

Preliminary Biogeoclimatic Ecosystem Classification of the United States Pacific Northwest

Part 1 - Methods

DRAFT

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Table of Contents

1	Introduction	1
2	Methods	1
2.1	Biogeoclimatic Mapping.....	1
2.1.1	Development of Training Points.....	2
2.1.2	Field Checking	10
2.1.3	Final Phase.....	11
2.1.4	Mapping Procedure.....	13
2.2	Determining Tree Species Environmental Suitability	14
3	Results.....	16
3.1	Biogeoclimatic Map	16
3.2	Tree Species Suitability.....	20
4	Discussion	21
5	Literature Cited.....	23
6	Supplementary Material	26
6.1	Appendix 1: Source of Training Points by Zone and Subzone	26
6.2	Appendix 2: List of Modelled Biogeoclimatic Units in United States	32

1 INTRODUCTION

The Biogeoclimatic Ecosystem Classification (BEC; MacKenzie and Meidinger, 2018; Pojar et al., 1987) is the foundational framework used in British Columbia (B.C.) to guide climate- and site-specific reforestation decisions, particularly the selection of appropriate tree species. With climate change, current guidance must be adjusted to account for a range of plausible future climates to ensure plantations remain resilient through to maturity.

MacKenzie and Mahony (2021) leveraged the BEC framework to develop an ecological approach to inform adjustments to tree species selection guidance with the Climate Change Informed Species Selection (CCISS) tool. They modelled the redistribution of biogeoclimatic subzone/variant (BGC units) climate envelopes under projected future climates using machine learning (Wang et al., 2012) and then linked equivalent site conditions and their associated tree species environmental suitability ratings between the current BGC unit and 30 future modelled future BGCs, spanning 20-year normal periods to the year 2100. The Climate-Based Seed Transfer system (CBST; O'Neill et al. 2017) also employs BEC subzone/variants as climate units to guide the selection of climate-adapted seed sources for reforestation.

Using BGC units as the central component of climate-change adaptation guidance has the advantage of directly integrating scientific advances into well-established decision-making systems for forest and land management in British Columbia. However, both these approaches require the existence of equivalent BGC units in regions that have analogue climates for future climate conditions in B.C. No BEC equivalent units exist for regions south of B.C., which are the most likely sources of climate analogues in southern coastal and interior of B.C. To address this gap, we developed a modelled BGC product for western North America, enabling the identification of suitable climate analogues beyond provincial boundaries.

The methods are presented in Part 1 (this report). A description of the U.S. biogeoclimatic units and tree species associated with a range of site conditions within these BGC units is presented in Part 2 (Meidinger and MacKenzie 2026).

2 METHODS

The methods for the two components to this project: 1) biogeoclimatic mapping; and 2) tree species environmental suitability assignments, follow.

2.1 BIOGEOCLIMATIC MAPPING

The approach to biogeoclimatic mapping for the United States (US) was to (1) classify vegetation plot data and other “training points” into biogeoclimatic zones and subzones, (2) train a machine learning classification model with training point subzone as the predictand and training point climate variables as the predictors, and (3) map the spatial distribution of each subzone as a prediction of the classification model. The biogeoclimatic units were refined over many iterations

of this process. We used Random Forests (Breiman 2001) for machine learning. For climate data, we used the PRISM temperature and precipitation maps of the contiguous US, accessed via ClimateNA (Wang et al. 2016) in early phases of this project, and via the climr R package (Daust 2024) for the final version.

The primary area of interest was the states of Washington, Oregon, Idaho, and Montana (Figure 1). As the project progressed, this core area was ‘bounded’ by expanding the training dataset to the adjacent states—California, Nevada, Utah, Colorado, Wyoming, and Montana—a secondary area of interest.



Figure 1. Area of interest. Dark grey: primary; Light grey: secondary.

2.1.1 Development of Training Points

The training point data set was developed using several data sources and map products. Two attributes were assigned to each training point: biogeoclimatic zone and subzone. Biogeoclimatic zone and subzone are climatic classification units inferred from mature plant communities on “zonal” sites; i.e., sites and soils with average moisture and nutrient conditions that indicate the local climate. Zone and subzone were mostly determined by reviewing vegetation and forest cover plots, along with regional vegetation mapping or satellite imagery, in order to determine the zonal vegetation.

Three data sources were used to develop most of the training points for the mapping: 1) vegetation plots available through VegBank (2026); 2) U.S. Forest Inventory & Analysis (FIA) Program data points collected for the U.S. National Forest Inventory (O’Connell et al. 2017); and 3) US

GAP/LANDFIRE vegetation maps (Rollins 2009; USGS 2019). In addition, some training points were assigned manually based on field observations, or expected zonal vegetation based on location (e.g., proximity to B.C. border and known conditions in B.C., or to populate gaps between vegetation plots already assigned to a zone/subzone).

The training point data set was developed over many iterations (see **First Phase**, **Second Phase**, and **Final Phase** sections). The process of assigning zone and subzone is discussed in these sections.

Other supporting digital products were also obtained. These included:

1. U.S. Potential Natural Vegetation Map (following Kuchler 1964 mapping; compiled by Kittel et al. (1998).
2. Vegetation Zones of U.S. (Brown et al. 1998) [original map at 1:10,000,000].
3. Level III and IV Ecoregions (available from US EPA [<https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>]; based on Omernik 1987)
4. WWF Terrestrial Ecoregions of the World (Olson et al. 2001).
5. Shining Mountains vegetation zonation map of B.C. and north-western U.S. (Demarchi et al. 2000).

These maps were somewhat useful in determining the zonal vegetation, but they were at a broad scale and mapped different kinds of vegetation/ecological units, conceptually different from biogeoclimatic zone and subzones. There were also spatial issues with U.S. Potential Natural Vegetation map (i.e., it was “offset” 6-8 km from actual ground conditions and was quite pixelated in many places).

2.1.1.1 First Phase

The initial mapping was completed in 2014/2015. It focused on the primary area (Figure 1) and utilized the plots available from VegBank for WA, OR, ID, and MT. These were almost exclusively U.S. Forest Service (USFS) plots that had been collected to develop USFS plant association guides (e.g., Williams and Lillybridge 1983, Henderson et al. 1992, Lillybridge et al. 1995, McCain and Diaz 2002) and USFS habitat type guides (e.g., Pfister et al. 1977, Steele et al. 1983, Cooper et al. 1991) for the National Forests in these states. 50,506 plots were obtained and after removing 4,877 plots with no or obviously incorrect location data (i.e., plots out of area), 45,620 plots remained for analysis. The data were imported into VPro (MacKenzie & Klassen 2009) where environment data and species code conversions were cross-walked to VPro codes, and new species added to create a new VPro species file.

The first round of analysis involved assigning Biogeoclimatic (BGC) Zone (Pojar et al. 1987) attribute to broadly circum-mesic plots. The initial assignment to zone was qualitative, concentrating on tree species characteristic of geographic areas and elevational sequences (Table 1). The process was as follows:

- Using the VPro plot profiling function, a GIS layer (kml) was created for each major tree species based on a cover of 19% or greater.
- These plots were attributed with:
 - Vegetation zone from Shining Mountains map (WA, N ID, extreme NW MT)

- Vegetation zone from Brown’s Vegetation of U.S.
- The data for many plots included the USFS association (habitat type) or alliance.
- Tree species distributions were viewed manually by displaying in Google Earth Pro and turning individual tree species layers on and off.
 - Contiguous areas of different tree species combinations were hypothesized to be a different biogeoclimatic zone.
- Biogeoclimatic zone was assigned to plots based on overall tree species composition, location, elevational position in sequence from valley bottom to mountain top, and existing USFS association/alliance assignments, and sometimes, vegetation map unit assignment.
- Zone assignments were reviewed on Google Earth imagery.

To assist with interpretation of tree species patterns and elevation relationships, United States Forest Service (USFS) plant association guides (e.g., Williams and Lillybridge 1983, Henderson et al. 1992, Lillybridge et al. 1995, McCain and Diaz 2002), USFS habitat type guides (e.g., Pfister et al. 1977, Steele et al. 1983, Cooper et al. 1991), and descriptions and generalized maps of forest zones described in Franklin and Dyrness (1988) were consulted. Only plots that appeared to have a good fit to a zone were assigned—these comprised broadly circum-mesic plots that had a clear zone signal, mostly using tree species, but also key understorey species.

The initial zones were mostly an extrapolation of zone concepts from British Columbia southward (Table 1), i.e., a consideration of observed tree species or vegetation cover distribution, geographic location, and position in BGC zone elevational sequence. In most cases, the B.C. zone concepts were applicable to the area of interest. In areas where the data did not fit into B.C. zone concepts, new zones were proposed. These areas were primarily in southern Oregon (see CMX, CWF, IWF, and MHRF zones; Table 1), but also included areas characterized by grand fir in the interior of WA and OR, i.e., the IGF (Interior Grand Fir) zone.

Then, the plots assigned to zone were evaluated to assign a biogeoclimatic subzone. Again, B.C. subzone concepts were extrapolated southward, as far as seemed reasonable, by reviewing the plot data for tree species combinations and understorey vegetation. New subzone concepts were proposed where necessary, e.g., new tree species assemblages or “different” understorey vegetation that suggested a different zonal association. At this stage, even areas where plots indicated high similarity to B.C. subzones, the areas were coded differently to recognize that they were in the U.S. and potentially a different subzone (e.g., IDFxh_WA as compared to IDFxh in B.C.). The vegetation of proposed subzones was reviewed through VPro vegetation summary tables.

As there were no plots in the grassland areas of WA and OR, 93 points were manually positioned to represent grassland areas following the generalized map in Franklin and Dyrness (1988; Figure 153, p. 212).

Preliminary biogeoclimatic maps were generated (v2, v3, and v4; Table 2) using methods like those described below (see **Mapping Procedure**). There were about 20,000 training points at this stage, mostly for the area of primary interest. In reviewing the mapping, most training points appeared to have reasonable spatial accuracy—the exception being the older plots in Montana. Some points were removed to minimize the impact.

2.1.1.2 Second Phase

In reviewing the preliminary maps and training point distribution (Figure 2), it was clear that there were gaps in the geographic distribution of points. At the same time, it was thought that it would be important to expand the mapping to adjacent states to ‘bound’ the primary area of interest to include different climates and vegetation. Initially, we added in some additional manual points to extend mapping into California chaparral, coastal redwood forests, California central valley grasslands, western juniper woodland, etc. and produced a new map (v10 – Table 2).

