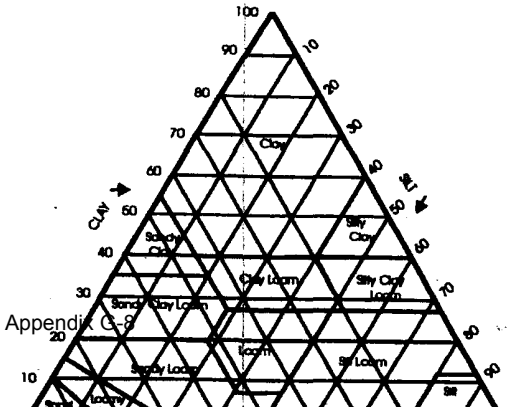
FEEL TEST:
The soil is rubbed between the thumb and forefinger to feel for its coarseness or fineness. Sand has a grainy feel, silt feels floury and clay feels very smooth

TASTE TEST:
Carefully chew a small amount of soil to test for volcanic ash. If the soil particles break when you chew, then the soil has volcanic glass in it.

HEAR TEST:
Fine sand can be detected by listening to a small amount of soil as you rub it.



Making a Ribbon



MOIST CAST TEST

Does the soil form a cast? — NO → SAND

YES ↓

Does the soil form a strong cast that allows ready handling? — NO → Does the soil form a weak cast that allows careful handling? — NO → The soil forms a weak cast that does not allow handling and feels grainy ↓ LOAMY SAND

YES ↓ (from ready handling)

YES ↓ (from careful handling)

RIBBON TEST

The soil flakes rather than ribbon (floury with graininess) ← NO — The soil barely begins to ribbon ← NO — Does the soil form a short thick ribbon? ← NO — Does the soil form a thin ribbon that breaks readily and barely supports its own weight? ← NO — Does the soil form a thin ribbon that holds its own weight? ← NO — Does the soil form a thin ribbon longer than 7.5 cm? — Does the soil flake and feel very floury? — NO → The soil barely forms a thick ribbon

YES ↓ SILT LOAM

YES ↓ LOAM

YES ↓ SANDY CLAY LOAM

YES ↓ (from breaks readily)

YES ↓ (from holds its own weight)

YES ↓ CLAY

YES ↓ SILT

SANDY LOAM

FEEL TEST

The soil feels moderately grainy ← NO — Does the soil feel smooth and floury? — Does the soil feel smooth? — NO → The soil has substantial graininess

YES ↓ CLAY LOAM

YES ↓ SILTY CLAY LOAM

YES ↓ SILTY CLAY

YES ↓ SANDY CLAY

Ground Cover

Estimate ground cover using the four broad classes by each category. Visual cover estimates should sum to 100%, however the cover class totals may not. In cases where moss, lichen or litter covers rocks or logs, ignore its cover and record just the total cover of the rocks or logs.

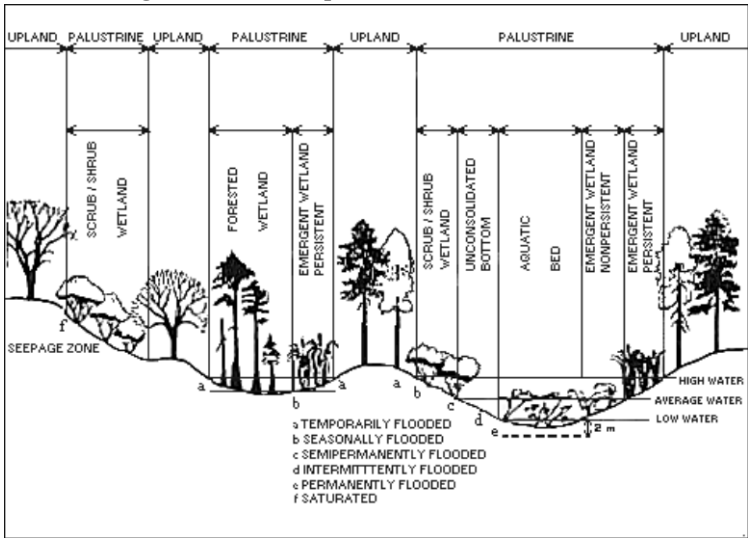
BILLY'S MOSS FLOWCHART

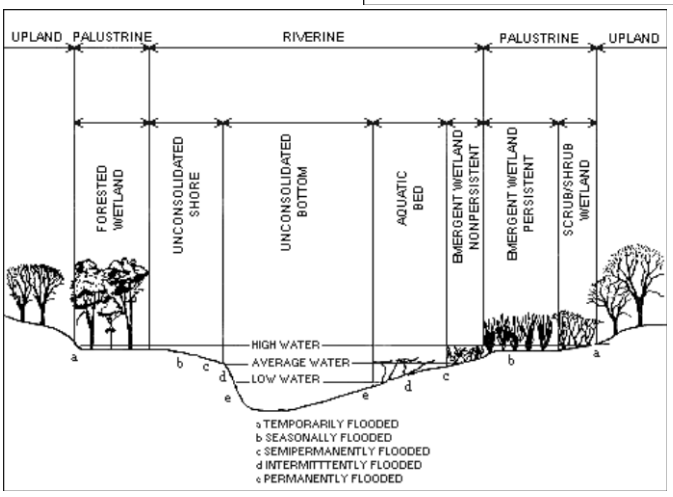
Classification Plot:

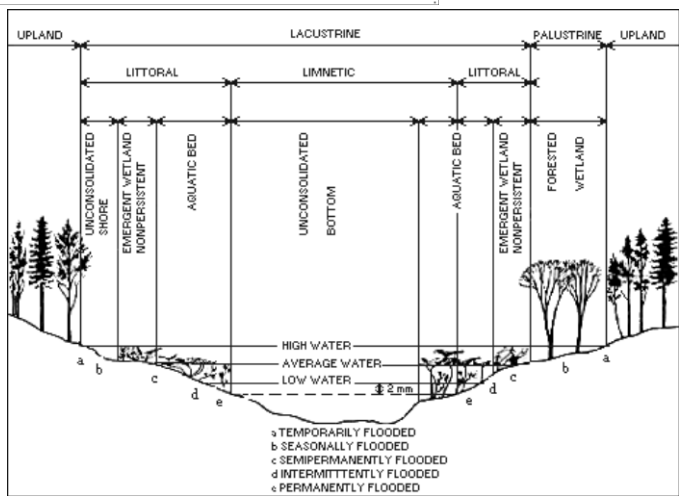
- Ground Cover Section-
  - Moss counts EXCEPT on logs and rocks
- Vegetation Description-
  - Moss counts on logs on ground, horizontal trees, under other plants and on rocks but NOT ON AERIAL LOGS
- Ocular Observation-
  - Moss counts on ground and rocks NOT on logs

Cowardin System

Is water an important control on the vegetation of this plot?