Table 1. U.S. Pacific Northwest Biogeoclimatic Zones Initially Described in Phase 1

B.C. Zones Extended Into U.S.			Key Species or Features
	BG	Bunchgrass	<i>Artemisia tridentata</i> , <i>Festuca idahoensis</i> , <i>Pseudoroegneria spicata</i>
	CDF	Coastal Douglas-fir	<i>Pseudotsuga menziesii</i> , <i>Abies grandis</i> , <i>Quercus garryana</i> , <i>Arbutus menziesii</i>
	CMA	Coastal Mountain-heather Alpine	Above treeline, maritime climate
	CWH	Coastal Western Hemlock	<i>Tsuga heterophylla</i> , <i>Abies amabilis</i>
	ESSF	Engelmann Spruce – Subalpine Fir	<i>Picea engelmannii</i> , <i>Abies lasiocarpa</i> , <i>Pinus albicaulis</i>
	ICH	Interior Cedar – Hemlock	<i>Tsuga heterophylla</i> , <i>Thuja plicata</i>
	IDF	Interior Douglas-fir	<i>Pseudotsuga menziesii</i> , <i>Pinus ponderosa</i> , <i>Pinus contorta</i>
	IMA	Interior Mountain-heather Alpine	Above treeline, continental climate
	MH	Mountain Hemlock	<i>Tsuga mertensiana</i> , <i>Abies amabilis</i> , <i>Cupressus nootkatensis</i>
	MS	Montane Spruce	<i>Pseudotsuga menziesii</i> , <i>Pinus contorta</i> , <i>Picea engelmannii</i> , <i>Abies lasiocarpa</i>
	PP	Ponderosa Pine	<i>Pinus ponderosa</i>
New Zones Proposed for U.S. Pacific Northwest in Primary Area of Interest			
	CMX	Coastal Mixed Evergreen	<i>Pinus lambertina</i> , <i>Calocedrus decurrens</i> , <i>Tsuga heterophylla</i> , <i>Quercus</i> spp., <i>Pseudotsuga menziesii</i>
	CWF	Coastal White Fir	<i>Abies concolor</i> , maritime climate
	IGF	Interior Grand Fir	<i>Abies grandis</i> , <i>Pseudotsuga menziesii</i>
	IWF	Interior White Fir	<i>Abies concolor</i> , continental climate
	MHRF	Mountain Hemlock – Red Fir	<i>Tsuga mertensiana</i> , <i>Abies magnifica</i>
New Zones Proposed for Secondary Area of Interest			
	CCH	California Chaparral	sclerophyllous shrublands, S. California
	CRF	Coastal Redwood Forest	<i>Sequoia sempervirens</i>
	CVG	Central Valley Grassland	historic grasslands, Central Valley, California
	GBD	Great Basin Desert	shrub-steppe / salt desert shrub vegetation, southern Great Basin
	MDCH	Madrean Chaparral	continental climate; <i>Quercus turbinella</i> , <i>Ceanothus greggii</i> , <i>Arctostaphylos pungens</i> , etc.
	MGP	Mixed-grass Prairie	<i>Hesperostipa comata</i> , <i>Pascopyrum smithii</i> , <i>Bouteloua curtipendula</i> , <i>Bouteloua gracilis</i>
	MMM	Montane Mountain Mahogany	<i>Cercocarpus ledifolius</i>
	MSSD	Mojave-Sonoran Semi-Desert	Mojave-Sonoran semi-desert scrub
	OW	Oak Woodland	<i>Quercus</i> spp. woodlands
	PPJW	Pinyon Pine – Juniper Woodland	<i>Juniperus</i> spp., pinyon <i>Pinus</i> spp.
	SGP	Short-grass Prairie	<i>Bouteloua gracilis</i> , <i>Bouteloua dactyloides</i> , <i>Aristida</i> spp., <i>Opuntia polyacantha</i>
	WJP	Western Juniper – Pine	<i>Juniperus occidentalis</i> , <i>Pinus</i> spp.
Alberta Zones Extended into U.S.			
	FG	Fescue Grassland	<i>Festuca campestris</i> , <i>Pascopyrum smithii</i> , <i>Festuca idahoensis</i> , <i>Danthonia parryi</i>
	SBAP	Sub-boreal AspenParkland	warm aspects – fescue grasslands; cool aspects – <i>Populus tremuloides</i>

We then accessed data points from the FIA program (U.S. National Forest Inventory [NFI], O’Connell et al. 2017) for each of the nine states in our area of interest (Figure 1). The FIA data points mostly record tree species but also have many ‘subplots’ with some understorey species. Using this data, gaps or areas with few VegBank plots in WA, OR, ID, and MT, were evaluated and new training points added. In addition, training points were added to WY, CO, UT, NV, and most of CA.

Table 2. Mapping Iterations[#]

Version	Date (year-month)	No. of training points
v2*	2014	20,019
v3 ⁺ & v4 ⁺	2015	20,019
v10	2016-05	19,476
v11	2019-12	36,699
v12	2021-09	36,884
	2024-04	37,646
V13	2026-03	37,702

[#] Mapping is for entire area of interest (Figure 1) unless noted otherwise

* Mapped biogeoclimatic zones in primary region of interest

⁺ Mapped zones; plus, tentative subzones for interior zones PP, IDF, IGF, ICH, MS, ESSF; for entire region of interest based almost entirely on points from area of primary interest

The FIA NFI inventory covers forested areas on private and public lands. FIA plots are a cluster of four 7.32 radius subplots in a set pattern (although earlier plot designs could differ in how the subplots were placed). The density of these “Phase 2” plots is about one for every 6,000 acres (2,428 ha). The tree data is collected on all subplots. Understorey vegetation data (along with other data) is collected from about one of every 16 Phase 2 plots (called “Phase 3” plots), within a 2 m radius microplot in each of the four subplots.

For our use, we compiled a set of GIS layers for each state, as follows:

- One layer for each tree species (plot number, lat., long., elevation, species name, species code), and
- A layer for subplots with understorey vegetation (attributes as above, but also with percent cover).

The subplot data was compiled into VPro for use in summarizing the vegetation of biogeoclimatic units. Tens of thousand of plots were acquired over the nine states (the exact number was not determined due to the way we summarized the data—into many individual layers). Figure 3 shows the FIA plot distribution in the nine states.

FIA plot locations are not precise, due to privacy concerns on private land, and possible issues with vandalism and plot integrity on public land. FIA plots are subject to ‘fuzzing’ and ‘swapping’—fuzzing means that the coordinates are moved but are within 1 mile of the actual plot coordinates. In addition, up to 20% of plots on private lands are swapped with another similar plot within the same county. Swapped plots are chosen to be similar on attributes such as forest type, stand-size class, latitude, and longitude. In more recent data, plot coordinates are within 0.5 mile of the actual plot for most plots; some are up to 1 mile away. Although it is potentially possible to get the actual plot coordinates, we were unable to do so.

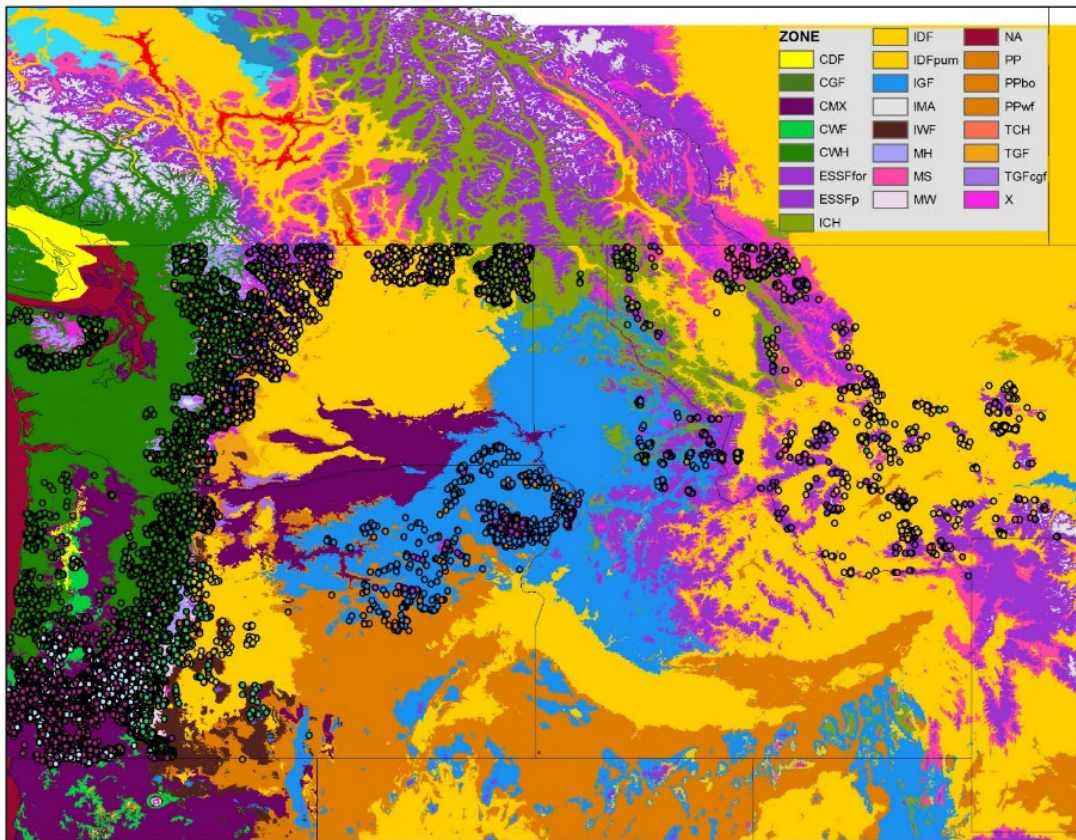


Figure 2. Modelled biogeoclimatic zones and U.S. training points (small black circles) after first phase

The procedure for assigning BGC zone and subzone to FIA plots was similar to that used for VegBank plots in phase 1, as follows:

- Tree species distributions were viewed manually in QGIS by clicking individual tree species layers on and off to evaluate geographic areas with certain tree species or combinations.
- Biogeoclimatic zone and subzone were assigned to FIA points based on tree species composition, location, and elevational position in sequence from valley bottom to mountain top.
 - In later stages, as the digital contour data became available for the entire area, digital contours (100 m, 200 m, 500 m) were also displayed with training points to evaluate BGC assignments.
- New zones and subzones were assigned to training points, where appropriate—see Table 1: *New Zones Proposed for Secondary Area of Interest*.

In general, the density of training points assigned to a zone and subzone was less in the five ‘secondary area of interest’ states (Figure 1) than in the four primary states.

In this second phase, it was also evident that non-forested areas, or areas with considerable development, did not have VegBank plots or FIA data points (Figure 3).

To improve the mapping of grassland zones and subzones, US GAP/LANDFIRE vegetation maps were used (Rollins 2009, USGS 2019). For grassland areas, the following steps were undertaken:

1. Using GIS, a 10 x 10 km grid of points was overlaid on the National GAP Analysis Program vegetation mapping (GAP/LANDFIRE National Terrestrial Ecosystems) and the U.S. National Vegetation Classification (Faber-Langendoen et al. 2014; USNVC 2025) unit associated with the map polygons were assigned to each point.
2. The USNVC classification was reviewed and points within selected USNVC Groups were assigned to biogeoclimatic zone and subzone.
3. The new training points were evaluated by reviewing their geographic distribution and land cover on Google and Bing imagery.
4. An elevation for the training points was calculated using USGS GTOPO30 (USGS 1996).

A similar set of steps was used to add points for alpine vegetation, but the grid density of points was 2 x 2 km. Following review on imagery, many of these points were subsequently assigned to parkland subzones instead of alpine. Some alpine and parkland points were added using the forest coverage product of Hansen et al. (2013).

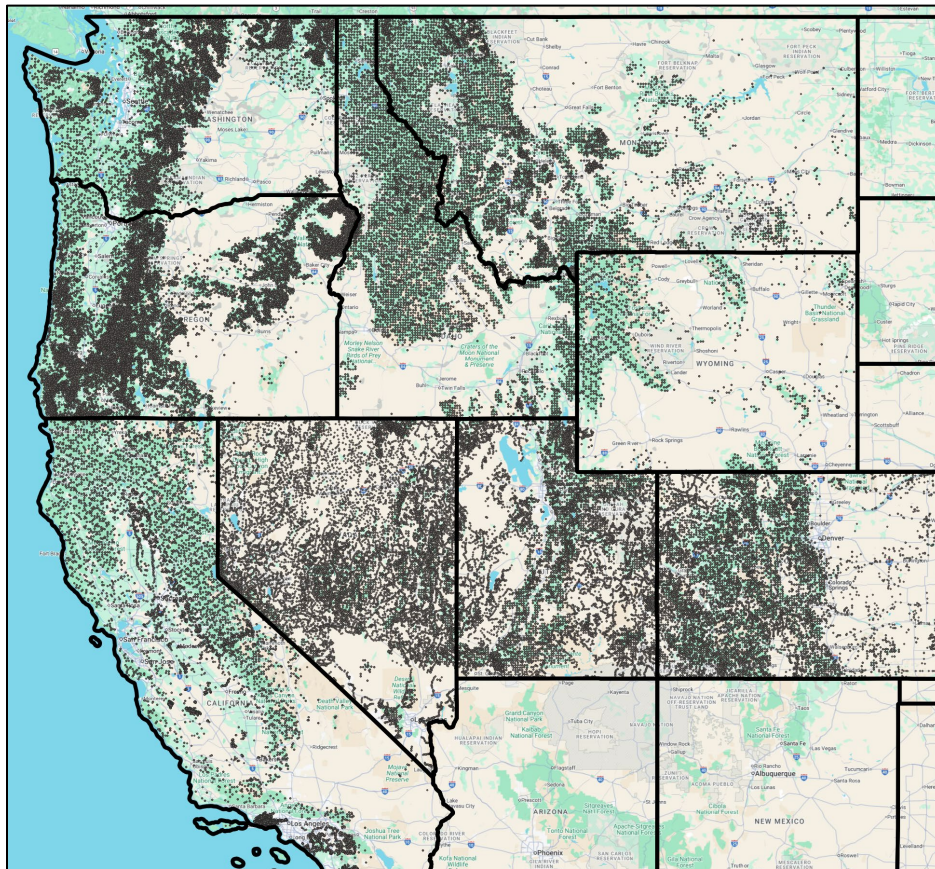


Figure 3. FIA data points acquired in area of interest.

After all these steps, some zones and subzones had few training points, so, where appropriate, training points were added manually. Points were added for some areas of grassland (BG), subalpine parkland (MH, ESSF), alpine (CMA, IMA), and oak woodland (OW).

The assignment of training points was evaluated using confusion matrices for two of the early map products (v10, v11; Table 2) and point assignments reevaluated for areas with higher confusion. Maps were also evaluated by producing vegetation data summaries comparing subzones within zones, and various ‘units’ within subzones (e.g., using habitat type plot assignments).

Field observations were conducted by W.H. MacKenzie during two trips to the U.S. to evaluate biogeoclimatic unit breaks and mapping along two transects, as follows:

- 2017: 258 data points in N WA, W ID, and N & C OR (Figure 4; purple dots)
- 2018: 95 data points in W MT, N ID, NE WA (Figure 4; red dots)

Some modifications to training points were implemented using the notes from these field observations. The v12 map (2021; Table 2) was produced with a total of 36,884 training points.

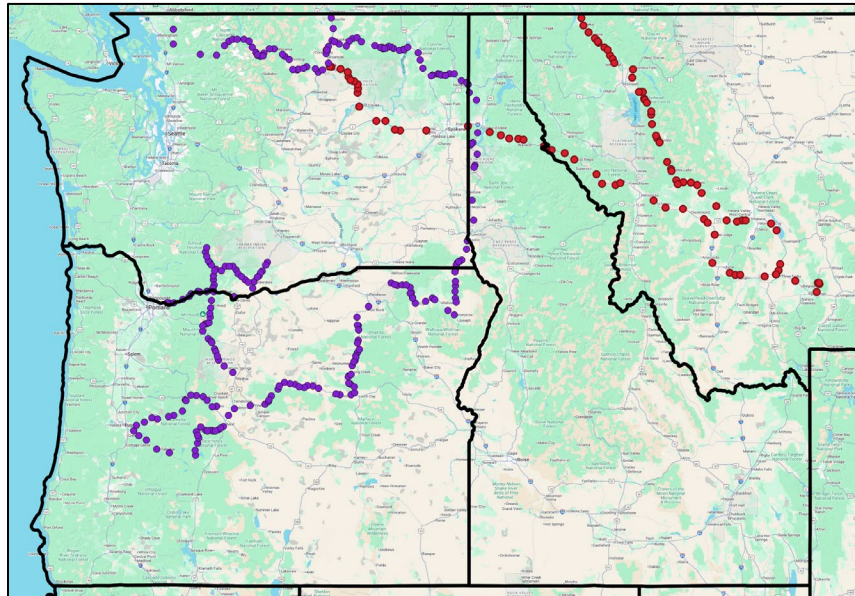


Figure 4. Field transects in 2017 and 2018 in WA, OR, N ID, and W MT.

2.1.2 Field Checking

In 2023, an intensive assessment of the mapping was conducted, with two vehicles driving transects across WA, OR, N ID, and part of NW MT (Figure 5). In total, notes for 1,318 check points were collected. In 2024, W.H. MacKenzie also made some observations in portions of Nevada and California.

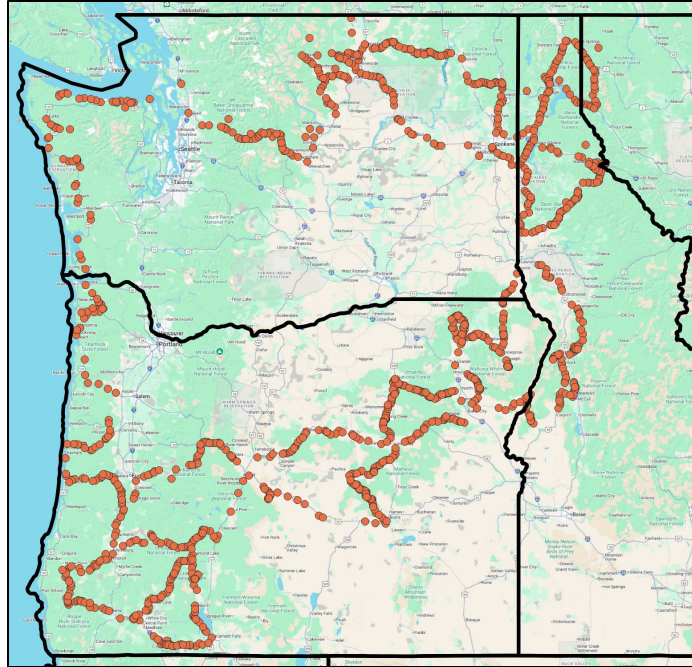


Figure 5. Field transects in 2023 in WA, OR, N ID, and NW MT.

2.1.3 Final Phase

Following the 2023 field checking of the mapping, 694 manual points were added along the route, using field checking points. In addition, 195 points were manually added in areas with few or no FIA points or VegBank plot data, to better map certain biogeoclimatic units identified during the field trip.

In 2025, following W.H. MacKenzie’s 2024 field trip, 37 FIA data points were added and modifications were made to existing training points to recognize some new subzones of the Oak Woodland, Coastal Redwood Forest, and Pinyon Pine – Juniper Woodland zones, and to better map parkland and alpine in the Yosemite Park area of eastern California.

In total, 37,702 training points were available for modelling (Figure 6). This included 17,927 VegBank plots, 8,128 FIA data points, 4,022 GAP points for alpine and parkland, 5,534 GAP points for grasslands and related ecosystems, and 2,091 manual points. Table 3 shows the sources of training points for each zone; Appendix 1 shows the sources for the subzones. Note: in the present procedure, training points for parkland subzones of the ESSF, MH, or MHRF zones were combined with the appropriate alpine subzone of the CMA or IMA zones. Training points for three BC units were included in the US—the CWHxs and IDFxx1 (NW WA), and ICHdm (NW MT).

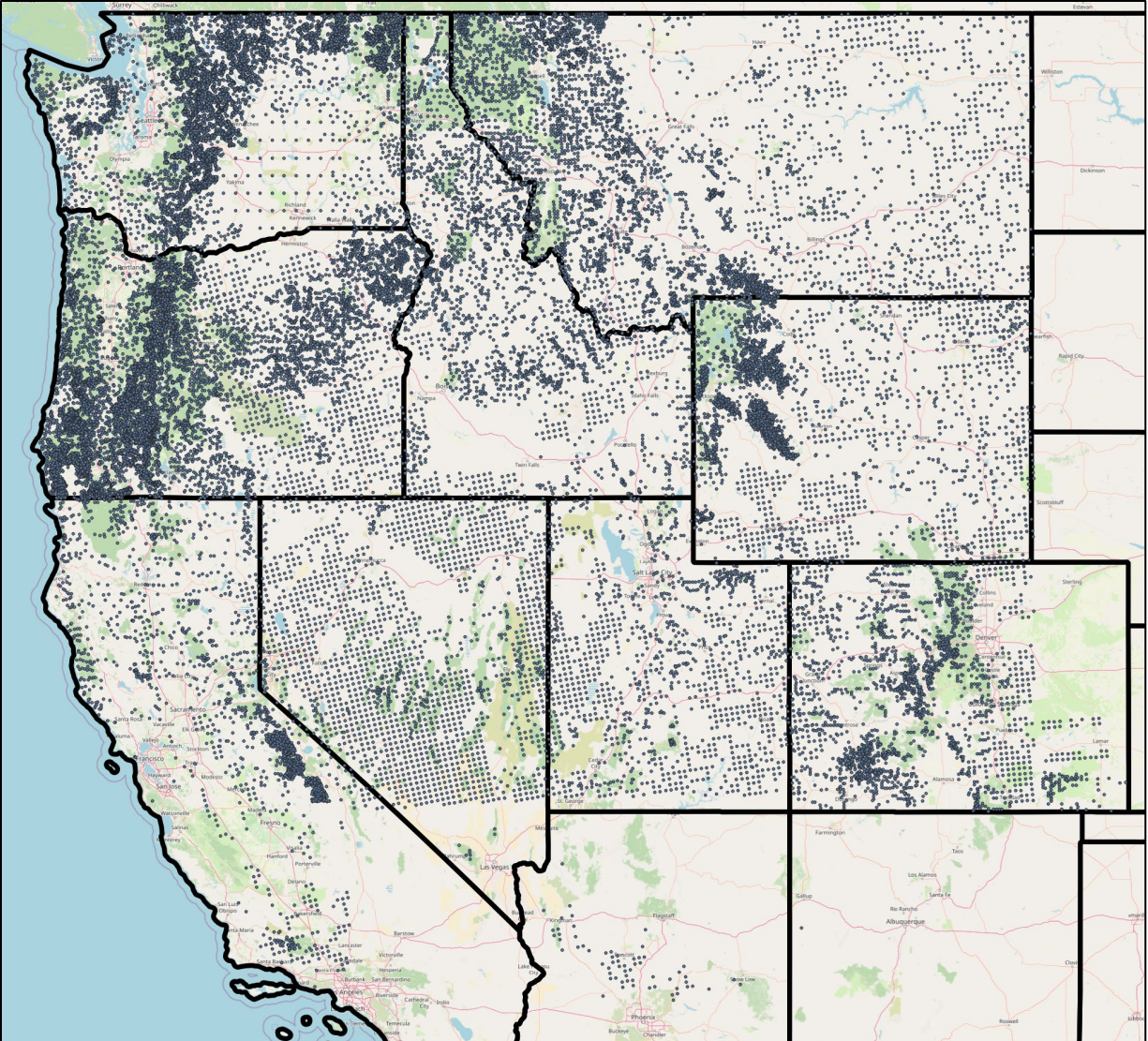


Figure 6. Distribution of 2026 set of training points

Table 3. Source of Training Points by Zone (zone names for codes are in Table 1)