Circle "upland" if the system is not a wetland. If the system is a wetland, circle the name of the Cowardin system, subsystem and class that best describes it.

Palustrine= inland marshes, swamps, bogs, fens, tundra and floodplains. Systems lack flowing water and contain ocean derived salts in concentrations of less than .05%. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers. Classes for this system include: **Moss-Lichen Wetland, Emergent Wetland, Scrub-Shrub Wetland, and Forested Wetland**.

Moss-Lichen - mosses or lichens cover substrates other than rock and emergents, shrubs, or trees make up less than 30% of the cover. The only water regime is saturated

Emergent - characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed.

Scrub-Shrub - dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes except subtidal are included.

Forested - by woody vegetation that is 6 m tall or taller. All water regimes are included except subtidal.

Lacustrine= Lake-associated wetlands including lakeshores, freshwater marshes, and aquatic beds as well as lakeshores. Subsystems are limnetic or deep water and **littoral**, or shoreward habitats with **emergent** wetland vegetation (non-persistant) being the only class with vegetation.

Riverine= fed by water flowing through a channel, includes river banks, streams, freshwater marshes, and freshwater aquatic beds. Subclasses include intermittant, upper and **lower perennial** and tidal. Only **lower perennial** subclasses can have **emergent** wetland vegetation (non-persistant).

Hydrologic Regime: (adapted from Cowardin et al. 1979).

Permanently Flooded - Water covers the land surface at all times of the year in all years.

Semipermanently Flooded - Surface water persists throughout growing season in most years except in years of extreme drought. When surface water is absent, the water table is usually at or very near the land surface. Land surface is normally saturated when water level drops below soil surface.

Seasonally Flooded - Surface water is present for extended periods during the growing season, especially *early in the growing season*, but is *absent by the end of the growing season* in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. When surface water is absent, the water table is often near the land surface.

Temporarily Flooded - Surface water present for brief periods during growing season, but water table usually lies well below soil surface for most of the season. Often characterizes flood-plain wetlands. Plants that grow both in uplands and wetlands are characteristic of the temporarily flooded regime.

Intermittently Flooded - Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. *Weeks, months, or even years may intervene between periods of inundation.* This modifier was developed for use in the arid West for water regimes of Playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations.

Saturated - Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season.

Disturbance

Comment on any evidence of natural or anthropogenic disturbance and specify the source.e.g. plant pathogens, fire scars on the trees or other evidence of fire.

Animal Use Evidence
Comment on any evidence of use of the plot by animal. Identify scat (bear, elk, deer, hare) by genus. Be on the look out for tree peeling, tree holes, ground holes, antler rubs, browse or grazing. Note any unusual wildlife sightings, for example larger birds, rapters, reptiles or amphibians.

General Site Description: Write a word-picture of the plot, including information about landscape features, species composition, unique or unusual features etc.

C. VEGETATION DESCRIPTION

Physiognomic Class Choose one:

Forest-	Trees with their crowns overlapping (generally forming 60-100% cover).
Woodland-	Open stands of trees with crowns not usually touching (generally forming 25-60% cover). Canopy tree cover may be less than 25% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.
Shrubland-	Shrubs generally **greater than 0.5 m tall** with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 25% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation dominated by woody vines is generally treated in this class.
Dwarf-Shrubland-	Low-growing shrubs usually **under 0.5 m tall**. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 25% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively
Herbaceous-	Herbs (graminoids, forbs, and ferns) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 25% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
Nonvascular-	Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and herb cover, respectively.
Sparse Vegetation-	Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 10% and greater than 0%).

Leaf Type
Select one value which best describes the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

Broad-Leaved -	Woody vegetation primarily broad-leaved (generally contributes greater than 50 percent of the total woody cover).
Needle-Leaved -	Woody vegetation primarily needle-leaved (generally contributes greater than 50 percent cover).
Microphyllous -	Woody cover primarily microphyllous (small leaves as in heather).
Graminoid -	Herbaceous vegetation composed of more than 50 percent graminoid/stipe leaf species.
Forb	(Broad-Leaf-Herbaceous) - Herbaceous vegetation composed of more than 50% broad-leaf forb species.
Pteridophyte -	Herbaceous vegetation composed of more than 50 percent species with frond or frond-like leaves.

Leaf Phenology

Select the value which best describes the leaf phenology of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

Evergreen -	Greater than 75% of the total woody cover is never without green foliage.
Deciduous –	More than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.
Mixed Evergreen – Deciduous	Evergreen and deciduous species generally contribute 25-75% of the total woody cover. and - cold-deciduous species admixed.
Perennial -	Herbaceous vegetation composed of more than 50% perennial species.
Annual -	Herbaceous vegetation composed of more than 50% annual species.

CLASSIFICATION FORM:

Strata/Lifeform, Cover, Height, Species

These data provide a gross picture of the structure and composition of the vegetation. Visually divide the community into the vegetation layers (strata) indicated on the form. Indicate the average height class of the stratum in the first column, using the Height Scale on the form. This should be the average height of the **top** of the canopy. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale on the form.

Herbaceous layers are H1 = Graminoids (grass, sedge, rush), H2 = Forbs (Dicot herbaceous), H3 = Ferns and Fern allies, and H4 tree seedlings. List the dominant species in each stratum, and list them in order of abundance. If species known to be diagnostic of a particular vegetation type are present, list these as well, marking them with an asterisk.

N- Nonvascular plants in this category should be counted on the logs which lie on the ground, horizontal trees and under other plants.

V- Vine/liana. Two genera in our region: (Clematis and Lonicera)

E- Epiphytes- Two in particular that may be common: Selaginella sp. and also Polypodium glycyrrhiza (licorice fern). **Estimate their cover as though they had been laid out flat on the ground**.

Tree species can have cover in all strata, except for the dwarf shrub strata. Trees between 0 and .5m should be indicated in the H4 tree seedling class.

Instructions for filling out fields in the Ocular Species Data Form

Starting with the uppermost stratum, list all the species present and the height class (HT) and canopy cover class (CCC) of each species. Use the 14 point scale located on the Ocular Species Form for the cover. For the tree species, record cover and height separately for the regen ($S < 5$ m) vs taller ($T > 5$ m) tree layer.

Trees are defined as single- or few-stemmed woody plants, generally greater than 5 m in height and 10 cm DBH at maturity and under optimal growing conditions. Individuals can be determined relatively easily. Emergent trees are obviously taller than the main canopy. The top of the crowns of trees in the subcanopy layer must be lower than the average height of the bottom of the live layer of the canopy layer, with only infrequent overlap. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions, and determining individuals can sometimes be difficult.

For species that are not identified in the field, collect and label with appropriate name (e.g. Carex spp #1). Write Y in column when voucher species is collected for later identification. Collect moss, liverwort and lichen vouchers using bryophyte envelopes, filling out appropriate details, especially noting the substrate on which the sample was growing. Remember to keep liverworts refrigerated/and or cool as much as possible. It may be easier to estimate the total cover for the mosses and lichens and then divide that cover by the cover for each species.

Use the critical areas table to help determine what the area covered by a given percent of either a circular or a square plot. For example, 10% of a 400 m2 circular plot is a circle with a diameter of 7.14 m. Measure your own armspan, which may be close to 1% of a 400 m2 circular plot.

Critical Areas of Different Plot Sizes.

Diameter for Critical Areas of Different Plot Sizes (values in m)

%	2462	400	200	100	50	25	10
100	55.99	22.57	15.96	11.28	7.98	5.64	3.57
75	48.49	19.54	13.82	9.77	6.91	4.89	3.09
50	39.59	15.96	11.28	7.98	5.64	3.99	2.52
25	27.99	11.28	7.98	5.64	3.99	2.82	1.78
10	17.71	7.14	5.05	3.57	2.52	1.78	1.13
8	15.84	6.38	4.51	3.19	2.26	1.60	1.01
5	12.52	5.05	3.57	2.52	1.78	1.26	0.80
2	7.92	3.19	2.26	1.60	1.13	0.80	0.50
1	5.60	2.26	1.60	1.13	0.80	0.56	0.36
0.5	3.96	1.60	1.13	0.80	0.56	0.40	0.25
0.1	1.77	0.71	0.50	0.36	0.25	0.18	0.11

Squared Sides for Critical Areas of Different Plot Sizes (values in m)

%	2462	400	200	100	50	25	10
100	49.62	20.00	14.14	10.00	7.07	5.00	3.16
75	42.97	17.32	12.25	8.66	6.12	4.33	2.74
50	35.09	14.14	10.00	7.07	5.00	3.54	2.24
25	24.81	10.00	7.07	5.00	3.54	2.50	1.58
10	15.69	6.32	4.47	3.16	2.24	1.58	1.00
8	14.03	5.66	4.00	2.83	2.00	1.41	0.89
5	11.10	4.47	3.16	2.24	1.58	1.12	0.71
2	7.02	2.83	2.00	1.41	1.00	0.71	0.45
1	4.96	2.00	1.41	1.00	0.71	0.50	0.32
0.5	3.51	1.41	1.00	0.71	0.50	0.35	0.22
0.1	1.57	0.63	0.45	0.32	0.22	0.16	0.10

Tips for estimating cover:

Cover is the percent of an area (usually a plot) which is occupied by the crowns of an individual species. To determine the area occupied by an individual plant, mentally connect the outer portions of the crown with a line, thus making a polygon. Do not subtract for small areas between leaves or small gaps between branches. Project this polygon to the ground as if it were a shadow. Determine the area of this "shadow" or determine the total area of all the "shadows" of the plants of each species. Convert this area to a percentage of the plot. This is percent cover.

There are numerous ways to estimate cover of a species on a plot. First determine the size of the plot. Begin by choosing one of the dominant species on the plot. Estimate cover for this species very carefully using one or more of the following methods:

1. Quickly estimate whether the species covers more or less than 50% of the plot; then more or less than 24% or 75% of the plot:
   if the species is greater than 75% use methods 5, 6
   if the species is 25-75% use methods 3, 4, 5, 6
   if the species is less than 25% use methods 2, 3, 4.

2. Measure or estimate areas which are 1% and 10% of the plot. **See table above.** Many types key out on the basis of whether a species is more or less than 10%, so this is a critical area. For species near this amount of cover, mentally try to fill a 10% area with plants so that their crowns don't overlap. For species with low cover in the plot, it is often useful to try to mentally fill a one percent area. If you fill the one percent area with plants and still have plants left over, fill another. This would give you 2%. Or if there are still some plants left over, fill another, and so on.

3. Measure the actual area covered by individual plants or clumps. This works well for large or clumpy plants such as vine maple, oceanspray or trees. For example given a large clump of vine maple, measure a typical radius of the clump and convert to area**.**

4. Measure or estimate the size of a typical individual of a species and then count the individuals of that species. This works well for small to medium-sized plants such as swordfern or beargrass. If the typical swordfern on a plot was 1/2 of one percent (1.6m radius) and there were 24 plants, the cover for swordfern would be 12%.

5. Estimate the area <u>not</u> covered by a species. Use this method when a species has more than 75% cover. Use methods 2, 3, or 4 but apply them to areas not covered by a species. This often works well for dense salal**. For example, if there are 4 openings in a plot which are not occupied by salal and each has a radius of about 2 m (2 x 2 x 3.14 = 12.6 m2 = 3.2% of 400m2 there would be 3.2 *4= 12.8 percent of the area which is not salal or 87.2 percent salal.**

6. Divide the plot into quarters or halves if the species is very unevenly distributed or if the plot is large. If you divide a plot into quarters estimate each quarter separately then **average** the four quarters together. If most of the plants of one species fall in one of the quarters, mentally try to fill in the holes with plants from the other quarters.