Zone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
BG	57	27		1443	484	2011
CCH		2		28	30	60
CDF	133	143			80	356
CMA	3		370		54	427
CMX	1633	135			20	1788
CRF		117			17	134
CVG				143	24	167
CWF	919	151			4	1074
CWH	5885	736			143	6767
ESSF	2168	1033	695	12	85	3993
FG				18	205	223
GBD	4			1082		1086
ICH	1268	512			65	1845
IDF	854	1193		112	208	2367
IGF	1634	613			81	2325
IMA	68	15	2528	1	48	2660
IWF	214	330		13	14	571
MDCH				75		75
MGP		14		750		764
MH	1007	78	15		55	1155
MHRF	585	83	387		11	1066
MMM		25		1		26
MS	1254	1137	27	20	73	2511
MSSD				71		71
OW		119			63	182
PP	201	721		204	115	1241
PPJW	40	653		1201	1	1895
SBAP					27	27
SGP		5		217		222
WJP		286		143	184	613
Total	17925	8128	4022	5534	2076	37702

2.1.4 Mapping Procedure

The procedure for producing the modelled map products evolved somewhat over time but has always used a Random Forests model (Breiman 2001) and a set of training points assigned to biogeoclimatic zone and subzone. The current method follows:

1. Training points were assigned to biogeoclimatic zone and subzone
2. Training points were then attributed with annual and seasonal climate predictors from the 'climr' R package (Daust et al. 2024).

3. These data were used to train a Random Forests classification model (Breiman 2001) of biogeoclimatic (BGC) subzone/variant climate envelopes.

Then, a 400 m hex polygon grid was built for each state in the western USA and each polygon was attributed with climr climate predictors. The BGC Random Forests model was then used to predict BGC membership for each polygon in each state grid. To create a final BGC map raw state maps were merged into a single map, and hexes were merged to create larger contiguous polygons based on BGC membership. To simplify the map, merged polygons less than 6 hexes in size were combined with the adjacent polygon that shared the longest common boundary.

2.2 DETERMINING TREE SPECIES ENVIRONMENTAL SUITABILITY

After the final map was selected, plots occurring within each mapped BGC were reviewed and summarized to identify common plant associations or habitat types and more broadly what tree species were found in each BGC. From this information, tree species environmental suitability ratings were assigned across edaphic conditions for use in the Climate Change Informed Species Selection tool (CCISS 2025; MacKenzie and Mahony 2021).

Over 200,000 georeferenced records with trees and understory vegetation were compiled from VegBank (91,288 vegetation plots) and FIA (117,394 plots/subplots). We assigned BGC membership from the map to all 208,682 points based on spatial intersection with the predicted BGC map. We used this data to summarize tree species for each BGC unit by habitat type/plant association, if this was available. For regions lacking these attributes, we summarized the data using whatever attributes were available, e.g., moisture regime or vegetation alliance. In some cases, individual plots were reviewed.

Tree species frequency and cover data were summarized for each association (or other unit) and the associations were then ordered by perceived soil moisture regime. Tree species were assigned to an environmental suitability class (Table 4; E1, E2, E3) for 'site units' – a combination of various soil moisture regime (SMR) and soil nutrient regime (SNR) classes. The number of site units in a BGC unit was determined by consideration of the amount of data, the number of tree species, and the change in tree species frequency/cover across the moisture gradient. The number of site units for a BGC subzone ranged from three to seven. Reports on the ecology of the area (e.g., Lillybridge et al. 1995; McCain and Diaz 2002) and the silvics of the tree species¹ was also used to generate the environmental suitability by SMR/SNR class.

Tree species suitability ratings were displayed on an edatopic grid for each BGC unit (see Part 2, Meidinger and MacKenzie 2026).

¹ Silvics of North America. <https://research.fs.usda.gov/silvics/>

Table 4. Environmental Suitability Classes

<p>E1 – High environmental suitability based on species autecology (climatic and site).</p>	<p>The species is generally common and abundant in natural forests but may be of variable abundance where disturbance regime/stand age distribution is unfavorable (e.g. shade intolerant species in low disturbance landscapes). Expect widespread regeneration success on all site conditions representative of the SMR class. Expect continuous distribution at a landscape or stand level where the species had been established.</p>
<p>E2 – Moderate environmental suitability based on species autecology (climatic and site). Species occurring towards the outer range of the species climatic or site tolerance.</p>	<p>The species has variable abundance in natural forests and is often concentrated in select site conditions for the SMR class (e.g. warm aspects, higher elevations, elevated micro sites) where the species may be highly feasible. Not all site conditions of the SMR class or normal post-disturbance stand conditions may be suitable for successful regeneration. Expect patchy or zoned distribution at a landscape and/or stand level.</p>
<p>E3 – Low environmental suitability based on species autecology (climatic and site) often occurring at the extremes of the species climatic or site tolerance.</p>	<p>The species is generally infrequent to sporadic in natural forests and has significant environmental limitations in the SMR class. Only specific landscape positions or microsites are likely to have regeneration success and good growth. Expect scattered or very widely spaced distribution at a landscape or stand level.</p>

3 RESULTS

3.1 BIOGEOCLIMATIC MAP

The predicted BGC map for the western conterminous USA (Figure 7) includes 30 BGC zones—eleven of which also occur in British Columbia (Meidinger and Pojar 1991) and two of which occur in Alberta (Natural Regions Committee 2006). The 17 new biogeoclimatic zones of the USA are proposed based on a review of vegetation description reports and data. Most zones have multiple subzones and 140 new biogeoclimatic subzone/variants are mapped (Appendix 2). When training points from southern British Columbia are included in the model, some additional B.C. biogeoclimatic subzones/variants are mapped into the U.S..

In the present map, parkland subzones of ESSF, MH, and MHRF are not mapped separately—the training points were included in the adjacent alpine (CMA, IMA) zone/subzone—they are mapped with the adjacent alpine zone.

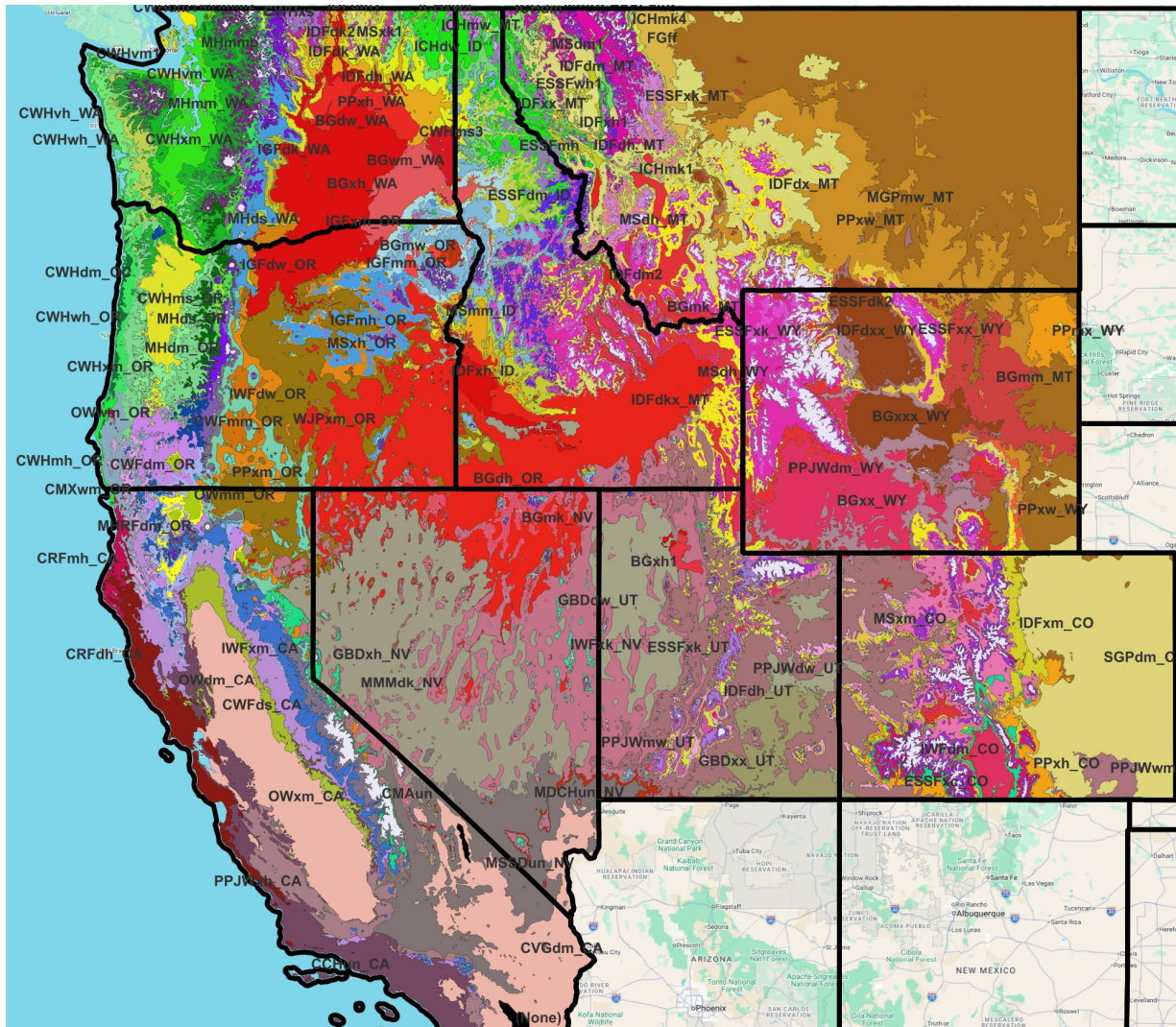


Figure 7. Biogeoclimatic map of western United States

Six of the 17 new BGC zones are forested occurring mostly south of the Washington-Oregon border, including the Coastal Mixed Evergreen (CMX) with 4 subzones, Coastal Redwood Forest (CRF) with 2 subzones, Coastal White Fir (CWF) with 4 subzones, Mountain Hemlock – Red Fir (MHRF) with 3 subzones², Interior Grand Fir (IGF) with 5 subzones, and Interior White Fir (IWF) with 4 subzones. The new zones encompass tree and understorey assemblages significantly different from current B.C. vegetation which may provide insight into potential dramatic ecological shifts under warmer future climates.

Many forested BGC zones described for British Columbia also have subzones defined for the western United States. These include the Coastal Douglas-fir (CDF) with 3 subzones, Coastal Western Hemlock (CWH) with 15 subzones, Mountain Hemlock (MH) with 5 subzones¹, Engelmann Spruce – Subalpine Fir (ESSF) with 15 subzones¹, Interior Cedar – Hemlock (ICH) with 7 subzones, Interior Douglas-fir (IDF) with 16 subzones, Montane Spruce (MS) with 11 subzones, and Ponderosa

² Additional parkland subzones occur but are not mapped separately—they are included in the alpine zones.

Pine (PP) with 8 subzones. These recognizable forest types represent less radical analogues to B.C.’s current ecosystems.

The modelled USA BGC map has BGC types and boundaries that match closely with equivalent zones at the international border suggesting that the analysis is producing a sufficiently accurate map for the purposes of providing BEC-equivalent analogues for climate futures of British Columbia (Figures 8 and 9). There are definitely some areas of ‘confusion’ in the modeling, but these are relatively minor.

Figure 10 shows B.C. biogeoclimatic units mapped into the United States by the model. Much of this is alpine (grey colours). Three BGC units from B.C. have training points in the U.S.—these are CWHxs (20 points), ICHdm (9), and IDFx1 (17). Training points were added for these B.C. units as the ecological conditions extended into the U.S. and the areas were not large enough in the U.S. to locate enough training points for reasonably accurate mapping. Somewhat similarly, two Alberta BGC units had training points added in the U.S.—the FGff (223 points) and SBAPfp (27). These five BGC units are not included in Figure 10.

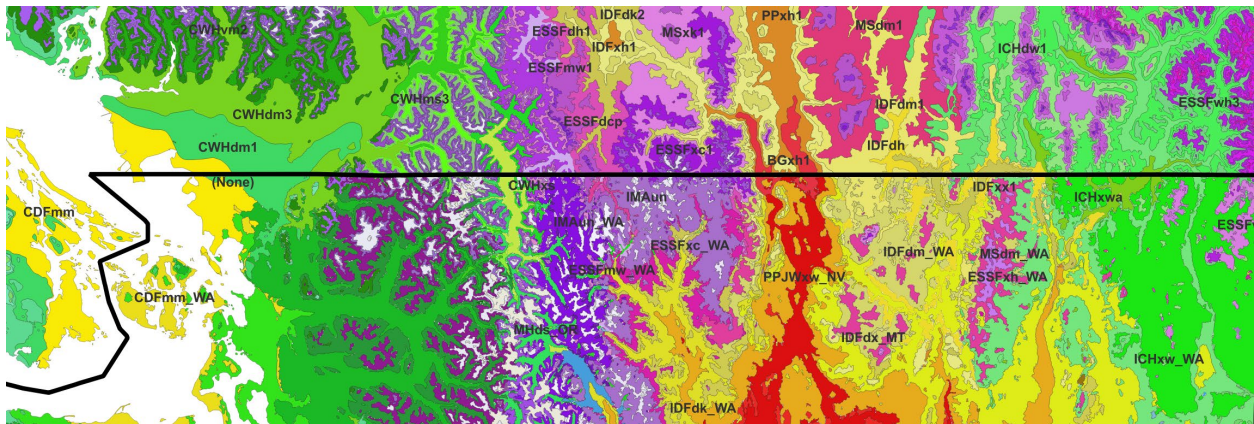


Figure 8. Biogeoclimatic units along British Columbia / Washington boundary. [Note: at this time, this is from the 6 March 2026 version; latest is 11 March]

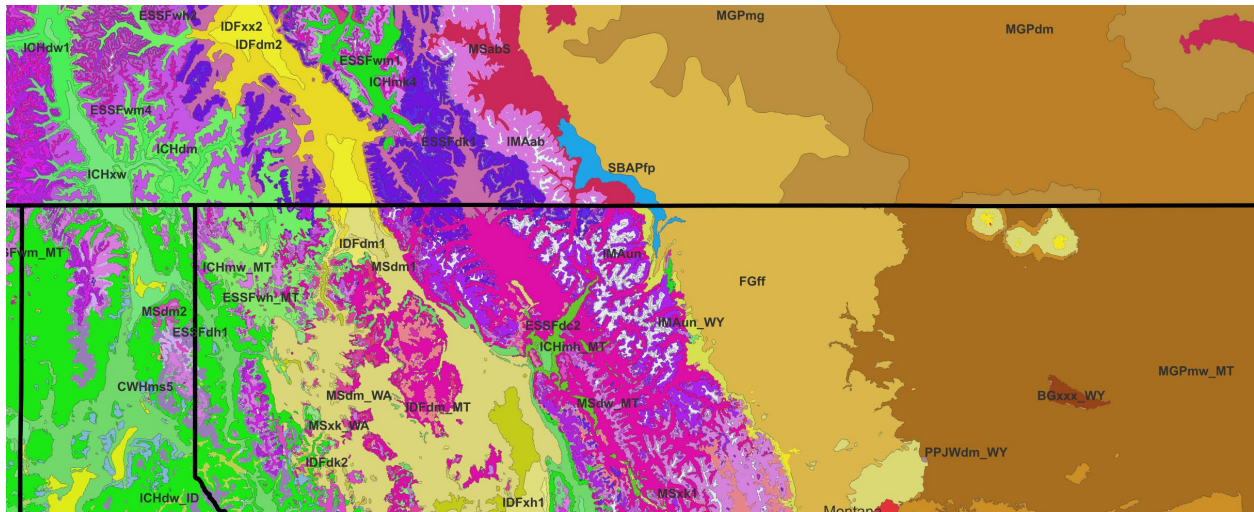


Figure 9. Biogeoclimatic units along British Columbia – Alberta / Idaho – Montana boundary.

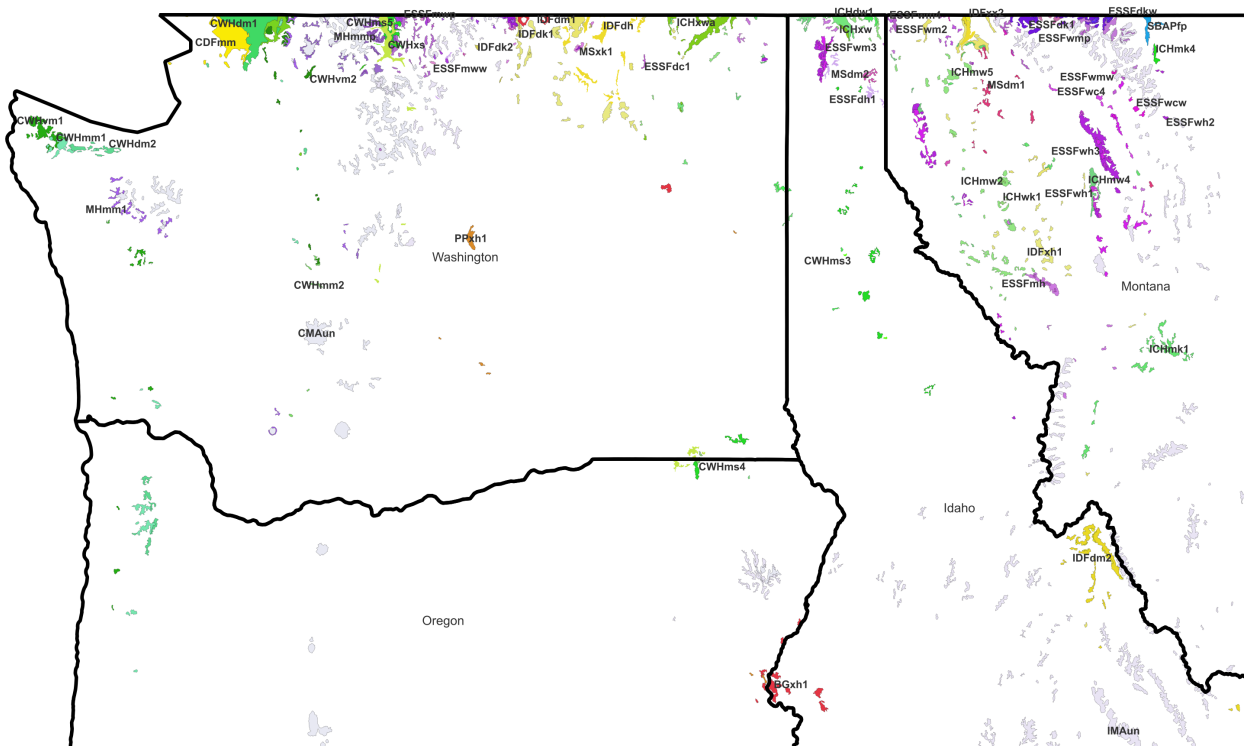


Figure 10. B.C. biogeoclimatic units mapped into northern U.S. by model. Colours correspond to those in Figure 7. Note grey colours are BC alpine zones.

The correspondence between the training points and the modelled map product is high. Ninety-eight percent of mapped BGC units include 69% or more of their corresponding training points. Forty-seven percent of BGC units include at least 90% of the training points, with 84% containing at least 70%. Only three BGC units have a poor correspondence of training points to the mapping—ESSFxx_WY, ESSFwh_MT, and ESSFdh_WA—at about 50%.

As an example of the mapping results, the IGFmh_OR occurs in NW Oregon and 94% of training points occur in the mapped area (Figure 11). The small speckles of blue outside of the core distribution of the training points is a common feature of most mapped biogeoclimatic units, even with merging of small numbers of ‘hexes’ (see Mapping Procedure). The number and size of these vary with BGC unit.