7. Check your cover estimates by:
   a. comparing each species to one that you are relatively certain about
   b. comparing estimates on the same species done by different methods
   c. comparing to someone else's estimate

Instructions for filling out fields in the Fuels Data Form

Fuels Data Form- LIVE FUELS page 1

Visualize the cover by strata. Remember that T1 Emergent trees stick out above the main canopy, and will not be found in many forest types. The T3 Subcanopy trees are at least 5 m tall but whose tops are found below the average lowest height of the main canopy, without much overlap. The T2 Canopy consists of everything below the emergent trees and above the subcanopy trees, and thus, is the predominant canopy strata. T4 Regen trees are those that are less than 5 m tall, including small seedlings. The moss and lichen strata do not include those that are growing on upright trees. Estimate the total cover and average height for each stratum. **Cover values are in 1% categories up to 5, then in 5% categories.** Starting from the center of the plot, select the closest 5 trees per stratum for the T1, T2 and T3 Strata. Record the six letter species code, DBH, height, and height to live crown. **Units should be metric.** Height to live crown is measured at the lowest point of the lowest branch where the foliage is continuous to the top. The lowest point of an upward-growing branch is the node where it meets the bole, the lowest point of a downward-growing branch may touch the ground. Within each stratum, count the number of trees by species and record in the tally column. Tally and record the cover and height by species rather than by individual plants within the T4 Regen stratum. Use the "Others" column to list multiple species. If there is an exceptionally large number of trees to tally (e.g. >100 regen) then tally within a subset of the plot and record the sampling area in the notes.

Check box indicates the presence of ladder fuels. Typical ladder fuels are moss and lichen on the trees and dead branches. They can also include adjacent shrubs and seedlings. Ladder fuels are a continuous fuel that starts within 1-2 feet of the ground and can carry fire to within 1-2 feet of the canopy. If there are vertical gaps greater than 1 - 2 feet then the site would not have ladder fuels, unless the composition or organization of materials/brush/shrubs/etc. is dense enough to create flames greater than 1 - 2 feet. When in doubt about the ability of something to be a ladder fuel, assume that it is. 50% of the plot should be affected by ladder fuels to be checked Y.

Fuel model:
Select one of the 13 fuel models.

Jackpots:
Jackpots are unusual accumulations of downed woody debris, of larger diameter that represent larger sources of fuel for a fire. They are found most often on steep slopes. Record the jackpot tally and their average length, width and height.

Snag class tally. Record the number of snags in each class, their average DBH and height. Snags must be taller than DBH (1.47m).

Snag Class:

1- Trees that have died recently and retain most of their bark and most of their branches; the top is intact. Very little decay has occurred in the wood, unless the tree had heart-rot decay when it was living.

2- Snags that have been dead at least several years and have lost some branches and some bark (except for grand fir and Douglas-fir, which tend to retain their bark after death); tops are often broken; there is some evidence of decay.

3- Snags that have been dead a long time and lack branches and bark (except for grand fir and Douglas-fir, which tend to retain their bark after death). Tops are broken off and the sapwood and heartwood are extensively decayed.

Fuels Data Form- DEAD AND DOWN FUELS page 2

Definitions:

Litter- Includes freshly fallen leaves, needles, bark, flakes, fruits (e.g cones), cone scales, dead matted grass, and a variety of miscellaneous vegetative parts. Does NOT include twigs and larger stems. Litter lies above the live moss layer and is NOT attached to standing trees or shrubs.

Duff- The fermentation and humus layers; does NOT include the freshly cast material of the litter layer. The top of the duff is where the needles, leaves fruits etc have noticeably begun to decompose. The bottom of the duff is the mineral soil. Duff is further split into **upper duff**, where plant parts are still largely recognizable and the **lower duff,** where they are not.

Fuel Loading – Dead and Down

For each plot, surveyors will estimate the loadings of **dead and downed** fuels using a modified Brown's transect. Transects are **50 ft in length** and the **height of the sampling plane is up to 2m**. To locate the plot, use the azimuth table, and follow that azimuth from the center until you are at the plot edge. Then, take 47+ the back azimuth (third column) and walk the tape out 50 ft. Take a second random azimuth from the plot center and repeat for the second transect. Record the slope (from the top to the bottom of the tape) and aspect (of the landscape on which plot is located) of each transect. The transect can be off the ground, but should generally follow the contour of the ground. On slopes, the measurement should occur straight down, not perpendicular to the slope.

The dead and downed fuels are classified into three types based on the diameter of the fuels. The fuels should be sampled by looking straight down over the tape. The diameter can be readily measured with the Go-No-Go (GNG) gauge. For ease of data collection in this project we have numbered the types. Type 1 (1 hr fuels) are from 0 to .25 inch in diameter. Type 2 (10 hr fuels) consist of dead branch wood between 0.25 and 1.0 in diameter. Type 3 (100 hr fuels) are 1 – 3 in diameter. A box system for the tally should be used where the corner dots of the box count as one and the lines connecting the corners and sides count as one, so each box counts as 10.

The last category is fuels larger than 3 inch diameter, which can be rotten=r or sound= s and are measured the entire length of the transect.

Tally the type one and two fuels in the first 6 feet.
Tally the type three fuels in the first 12 feet
Record the diameter of the 3+ r and 3+s to **nearest tenth of inch**

The tally rules for the downed woody material are as follows:

- Do not count dead woody stems and branches still attached to standing or horizontal but rooted shrubs and trees
- Do not count twigs and branches when the intersection between the central axis of the particle and the sampling plane lies in the duff
- If the sampling plane intersects the end of a piece, tally only if the central axis is crossed
- Do not tally any particle having a central axis that coincides perfectly with the sampling plane
- If the sampling plane intersects a curved piece more than once, tally EACH intersection
- Tally uprooted stumps and roots not encased in dirt. Do not tally undisturbed stumps
- For rotten logs that have fallen apart, visually construct a cylinder containing the rotten material and estimate its diameter
- Do measure through rotten logs whose central axis is in the duff layer

After you have finished the downed wood sampling, return along the transect sampling the litter and duff depths and derivation (explanation below).

Litter and Duff

Take measurements at 5, 15, 25, 35 and 45 ft along the transect

The litter is the freshly fallen dead material at the top of the forest floor. Record the arrangement of the litter- normal, fluffy or perched. Perched is generally grass type litter only that is not fully on the forest floor. Fluffy would refer to litter such as from a fern frond. Record the litter type- humic vs peat-derived.

At each sampling point, gently insert a trowel or knife into the ground until you hit mineral soil, then carefully pull away exposing the litter/duff profile. Locate the boundary between the litter and the LOWER duff layers. Vertically measure the litter and the duff to the nearest tenth of an inch. Further divide the duff layer into upper and lower duff and record to

nearest tenth of inch. Record the depth and derivation. Unless you are in an area with peat forming Sphagnum mosses, the derivation for the upper duff will be dead moss/litter and the lower duff will be humus/muck.

The measurement rules for litter and duff are as follows:

- Do not include twigs and larger stems in the depth measurements
- If there is moss at the point of measurement, measure the duff from the base of the green portion of the moss.
- If there is a tree, stump or large rock at the point, record the litter or duff as zero, even if there is litter or duff on top of the stump or rock
- Refill the holes
- If a log is in the middle of a litter or duff measuring point, move the collection point one foot over to the right, perpendicular to the sampling plane

CLASSIFICATION PLOT SAMPLING PRIORITIES FOR 2007 (R. Crawford)

High Priority
Alpine /sparsely vegetated areas

Shrublands (dominated by shrubs taller than 0.5 m tall) anywhere, uplands higher priority than wetlands

Vegetation in Avalanche Chutes distinctly different than surrounding forests

Douglas-fir forests west of the Cascade Crest with no or little western hemlock or western redcedar (<10% cover) and that do not key to any of the described associations

Subalpine parkland tree islands/stringers west of the Cascade Crest

Forests/woodlands in the Ross Lake area of NOCA dominated or co-dominated by Douglas-fir, ponderosa pine, and/or lodgepole pine

Western redcedar dominated upland (not wetlands we have that pretty well covered) stands, where redcedar dominates often with western hemlock but not much if any Douglas-fir, especially if covering a substantial area (most likely on outer coast and in moist valley bottoms). Don't worry about small inclusions (local canopy variation) in broader types.

Herbaceous or dwarf-shrub "balds" west of the Cascade Crest. Low to middle elevations (not subalpine) dry openings in forest, usually with shallow soils, south to west aspects, and/or dry topographic position. Can have vernally wet seeps that dry out in late summer. (Herbaceous balds are those open, convex features on the valley wall with shallow soils,exposed becdrock and low vegetation and moss).

Dry grasslands below the subalpine zone

Any association mentioned in the preliminary classification as needing more data or better clarification

Medium Priority
Riparian forests (riverine floodplain or terraces) that do not fit existing provided descriptions or names in preliminary classification

Non-forested wetlands, especially middle elevations

Ponderosa pine dominated stands in Lake Chelan NRA

Bigleaf maple stands in Lake Chelan NRA

LASER RANGE FINDER

Safety: avoid looking directly at laser, never point the instrument directly at the sun, do not expose to extreme temp.

On: Button on right side closest to you
Off: Two buttons (simultaneously), left side furthest from you
Fire button: Same as "On" button. Will take measurement or select menu item.
To Scroll through menu: Either of two buttons, right side furthest from you – forward and back.

Cross-hair scope: Simply press Fire button to take a measurement.
Red dot scope: First press Fire button to activate the red dot, then press Fire button to take measurement. Red dot will disappear after 15 seconds. Re-press Fire button to reactivate the red dot. To increase intensity of the red dot, use middle left button.

High-pitched single beep: measurement was not taken, try again.
High-pitched double beep: measurement was taken.
Fast ticking: instrument is trying to lock onto a target.

Measurement point: Measurements are taken from the middle of the laser, at the tripod attachment point (offset of '0'). This is also the pivot point for tree height calculations. If using the laser as a hand-held instrument, the 'offset' should be calibrated to the user (usually the back of the user's head) if measurements are to be accurate. To make this adjustment, see "height pivot offset" below. Note: 1) this offset only affects tree ht measurements. 2) any time the units are changed (see "change units" below) offset will be reset to 0.

To Measure Distance: HD on the screen (top near center) indicates that you are ready to take horizontal distance, (VD = vertical distance, SD = slope distance (use scroll buttons)). Aim at object and press the Fire button to get reading. F or M to the right of the number indicates whether the distance is in ft. or meters (to change, see "change units" below).

To Measure Tree Height: HT on the screen (top left) indicates that you are ready to take horizontal distance to the tree. If possible, stand at a distance from the tree that gives you an angle less than 50 degrees when shooting to the top of the tree. Aim first at a reflector that is held directly beside the tree, at the center of its girth. Press fire button for horizontal distance (remember that the first push may simply reactivate the red dot). Downward arrow indicates that you are ready to take a reading to the base of the tree. Aim and hit fire button. Upward arrow indicates that you are ready to take a reading to the top of the tree/crown. Aim and hit fire button. (Note: this only takes an angle reading, so measure where you think the top of the tree is, rather than where you can see it.) Hit fire button again for calculation of tree height.

Filter on: 'filter on' is for use with the reflector. Range finder will only pick up signals from a highly reflective surface in this mode.
Filter off: reading taken from any object that the laser bounces off. The reflector can also be used.
Turning filter on or off: scroll to "SYS", press fire button, press fire button to turn filter off or on, press the button furthest away from you to save the setting.

Change units: Note: this change will affect values stored in memory, including offset. Scroll through SYS systems menu; when UNITS indicator is flashing and SEL shows in numeric display area, press fire to toggle between options, and press forward most button to select, continue for degrees, gradients and %, press back twice to accept new settings and return to main menu.

Height Pivot Offset: Go to SYS option indicator, press 'fire' to select, press forward until the PIVOT indicator begins blinking (lower left), HT is displayed in top left, and current offset value is blinking. Use two forward buttons to edit the offset value in whole ft or meters. Advance to the next digit using the left fire button. Long-press the back key to reset to 0. When the value is correct, press the fire button. Press forward or back to exit the edit mode. PIVOT in the lower screen of the HT option indicates a pivot offset.