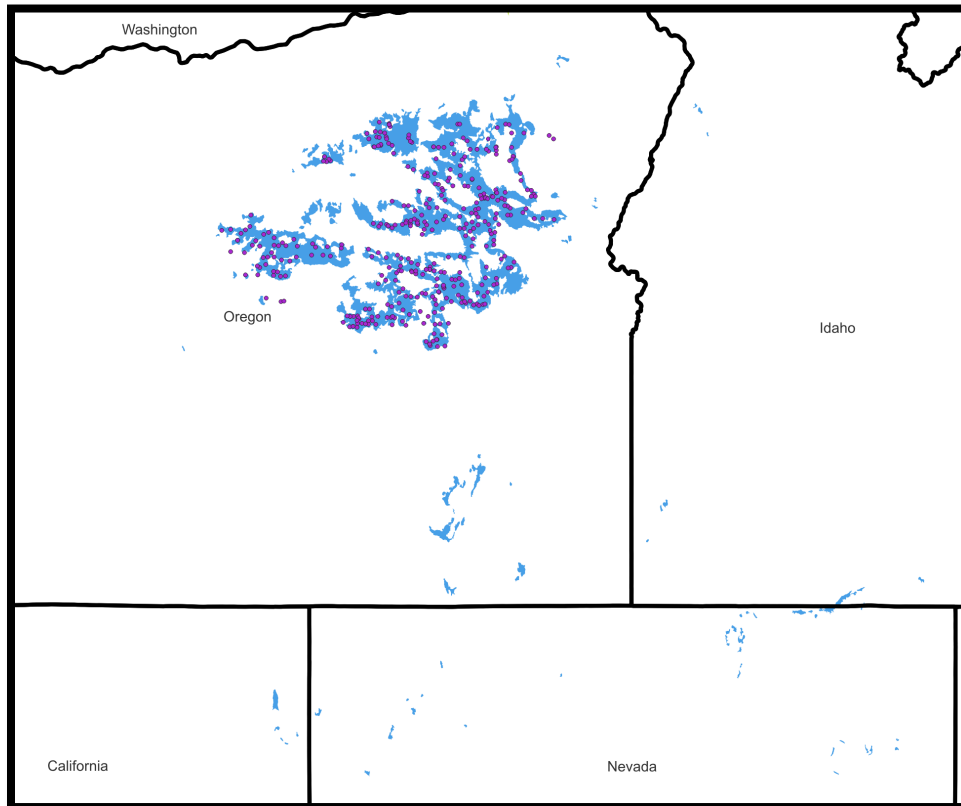


Figure 11. IGFmh_OR in blue with training points in red.

3.2 TREE SPECIES SUITABILITY

Tree species suitability ratings are available for the treed ecosystems in all BGC units for use in the CCISS model (CCISS 2025). Table 5 is an example of the suitability ratings for one BGC unit.

Table 5. Example of tree species environmental suitability for one biogeoclimatic subzone

CWHdm_OR: Coastal Western Hemlock Zone, Oregon Dry Maritime Subzone							
	SMR 1*	SMR 2	SMR 3-4	SMR 5; SNR ⁺ P-M	SMR 5; SNR R	SMR 6; SNR P- M	SMR 6; SNR R
<i>Arbutus menziesii</i>	E3 [#]	E3					
<i>Chrysolepis chrysophylla</i>	E3	E2	E2				
<i>Pseudotsuga menziesii</i>	E2	E1	E1	E1	E2	E1	E2
<i>Tsuga heterophylla</i>	E3	E2	E1	E1	E1	E2	E2
<i>Calocedrus decurrens</i>		E3	E3	E3			
<i>Thuja plicata</i>			E2	E2	E2	E1	E1
<i>Acer macrophyllum</i>			E2	E2	E2	E2	E2
<i>Alnus rubra</i>			E2	E2	E2	E2	E2
<i>Abies grandis</i>				E3	E3	E3	E2
<i>Populus trichocarpa</i>							E2
<i>Picea sitchensis</i>							E3

* SMR – soil moisture regime; 1 = xeric, 2 = subxeric, 3 = submesic, 4 = mesic, 5 = subhygric, 6 = hygric

⁺ SNR – soil nutrient regime; P = poor, M = medium, R = rich

[#] Suitability codes are explained in Table 4

4 DISCUSSION

The approach to mapping and classification in the U.S. differs considerably from that in B.C. The BEC system in B.C. is supported by decades of plot sampling and classification and mapping refinement conducted by local ecologists. Biogeoclimatic mapping in B.C. generally involves some modelling, e.g., projecting elevational changes by aspect across a geographic area, but the model is developed from many ground and helicopter transects of changes in tree species or vegetation physiognomy, as well as a reasonable density of on-the-ground observations (plots). Modelled boundaries are refined based on ground observations and experience. In comparison, the U.S. mapping is more generalized. It has not been conducted at the same scale of effort and is based entirely on a model. Although it is supported by ground data, the data is generally somewhat limited in its environmental attributes, challenging the interpretation of zonal site conditions. In addition, the data density varies considerably, with some areas having little ground data; and some areas having more data, but the density of training points was lower, by design (i.e., in the area of secondary interest). U.S. plots often had very abbreviated species lists; again, challenging the interpretation.

However, by aligning ecological units across jurisdictions, this work ensures that guidance from CCISS (CCISS 2025), CBST (O’Neill et al. 2017), and other climate adaptation tools based on BEC are adequately informed with realistic shifting climate envelopes, particularly for the southern regions of British Columbia. The predicted future redistribution of BGC units from the CCISS analysis frequently identifies USA BGC units as the best analogues of future climates in British

Columbia. The close correspondence of mapped BGC zones at the Canada–U.S. border demonstrates that the modelling approach is sufficiently robust to capture ecological continuity across political boundaries, thereby enhancing confidence in its application to climate adaptation planning. There are subzone differences at the Canada-U.S. border, but this is generally by design—in most cases, equivalent B.C. subzone units in the U.S. were appended with a state abbreviation to recognize that they could be different.

By linking modelled BGC units to described plant associations and tree species suitability ratings across edaphic conditions, this work enables practitioners to anticipate both opportunities and constraints in future reforestation strategies at a site level. This information also opens other potential avenues for research and application including transboundary conservation planning and dynamic vegetation model predictions of species turnover under climate change.

The field transects that were conducted to check the mapping generally showed reasonable correspondence between map boundaries and observations of changes in species composition, at least for the primary area of interest (Figure 1). The mapping may not be as accurate in the States in the secondary area of interest, as less time and effort was spent to research and refine the biogeoclimatic classification. The density of training points was, as a result, lower. More time could be spent to refine the classification in these secondary areas. More data is often available.

Collaboration with land managers across jurisdictions will be essential to ensure that mapped BGC units are interpreted consistently and applied effectively in reforestation and seed transfer programs. Iterative refinement of mapping and subzone definitions using additional plot data and vegetation descriptions will improve ecological resolution going forward.

This product provides important information for anticipating and managing the impacts of climate change on ecosystems in British Columbia. The identification of new BGC zones and their alignment with existing Canadian units ensures that climate adaptation tools are relevant for southern areas into more distant time periods. While methodological limitations warrant ongoing refinement, the resulting map and descriptions represents a practical and ecologically meaningful step toward climate-resilient forest management across borders.

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6 SUPPLEMENTARY MATERIAL

6.1 APPENDIX 1: SOURCE OF TRAINING POINTS BY ZONE AND SUBZONE

Zone / Subzone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
BG	57	27		1443	484	2011
BGdh_OR		1		747	62	810
BGdw_OR					61	61
BGdw_WA					56	56
BGmk_MT	26	2		115		143
BGmk_NV		13		75		88
BGmm_MT		6		117		123
BGmw_OR					66	66
BGmw_WA				1	63	64
BGwm_WA					39	39
BGxh_WA				114	95	209
BGxx_WY	31	5		151	42	229
BGxxx_WY				123		123
CCH		2		28	30	60
CCHun_CA		2		28	30	60
CDF	133	143			80	356
CDFmm_OR	128	89			41	258
CDFmm_WA		24			29	53
CDFxm_CA	5	30			10	45
CMA	3		370		54	427
CMAun_CA			266			266
CMAun_OR			37		5	42
CMAun_WA	3		67		49	119
CMX	1633	135			20	1788
CMXdm_OR	581	10			8	599
CMXmm_OR	653	31			12	696
CMXwm_OR	399	26				425
CMXxm_CA		68				68
CRF		117			17	134
CRFdh_CA		79			4	83
CRFmh_CA		38			13	51
CVG				143	24	167
CVGdm_CA				143	24	167

Zone / Subzone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
CWF	919	151			4	1074
CWFdm_OR	250	51				301
CWFds_CA		88				88
CWFmm_OR	529	2			4	535
CWFwm_OR	140	10				150
CWH	5885	739			143	6767
CWHdm_OC	207	40			5	252
CWHdm_OR	2355	88			1	2444
CWHdm_WA	361	127			5	493
CWHdm_WC	30	36			6	72
CWHds_WA	298	4			2	304
CWHmh_OR	17	8			37	62
CWHms_OR	296					296
CWHms_WA	361	1			3	365
CWHvh_WA		34			17	51
CWHvm_OR	515	17				532
CWHvm_WA	1097	93			1	1191
CWHwh_OR	84	43			4	131
CWHwh_WA		74			10	84
CWHxm_OR	261	71			20	352
CWHxm_WA	3	100			15	118
CWHxs		3			17	20
ESSF	2168	1033	695	12	85	3993
ESSFdh_WA	99	6			1	106
ESSFdk_MT	129	39	11			179
ESSFdkp_MT	35	6	28			69
ESSFdm_ID	167	109	3		5	284
ESSFdmp_ID	13	11	11		32	67
ESSFdw_ID	34	103			2	139
ESSFmw_WA	393	6			1	400
ESSFmwp_WA	35		4			39
ESSFwh_MT	37	4			17	58
ESSFwm_MT	142	62			15	219
ESSFwmp_MT	9					9
ESSFxc_CO		128	91			219
ESSFxc_WA	522	2	4			528
ESSFxcp_CO		34	34			68
ESSFxcp_WA	140		49			189
ESSFxfh_WA	69					69
ESSFfk_MT	64	145		1		210

Zone / Subzone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
ESSFfk_UT		61		2		63
ESSFfk_WY	105	224	62	9		400
ESSFfkp_MT	1	2	62			65
ESSFfkp_UT			7			7
ESSFfkp_WY	12	46	309			367
ESSFfw_OR	124	16	3		11	154
ESSFfwp_OR	38		4		1	43
ESSFxx_WY		27	7			34
ESSFxxp_WY		2	6			8
FG				18	205	223
FGff				18	205	223
GBD	4			1082		1086
GBDdw_UT				151		151
GBDxh_NV	4			848		852
GBDxx_UT				83		83
ICH	1268	512			65	1845
ICHdh_ID	25	114			29	168
ICHdm		9				9
ICHdw_ID	794	228			14	1036
ICHmh_MT	61					61
ICHmw_MT	99	8				107
ICHxh_ID	105	102				207
ICHxw_ID	38	31				69
ICHxw_WA	146	20			22	188
IDF	854	1193		112	208	2367
IDFdh_MT		48			2	50
IDFdh_UT		46		25		71
IDFdh_WA	72	67			54	193
IDFdk_MT	58	76		7		141
IDFdk_WA	74	5			1	80
IDFdkx_MT	111	198		13	5	327
IDFdm_MT	70	169			1	240
IDFdm_WA	239	10			9	258
IDFdx_MT	66	205		63		334
IDFdx_WY		44		4		48
IDFhx_ID	1	96			39	136
IDFhx_OR	1	41			30	72
IDFhx_WA	128	17			17	162
IDFxm_CO		137				137
IDFxx_MT		16			35	51

Zone / Subzone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
IDFxx_WA	34	16				50
IDFxx1		2			15	17
IGF	1634	610			81	2325
IGFdk_WA	797	22			1	820
IGFdw_OR	324	29				353
IGFmh_OR	121	239			21	381
IGFmm_OR	323	222			46	591
IGFxm_OR	69	98			13	180
IMA	68	15	2528	1	48	2660
IMAAun_CO	31		867		3	901
IMAAun_MT			65	1	5	71
IMAAun_WA	32		51		32	115
IMAAun_WY	5	15	1545		8	1573
IWF	214	330		13	14	571
IWFdm_CO		40		13		53
IWFdw_OR	211	220			14	445
IWFxk_NV	3	39				42
IWFxm_CA		31				31
MDCH				75		75
MDCHun_NV				75		75
MGP		14		750		764
MGPmw_MT		14		750		764
MH	1007	78	15		55	1155
MHdm_OR	217	27				244
MHdmp_OR		1	1			2
MHds_OR	92	19				111
MHds_WA	113					113
MHmm_WA	410	28				438
MHmmp_WA	1		8		32	41
MHms_WA	173	3				176
MHmsp_WA	1		6		23	30
MHRF	585	83	387		11	1066
MHRFdm_OR	115	12				127
MHRFdmp_OR			1			1
MHRFds_CA	108	71	125		6	310
MHRFdsp_CA			259			259
MHRFmm_OR	362				5	367
MHRFmmp_OR			2			2
MMM		25		1		26
MMMdk_NV		25		1		26

Zone / Subzone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
MS	1254	1137	27	20	73	2511
MSdh_MT	184	127				311
MSdh_UT		62		7		69
MSdh_WY	132	366	25	12		535
MSdk_CO		45		1		46
MSdm_WA	327	2			2	331
MSdw_MT	303	181				484
MSmm_ID	73	104			30	207
MSxh_OR	63	67	1		21	152
MSxk_WA	169	5			1	175
MSxm_CO		167	1			168
MSxx_NV	3	11			19	33
MSSD				71		71
MSSDun_NV				71		71
OW		119			63	182
OWdm_CA		53				53
OWmm_OR		28			20	48
OWwm_OR		1			43	44
OWxm_CA		37				37
PP	201	721		204	115	1241
PPmx_WY		53		34		87
PPxh_CO		48		11		59
PPxh_WA	13	48			65	126
PPxk_OR	106	59				165
PPxm_OR	82	271			45	398
PPxw_MT		164		159		323
PPxw_WY		37				37
PPxx_OR		41			5	46
PPJW	40	653		1201	1	1895
PPJWdm_WY		91		19	1	111
PPJWdw_UT		229		451		680
PPJWmw_UT		69		59		128
PPJWwm_CO		97		10		107
PPJWxh_CA		38		26		64
PPJWxw_NV	40	129		636		805
SBAP					27	27
SBAPfp					27	27
SGP		5		217		222
SGPdm_CO		5		217		222
WJP		286		143	184	613

Zone / Subzone	VegBank plot	FIA point	GAP (alpine)	GAP (grassland)	Added point	Total
WJPxm_OR		286		143	184	613
Total	17925	8128	4022	5534	2076	37685

6.2 APPENDIX 2: LIST OF MODELLED BIOGEOCLIMATIC UNITS IN UNITED STATES

BGC unit	Zone	Subzone	General Location
BG	Bunchgrass		
BGdh_OR		Dry Hot Oregon BG	SE Oregon, S Idaho, N Nevada
BGdw_OR		Dry Warm Oregon BG	NE Oregon
BGdw_WA		Dry Warm Washington BG	C Washington
BGmk_MT		Moist Cool Montana BG	SW Montana, EC Idaho
BGmk_NV		Moist Cool Nevada BG	N Nevada, S Oregon, S Idaho
BGmm_MT		Moist Mild Montana BG	E Wyoming, S Montana
BGmw_OR		Moist Warm Oregon BG	NE Oregon
BGmw_WA		Moist Warm Washington BG	C Washington
BGwm_WA		Wet Mild Washington BG	C Washington
BGxh_WA		Very Dry Hot Washington BG	C Washington
BGxx_WY		Very Dry Very Hot Wyoming BG	SW Wyoming
BGxxx_WY		Very Very Dry Very Hot Wyoming BG	C & NC Wyoming
CCH	California Chaparral		
CCHun_CA		California CCH	WC & SW California
CDF	Coastal Douglas-fir		
CDFmm_OR		Moist Maritime Oregon CDF	W Oregon
CDFmm_WA		Moist Maritime Washington CDF	NW Washington
CDFxm_CA		Very Dry Maritime California CDF	SW Oregon, N California
CMA	Coastal Mountain-heather Alpine		
CMAun_CA		California CMA	EC California
CMAun_OR		Oregon CMA	W Oregon
CMAun_WA		Washington CMA	W Washington
CMX	Coastal Mixed Evergreen		
CMXdm_OR		Dry Maritime Oregon CMX	SW Oregon, NW California
CMXmm_OR		Moist Maritime Oregon CMX	SW Oregon, NW California

BGC unit	Zone	Subzone	General Location
CMXwm_OR		Wet Maritime Oregon CMX	SW Oregon, NW California
CMXxm_CA		Very Dry Maritime California CMX	C & N California
CRF	Coastal Redwood Forest		
CRFdh_CA		Dry Hypermaritime California CRF	N & C California
CRFmh_CA		Moist Hypermaritime California CRF	N California
CVG	Central Valley Grassland		
CVGdm_CA		Dry Mild CVG	C California
CWF	Coastal White Fir		
CWFds_CA		Dry Submaritime California CWF	EC California
CWFdm_OR		Dry Maritime Oregon CWF	SW Oregon, NW & EC California
CWFmm_OR		Moist Maritime Oregon CWF	SW Oregon
CWFwm_OR		Wet Maritime Oregon CWF	SW Oregon, NW California
CWH	Coastal Western Hemlock		
CWHdm_OC		Dry Maritime Oregon Coast CWH	Coastal Oregon
CWHdm_OR		Dry Maritime Oregon CWH	W Oregon
CWHdm_WA		Dry Maritime Washington CWH	W Washington
CWHdm_WC		Dry Maritime Washington Coast CWH	Coastal Washington
CWHds_WA		Dry Submaritime Washington CWH	NW Washington
CWHmh_OR		Moist Hypermaritime Oregon CWH	SW Coastal Oregon & N Coastal California
CWHms_OR		Moist Submaritime Oregon CWH	W Oregon
CWHms_WA		Moist Submaritime Washington CWH	W Washington
CWHvh_WA		Very Wet Hypermaritime Washington CWH	W Coastal Washington
CWHvm_OR		Very Wet Maritime Oregon CWH	SW Washington & W Oregon
CWHvm_WA		Very Wet Maritime Washington CWH	W Washington
CWHwh_OR		Wet Hypermaritime Oregon CWH	Coastal Oregon
CWHwh_WA		Wet Hypermaritime Washington CWH	Coastal Washington
CWHxm_OR		Very Dry Maritime Oregon CWH	W Oregon
CWHxm_WA		Very Dry Maritime Washington CWH	W Washington and NW Oregon
ESSF	Engelmann Spruce – Subalpine Fir		
ESSFdh_WA		Dry Hot Washington ESSF	NW Washington (E Cascades)

BGC unit	Zone	Subzone	General Location
ESSFdk_MT		Dry Cool Montana ESSF	NW Montana
ESSFdkp_MT ³		Dry Cool Montana Parkland ESSF	NW Montana
ESSFdm_ID		Dry Mild Idaho ESSF	C Idaho & WC Montana
ESSFdmp_ID ⁴		Dry Mild Idaho Parkland ESSF	C Idaho & WC Montana
ESSFdw_ID		Dry Warm Idaho ESSF	NE Idaho & NW Montana
ESSFmw_WA		Moist Warm Washington ESSF	NW Washington (E Cascades)
ESSFmwp_WA ⁵		Moist Warm Washington Parkland ESSF	NW Washington (E Cascades)
ESSFwh_MT		Wet Hot Montana ESSF	NE Washington, N Idaho, NW Montana
ESSFwm_MT		Wet Mild Montana ESSF	NE Washington, N Idaho, NW Montana
ESSFwmp_MT ²		Wet Mild Montana Parkland ESSF	NE Washington, N Idaho, NW Montana
ESSFxc_CO		Very Dry Cold Colorado ESSF	W & C Colorado
ESSFxc_WA		Very Dry Cold Washington ESSF	NC Washington
ESSFxcp_CO ⁶		Very Dry Cold Colorado Parkland ESSF	W & C Colorado
ESSFxcp_WA ⁴		Very Dry Cold Washington Parkland ESSF	NC Washington
ESSFhx_WA		Very Dry Hot Washington ESSF	NE Washington [N Idaho, NW Montana]
ESSFhk_MT		Very Dry Cool Montana ESSF	WC Montana & EC Idaho
ESSFhk_UT		Very Dry Cool Utah ESSF	SW, C, & NE Utah
ESSFhk_WY		Very Dry Cool Wyoming ESSF	W Wyoming, SW Montana, C Idaho
ESSFhkp_MT ²		Very Dry Cool Montana Parkland ESSF	WC Montana & EC Idaho
ESSFhkp_UT ⁵		Very Dry Cool Utah Parkland ESSF	SW, C, & NE Utah
ESSFhkp_WY ⁷		Very Dry Cool Wyoming Parkland ESSF	W Wyoming, SW Montana, C Idaho
ESSFhw_OR		Very Dry Warm Oregon ESSF	NE Oregon & WC Idaho
ESSFhwp_OR ⁸		Very Dry Warm Oregon Parkland ESSF	NE Oregon & WC Idaho
ESSFxx_WY		Very Dry Very Hot Wyoming ESSF	W & NC Wyoming

³ ESSFdkp_MT, ESSFhkp_MT & ESSFwmp_MT mapped with IMAun_MT

⁴ ESSFdmp_ID mapped with IMAun_ID

⁵ ESSFmwp_WA & ESSFxcp_WA mapped with IMAun_WA

⁶ ESSFxcp_CO & ESSFhkp_UT mapped with IMAun_CO

⁷ ESSFhkp_WY & ESSFxxp_WY mapped with IMAun_WY

⁸ ESSFhwp_OR mapped with IMAun_OT

BGC unit	Zone	Subzone	General Location
ESSFxp_WY ⁶		Very Dry Very Hot Wyoming ESSF Parkland	W & NC Wyoming
FG	Fescue Grassland		
FGff		Foothills Fescue FG	NW Montana, to AB border
GBD	Great Basin Desert		
GBDdw_UT		Dry Warm Utah GBD	Utah, E Nevada, WC Wyoming
GBDxh_NV		Very Dry Hot Nevada GBD	Nevada, NE California
GBDxx_UT		Very Dry Very Hot Utah GBD	SE Utah
ICH	Interior Cedar – Hemlock		
ICHdh_ID		Dry Hot Idaho ICH	NEd Idaho & NW Montana
ICHdw_ID		Dry Warm Idaho ICH	NE Washington, N Idaho, NW Montana
ICHmh_MT		Moist Hot Montana ICH	NW Montana
ICHmw_MT		Moist Warm Montana ICH	NW Montana [N Idaho]
ICHxh_ID		Very Dry Hot Idaho ICH	N Idaho [W Montana]
ICHxw_ID		Very Dry Warm Idaho ICH	NC Idaho
ICHxw_WA		Very Dry Warm Washington ICH	NE Washington, N Idaho
IDF	Interior Douglas-fir		
IDFdh_MT		Dry Hot Montana IDF	NW Montana
IDFdh_UT		Dry Hot Utah IDF	Utah, E Nevada, W Colorado
IDFdh_WA		Dry Hot Washington IDF	NE Washington, NW Idaho
IDFdk_MT		Dry Cool Montana IDF	W Montana
IDFdk_WA		Dry Cool Washington IDF	NC Washington
IDFdkx_MT		Dry Cool/Mild Montana IDF	SW Montana, S Idaho, NW Wyoming
IDFdm_MT		Dry Mild Montana IDF	NW Montana
IDFdm_WA		Dry Mild Washington IDF	NE Washington
IDFdx_MT		Dry Very Hot Montana IDF	SW Montana, EC Idaho, NW Wyoming
IDFdx_WY		Dry Very Hot Wyoming IDF	NC & SE Wyoming, SC Montana
IDFxh_ID		Very Dry Hot Idaho IDF	C Idaho, NE Oregon, SE Washington
IDFxh_OR		Very Dry Hot Oregon IDF	C & NE Oregon
IDFxh_WA		Very Dry Hot Washington IDF	NC & C Washington
IDFxm_CO		Very Dry Mild Colorado IDF	W & C Colorado [SE Wyoming]