"Gates" can be set to create a limited range in which a distance will be measured. Go to **GATE** indicator, press Fire, press Fire to turn Gate on or off, press middle button to enter the "short" distance (as done in pivot offset), or set by pressing Fire at chosen distance; press middle button and enter the "long" distance if desired. At end or any time press furthest button to back out to main menu. To clear Gate, long-press furthest button when Gate value is shown, or enter in 0 for Gate value.

KODAK EASYSHARE DX7590

Description

The Kodak EasyShare DX7590 is a 5.0 megapixel (MP) camera. Photos taken at the maximum 5.0 mp mode produce pictures that can be enlarged to 20" X 30", and produce photos that take up as much as 2 MB of memory once transferred to the computer. The camera can also shoot photos at 4.4 MP, 4.0 MP, 3.1 MP, and 1.8 MP. Our project generally will not require shooting 5.0 MP photos, so **shoot at 4.0 or 3.1 MP** (see "setting photo quality").

LCD SCREEN and the VIEWFINDER

To turn on or off the LCD screen push the lone button in the upper left corner of the back of the camera labeled EVF/LCD. The camera has a nice LCD screen, but any LCD screen can be deceptive when focusing. It is usually better to focus using the viewfinder. To use the view finder just turn off the LCD screen. Using the LCD screen will also drain the batteries faster than using the viewfinder. Only the LCD screen allows you to view photos already taken.

CAMERA MODES

There are several camera modes, which are selected primarily by using the "power ring" on the back of the camera. There is also the "flower" mode and the "landscape" mode, turned on using the right, middle button on the top of the camera. For our purposes, we will mostly be using the **automatic**, **A** (aperture), **landscape** or **flower** modes. The modes on the power ring control the camera shutter speeds, focus, and ISO. The flower and landscape modes interact with the power ring modes relative to the mode selected. It would be nice to simply use the automatic mode, but unfortunately, we will have to use the A mode in order to shoot in low light situations, so it is important to familiarize yourself with this mode.

SETTING PHOTO QUALITY

- Select "menu" by pushing the menu button (middle, lower right button on back)
- Use the "joystick" located in the middle of the "power ring" to scroll down (tilt joystick down) to the second option and select by pushing joystick in.
- LCD screen will now show you all of the quality options. Use the joystick to scroll to desired MP and push joystick in to select.
- Exit menu by pushing menu button.

FOCUS and FLASH RANGE

The camera can focus from 4.7" to infinity. Remember that you cannot focus closer than 4.7." The flash is supposed to be good from 2' to 16' while the camera is zoomed out, and good from 6.6' to 12.1' when fully zoomed in.

TAKING A PICTURE

- Make sure the **camera is on** and the **lens cap is off**.
- **Select the mode** you will be shooting in. This may be a two step process (ie. You may be shooting in automatic mode AND flower mode – use the flower mode when photographing plants close-up, and use the landscape mode when photographing scenery far away. For most scenes, neither flower nor landscape mode should be turned on.).
- Frame your photo – When you **hold down the shutter button halfway**, the camera will focus on the object in-between the blue [ ]. If you hold down the button for a second or more, green [ ] will appear, signifying where the focus has been established.
- When the focus desired is established, **completely press down the shutter button**.

IMPORTANT FEATURES

The camera is designed to assist the photographer while taking pictures, so it is important to have the **"status" button on**. This button is represented by an "i" on the back upper left of the camera. The status button will allow you to see what f-stop and shutter speed you are shooting at, and it will warn you if your focus is off or if the light level is too low for handheld photography.

- If your focus is off, a red AF (automatic focus failed) will appear in the right-hand corner of the LCD screen. This means that you are too close to your subject, or the camera cannot identify a subject to focus on.
- If the light level is too low for handheld photography, ✋))) will appear in the upper right corner of the LCD. You may also see AE (automatic exposure failed), which is telling you that the exposure failed (not enough light)

LIGHT SENSITIVTY

This camera has the equivalent light sensitivity to ISO 80-160 when in automatic mode and a range of ISO 80-800 in the other modes. ISO 80-160 means that the camera needs a lot of light to take a picture, not an ideal situation for photographing under dense forest canopies. For low light forest situations, it would be better to shoot using a higher ISO, preferably ISO 400.

To adjust ISO manually:

The ISO can only be manually adjusted when the camera is in P, A, S, M or C modes. The easiest mode to operate in would be the A mode (aperture priority). Once in this mode, be sure that the "status" button is on. Find the "jog dial," which is on the front of the camera, in the upper right corner where the index finger naturally sits. The "jog dial" controls the yellow arrow that scrolls between options in the bottom of the LCD screen.

- Scroll the jog dial to the ISO icon on the right.
- Once the yellow arrow is next to the ISO icon, push in the jog dial to select ISO. You know that ISO is selected when the icon turns yellow.
- Jog the dial right or left to change the ISO.
- When the ISO desired is showing, press the jog dial in to set the camera to that ISO.

MACRO PHOTOGRAPHY

Camera shoots as close as 4.7". This distance can be effective when shooting flowers or plants close-up in the field for identification later in the office. Kodak suggests shooting in "flower" mode whenever objects are closer than 28 inches. "Flower" mode is depicted as a flower on the top of the camera, middle button. If the camera is in automatic mode and flower mode, it automatically shoots in ISO 100, which is ideal for bright light situations, but not ideal for low light situations. To shoot in low light situations, turn the dial to "A" mode (aperature priority), and adjust your ISO to 400. ISO 800 can only be selected when the quality is set at 1.8 MP. Do not use the flash in macro mode.

REVIEWING PHOTOS

- Push the "Review" button in the lower far-right corner on the back of the camera
- To scroll between photos, push the joystick left to go backwards and right to scroll forward.

RECORDING PHOTO NUMBERS IN FIELD

As soon as a photo has been taken, it is crucial that the photo number is recorded onto the field data sheet. There will be hundreds of photographs at the end of the season, so it is essential that the number is recorded in the field.