BGC unit	Zone	Subzone	General Location
IDFxx_MT		Very Dry Very Hot Montana IDF	NW Montana
IDFxx_WA		Very Dry Very Hot Washington IDF	SC Washington & NC Oregon
IGF	Interior Grand Fir		
IGFdk_WA		Dry Cool Washington IGF	WC Washington
IGFdw_OR		Dry Warm Oregon IGF	NC Oregon & SC Washington
IGFmh_OR		Moist Hot Oregon IGF	NE Oregon
IGFmm_OR		Moist Mild Oregon IGF	NE Oregon, C & NW Idaho, SE Washington
IGFxm_OR		Very Dry Mild Oregon IGF	NE Oregon, C & NW Idaho, SE Washington
IMA	Interior Mountain-heather Alpine		
IMAun_CO		Colorado IMA	E Utah & W Colorado
IMAun_MT		Montana IMA	W Montana
IMAun_WA		Washington IMA	WC Washington
IMAun_WY		Wyoming IMA	WC Wyoming, EC Idaho, & SW Montana
IMAun_OR		Oregon IMA	NE Oregon & WC Idaho
IMAun_ID		Idaho IMA	C & EC Idaho
IWF	Interior White Fir		
IWFdm_CO		Dry Mild Colorado IWF	SW & SC Colorado
IWFdw_OR		Dry Warm Oregon IWF	SC Oregon, NE California
IWFxk_NV		Very Dry Cool Nevada IWF	E Nevada
IWFxm_CA		Very Dry Mild Nevada IWF	NE California, W Nevada, near Lake Tahoe
MDCH	Madrean Chaparral		
MDCHun_NV		Nevada MDCH	SE Nevada, SW Utah [NW & C Arizona]
MGP	Mixed-grass Prairie		
MGPmw_MT		Moist Warm Montana MGP	N & E Montana, E Wyoming, C & NC Colorado
MH	Mountain Hemlock		
MHdm_OR		Dry Maritime Oregon MH	NW & WC Oregon
MHdmp_OR ⁹		Dry Maritime Oregon Parkland MH	NW & WC Oregon
MHds_OR		Dry Submaritime Oregon MH	W Oregon

⁹ MHdmp_OR, MHRFdm_OR, & MHRFmmp_OR mapped with CMAun_OR

BGC unit	Zone	Subzone	General Location
MHds_WA		Dry Submaritima Washington MH	SW Washington
MHm_WA		Moist Maritime Washington MH	W Washington
MHmmp_WA ¹⁰		Moist Maritime Washington Parkland MH	W Washington
MHms_WA		Moist Submaritima Washington MH	NW & WC Washington
MHmsp_WA ⁹		Moist Submaritima Washington Parkland MH	NW & WC Washington
MHRF	Mountain Hemlock – Shasta Red Fir		
MHRFdm_OR		Dry Maritime Oregon MHRF	SW Oregon, N California
MHRFdmmp_OR ⁸		Dry Maritime Oregon Parkland MHRF	SW Oregon, N California
MHRFds_CA		Dry Submaritima California MHRF	SW Oregon, N & EC California
MHRFdsp_CA ¹¹		Dry Submaritima California Parkland MHRF	SW Oregon, N & EC California
MHRFmm_OR		Moist Maritime Oregon MHRF	SW Oregon
MHRFmmp_OR ⁸		Moist Maritime Oregon Parkland MHRF	SW Oregon
MMM	Montane Mountain Mahogany		
MMMdck_NV		Dry Cool Nevada MMM	C & N Nevada
MS	Montane Spruce		
MSdh_MT		Dry Hot Montana MS	W Montana [EC Idaho]
MSdh_UT		Dry Hot Utah MS	Utah, E Nevada [W Colorado]
MSdh_WY		Dry Hot Wyoming MS	SE Idaho, SW Montana, W Wyoming
MSdk_CO		Dry Cool Colorado MS	SW & SC Colorado
MSdm_WA		Dry Mild Washington MS	NC & NE Washington
MSdw_MT		Dry Warm Montana MS	NW Montana
MSmm_ID		Moist Mild Idaho MS	C Idaho, WC Montana
MSxh_OR		Very Dry Hot Oregon MS	NE Oregon, SE Washington
MSxk_WA		Very Dry Cool Washington MS	NC & C Washington
MSxm_CO		Very Dry Mild Colorado MS	C & N Colorado, SE Wyoming [E Utah]
MSxx_NV		Very Dry Very Hot Nevada MS	C & EC Nevada
MSSD	Mojave – Sonoran Semi-Desert		
MSSDun_NV		Nevada MSSD	SE California, S Nevada

¹⁰ MHmmp_WA & MHmsp_WA mapped with CMAun_WA

¹¹ MHRFdsp_CA mapped with CMAun_CA

BGC unit	Zone	Subzone	General Location
OW	Oak Woodland		
OWmm_OR		Moist Maritime Oregon OW	SW Oregon, N California
OWwm_OR		Wet Maritime Oregon OW	SW Oregon
OWdm_CA		Dry Maritime California OW	C & N California
OWxm_CA		Very Dry Maritime California OW	S California
PP	Ponderosa Pine		
PPmx_WY		Moist Very Hot Wyoming PP	NE Wyoming [SE Montana]
PPxh_CO		Very Dry Hot Colorado PP	SW, SC, & NC Colorado
PPxh_WA		Very Dry Hot Washington PP	NC & E Washington, NE Oregon, W Idaho
PPxk_OR		Very Dry Cool Oregon PP	SC Oregon
PPxm_OR		Very Dry Mild Oregon PP	C & S Oregon, NE California
PPxw_MT		Very Dry Warm Montana PP	C & S Montana, NE Wyoming
PPxw_WY		Very Dry Warm Wyoming PP	SE Wyoming
PPxx_OR		Very Dry Very Hot Oregon PP	SC Washington, NC Oregon
PPJW	Pinyon Pine – Juniper Woodland		
PPJWdm_WY		Dry Mild Wyoming PPJW	Wyoming [NE Utah, NW Colorado]
PPJWdw_UT		Dry Warm Utah PPJW	Utah, W Colorado [SE Idaho]
PPJWmw_UT		Moist Warm Utah PPJW	E Utah, W Colorado
PPJWwm_CO		Wet Mild Colorado PPJW	EC & SE Colorado
PPJWxh_CA		Very Dry Hot California PPJW	S California
PPJWxw_NV		Very Dry Warm Nevada PPJW	Nevada, E California, W Utah, S Idaho
SBAP	Sub-boreal Aspen Parkland		
SBAPfp		Foothills Parkland Sub-boreal Aspen Parkland	NW Montana, to AB border
SGP	Shortgrass Prairie		
SGPdm_CO		Dry Mild Colorado SGP	E Colorado, SE Wyoming
WJP	Western Juniper – Pine		
WJPxm_OR		Very Dry Mild Oregon WJP	Oregon, NE California, NW Nevada, SW Idaho

Preliminary Biogeoclimatic Ecosystem Classification of the United States Pacific Northwest

Part 2 - Description of Classification Units

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March 2026

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Contents

1	Introduction.....	1
1.1	Presentation Format	1
2	Coastal Forested Zones	3
2.1	Coastal Douglas-fir [CDF]	3
2.1.1	CDF Subzones.....	3
2.1.2	CDFmm_WA – Moist Maritime Washington CDF	6
2.1.3	CDFmm_OR – Moist Maritime Oregon CDF.....	7
2.1.4	CDFxm_CA – Very Dry Maritime California CDF	8
2.2	Coastal Mixed Evergreen [CMX]	9
2.2.1	CMX Subzones.....	9
2.2.2	CMXwm_OR – Wet Maritime Oregon CMX	11
2.2.3	CMXmm_OR – Moist Maritime Oregon CMX	12
2.2.4	CMXdm_OR – Dry Maritime Oregon CMX	13
2.2.5	CMXxm_CA – Very Dry Maritime California CMX	14
2.3	Coastal Redwood Forest [CRF].....	15
2.3.1	CRF Subzones	15
2.3.2	CRFdh_CA – Dry Hypermaritime California CRF	16
2.3.3	CRFmh_CA – Moist Hypermaritime California CRF.....	17
2.4	Coastal Western Hemlock [CWH]	18
2.4.1	CWH Subzones	18
2.4.2	CWHxm_WA – Very Dry Maritime Washington CWH	20
2.4.3	CWHxm_OR – Very Dry Maritime Oregon CWH	21
2.4.4	CWHdm_WA – Dry Maritime Washington CWH	22
2.4.5	CWHdm_WC – Dry Maritime Washington Coast CWH.....	23
2.4.6	CWHdm_OR – Dry Maritime Oregon CWH	24
2.4.7	CWHdm_OC – Dry Maritime Oregon Coast CWH	25
2.4.8	CWHds_WA – Dry Submaritime Washington CWH	26
2.4.9	CWHms_WA – Moist Submaritime Washington CWH	27

2.4.10	CWHms_OR – Moist Submaritime Oregon CWH	28
2.4.11	CWHvm_WA – Very Wet Maritime Washington CWH	29
2.4.12	CWHvm_OR – Very Wet Maritime Oregon CWH.....	30
2.4.13	CWHmh_OR – Moist Hypermaritime Oregon CWH.....	31
2.4.14	CWHwh_WA – Wet Hypermaritime Washington CWH.....	32
2.4.15	CWHwh_OR – Wet Hypermaritime Oregon CWH	33
2.4.16	CWHvh_WA – Very Wet Hypermaritime Washington CWH.....	34
2.5	Coastal White Fir [CWF]	35
2.5.1	CWF Subzones.....	35
2.5.2	CWFwm_OR – Wet Maritime Oregon CWF	36
2.5.3	CWFmm_OR – Moist Maritime Oregon CWF	37
2.5.4	CWFdm_OR – Dry Maritime Oregon CWF	38
2.5.5	CWFds_CA – Dry Submaritime California CWF	39
2.6	Mountain Hemlock – Red Fir Zone [MHRF]	40
2.6.1	MHRF Subzones	40
2.6.2	MHRFmm_OR – Moist Maritime Oregon MHRF.....	42
2.6.3	MHRFdm_OR – Dry Maritime