- Press review button of photo just taken
- Hit the "status" (i) button twice until you see several lines of information appear.
- The "name" or number of the photo will be at the upper left corner of the LCD screen and it will read something like "000_0044.jpg.
- This number can be seen in the computer when the photo is downloaded by either right-clicking on a photo or looking in the upper left corner of the photo when it is opened in "windows picture viewer."

DELETING PHOTOS in the field

- Press the review button (lower far-right button on back)
- Scroll to the picture you want to delete using the joystick.
- Press the delete button
- Scroll to "Picture" to delete the photo on the LCD screen and push in the joystick to initiate the action.
- If you want to delete all photos on the camera, select the "All…" option instead of "Picture," and push in the joystick to initiate the action.

Park: _ _ _ _ _ **PLOT NUMBER:** _ _ _ - _ _ _ _ **Date:** _ _ _/_ _ _ , _ _ _

PROVISIONAL ASSOC. NAME: _____

TREES:			S (<5M)		T (>5M)		
	SPECIES CODE		HT	CCC	HT	CCC	v?
T1	_ _ _ _ _ _	_ _ _ _ _ _ _____	____	[___]	____	[___]	
T2	_ _ _ _ _ _	_ _ _ _ _ _ _____	____	[___]	____	[___]	
T3	_ _ _ _		[ ]		____	[___]	
T4	_ _ _ _		[ ]		____	[___]	
T5	_ _ _ _		[ ]		____	[___]	
T6	_ _ _ _ _ _	_ _ _ _ _ _ _____	____	[___]	____	[___]	
T7	_ _ _ _ _ _	_ _ _ _ _ _ _____	____	[___]	____	[___]	
T8	_ _ _ _	_ _ _ _ _ _ _____	____	[___]	____	[___]	

SHRUBS:			HT	CCC	
S1	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	v?
S2	_ _ _ _		___	[___]	
S3	_ _ _ _		___	[___]	
S4	_ _ _ _		___	[___]	
S5	_ _ _ _		___	[___]	
S6	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	
S7	_ _ _ _		___	[___]	
S8	_ _ _ _		___	[___]	
S9	_ _ _ _		___	[___]	
S10	_ _ _ _		___	[___]	
S11	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	
S12	_ _ _ _		___	[___]	
S13	_ _ _ _		___	[___]	
S14	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	
S15	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	
S16	_ _ _ _		___	[___]	
S17	_ _ _ _		___	[___]	
S18	_ _ _ _		___	[___]	

GRAMINOIDS:					
G1	_ _ _ _		___	[___]	v?
G2	_ _ _ _		___	[___]	
G3	_ _ _ _		___	[___]	
G4	_ _ _ _		___	[___]	
G5	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	
G6	_ _ _ _		___	[___]	
G7	_ _ _ _		___	[___]	
G8	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]	

FORBS:				
	SPECIES CODE		HT	CCC **v?**
F1	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F2	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F3	_ _ _ _ _ _		___	[___]
F4	_ _ _ _ _ _		___	[___]
F5	_ _ _ _ _ _		___	[___]
F6	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F7	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F8	_ _ _ _ _ _		___	[___]
F9	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F10	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F11	_ _ _ _ _ _		___	[___]
F12	_ _ _ _ _ _		___	[___]
F13	_ _ _ _ _ _		___	[___]
F14	_ _ _ _ _ _		___	[___]
F15	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F16	_ _ _ _ _ _		___	[___]
F17	_ _ _ _ _ _		___	[___]
F18	_ _ _ _ _ _		___	[___]
F19	_ _ _ _ _ _		___	[___]
F20	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F21	_ _ _ _ _ _		___	[___]
F22	_ _ _ _ _ _		___	[___]
F23	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F24	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F25	_ _ _ _ _ _		___	[___]
F26	_ _ _ _ _ _		___	[___]
F27	_ _ _ _ _ _		___	[___]
F28	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F29	_ _ _ _ _ _		___	[___]
F30	_ _ _ _ _ _		___	[___]
F31	_ _ _ _ _ _		___	[___]
F32	_ _ _ _ _ _		___	[___]
F33	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]
F34	_ _ _ _ _ _		___	[___]
F35	_ _ _ _ _ _		___	[___]
F36	_ _ _ _ _ _	_ _ _ _ _ _ _____	___	[___]

Height Code	Range
1	<0.5 m
2	0.5-1m
3	1-2 m
4	2-5 m
5	5-10 m
6	10-15 m
7	15-20 m
8	20-35 m
9	35 - 50 m
10	>50 m

Cover	Range	Mid
0	0 Cover	0
1	>0 – < 1%	0.30%
3	1 – < 5%	3%
8	5 – <10%	8%
13	10 - <15%	13%
20	15 – <25%	20%
30	25 – <35%	30%
40	35 – <45%	40%
50	45 – <55%	50%
60	55 – <65%	60%
70	65 – <75%	70%
80	75 – <85%	80%
90	85 – <95%	90%
98	95 – <100%	97.50%

Park: **PLOT NUMBER:** - **Date:** / /

GRAMINOIDS con't:	HT	CCC	V?
G9			
G10			
G11			
G12			
G13			
G14			
G15			
G16			
G17			
G18			

FERNS AND ALLIED FORMS:	HT	CCC	V?
F1			
F2			
F3			
F4			
F5			
F6			
F7			
F8			
F9			
F10			

MOSSES AND LIVERWORTS:	HT	CCC	V?
M1			
M2			
M3			
M4			
M5			
M6			
M7			
M8			
M9			
M10			
M11			
M12			
M13			
M14			
M15			
M16			
M17			
M18			
M19			
M20			

LICHENS:	HT	CCC	V?
L1			
L2			
L3			
L4			
L5			
L6			
L7			
L8			
L9			
L10			
L11			
L12			
L13			
L14			
L15			
L16			
L17			
L18			
L19			
L20			

COMMENTS

Height Code	Range
1	<0.5 m
2	0.5-1m
3	1-2 m
4	2-5 m
5	5-10 m
6	10-15 m
7	15-20 m
8	20-35 m
9	35 - 50 m
10	>50 m

Cover	Range	Mid
0	0 Cover	0
1	>0 – < 1%	0.30%
3	1 – < 5%	3%
8	5 – <10%	8%
13	10 - <15%	13%
20	15 – <25%	20%
30	25 – <35%	30%
40	35 – <45%	40%
50	45 – <55%	50%
60	55 – <65%	60%
70	65 – <75%	70%
80	75 – <85%	80%
90	85 – <95%	90%
98	95 – <100%	97.50%

Entered by:_____date:_____
Updated by: _____date:_____
Updated by: _____date:_____
Verified by: _____date:_____

Classification Plot Survey Form

___Ocular ___ Recon
___Fuels

***A: IDENTIFICATION AND LOCATION*:** **Park**: __ __ __ __ **PLOT NO.** __ __ -__ __ __ **Date:** __ __/ __ __ , __ __
Surveyors: _____ **Watershed:** _____

PROVISIONAL ASSOC. NAME: new? Y_ N_____

Name notes:

_____

Key Worked? Y N notes:_____

Descript. Good? Y N notes:_____

_____

GPS REF. NO.:_____ **Field UTM X** __ __ __ __ __ __ mE **Field UTM Y** __ __ __ __ __ __ __ mN

GPSoffset az_____ **dist**_____ **GPS Error** +/- __ ___ m **PDOP**____ **GPS notes**_____

PHOTOGRAPHS TAKEN?: Y (i) numbers and description:

PLOT TYPE: __ __ __ __ __ __ **1)** _____

PLOT AREA: _____ **2)** _____

LENGTH/RADIUS v: _____ **3)** _____

WIDTH h: _____ **4)** _____

DIRECTIONS (to plot)**:**_____

_____

B: ENVIRONMENTAL FEATURES:

GPS Alt. **Map GIS**

ASPECT(º): _____ **SLOPE (%):** __ __ __ **ELEVATION:** (ft. or m.)__ __ __ __ __ **ELEV SOURCE:**

LANDFORM: _____ **MACROPOS.:** ___ **MICROPOS.:** ___ **MCONFIGv:** ____ **MCONFIGh:** ____ **TM:** __ . __

Environment notes:_____

SOIL DESCRIPTION:

Horizon	Depth (cm)	Color Dry	Color Wet	Texture	% Rock frag	Notes

GROUND COVER (use classes): ____ SOIL
\+ ____ GRAVEL
(=100% TOTAL) + ____ ROCK
\+ ____ WOOD
\+ ____ NonVasc
\+ ____ LITTER
\+ ____ OTHER

Cover classes	
00 0%	bare soil = <2mm fraction
01 >0 - 10%	gravel = 2mm to <10cm
02 10 – 25 %	rock [inc. cobbles, boulders] = > 10cm
03 25 - 60%	wood = > 1cm
04 60 - 100%	moss= **not** on logs and rocks
	litter = organic < 1 cm
	other = specify (water, snow, cement)

RIPARIAN/WETLAND FEATURES and COWARDIN CLASS :

__ Upland
__ Palustrine (circle): Moss/lichen Emergent Forested Scrub/shrub
__ Lacustrine (circle): Littoral Emergent

HYDRO. REGIME (circle) **:**

Seasonally Flooded Temporarily Flooded
Intermittently Flooded Saturated
Semipermanently Flooded Permanently Flooded

__ Riverine (circle): Lower perennial Emergent

DISTURBANCE: (natural or anthropogenic- e.g. stumps, pathogens, fire scars)

_____

__

ANIMAL EVIDENCE: (indicate type and note details below e.g, browse, middens, holes, scat, scrapes etc)

_____

__

Park: __ __ __ __ **PLOT NO.** __ __- __ __ __ **Date:** __ __/ __ __ , __ __

Surveyors: _____

GENERAL SITE DESCRIPTION (landscape features, position in landscape, adjacent associations or structural stages, etc.:

_____

_____

_____

_____

_____

_____

C. VEGETATION DESCRIPTION:

Physiognomic class:
___Forest ___Woodland ___Shrubland ___Dwarf Shrubland ___Herbaceous ___Sparse vascular vegetation

Leaf type: ___Broad-leaf ___Needle-leaf ___Microphyllous ___Graminoid ___Forb ___Pteriodphyte

Leaf phenology of physiognomic class:

Trees and Shrubs: __Evergreen ___Deciduous ___ Mixed evergreen- deciduous **Herbs**: ___annual ___perennial

Cover and dominant species by Strata: 00 0%; **01** > 0 - 10%; **02** 10 – 25 %; **03** 25 - 60%; **04** 60 - 100%

	Cover	Height	Species (in order of abundance)
T1 Emergent	_____	_____	_____
T2 Canopy	_____	_____	_____
T3 Sub-canopy 5+ m	_____	_____	_____
S1 Tall shrub 2- 5 m	_____	_***04***__	_____
S2 Short Shrub 0.5-2 m	_____	_____	_____
S3 Dwarf shrub 0-.5m	_____	_____	_____
H Herbaceous			
H1 Graminoids	_____	_____	_____
H2 Forbs	_____	_____	_____
H3 Ferns	_____	_____	_____

H4 Tree seedlings	____	____	_____
N Non-vascular	____	____	_____
V- Vine/liana	____	____	_____
E Epiphytes	____	____	_____

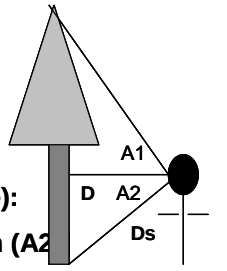
Entered by:_____**date:**_____
Updated by: _____**date:**_____
Updated by: _____**date:**_____
Verified by: _____**date:**_____

Height	Range
1	<0.5 m
2	0.5 - <1m
3	1 - <2 m
4	2 - <5 m
5	5 - <10 m
6	10 - <15 m
7	15 - <20 m
8	20 - <35 m
9	35 - <50 m
10	50+ m

Height = D * [tan (A1) +/- tan (A2)]

if on slope (+ if above, - if below tree):

Height = [cos (A2) * Ds] * [tan (A1) +/- tan (A2



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS D-586, April 2009

National Park Service
U.S. Department of the Interior

Natural Resource Program Center
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Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA ™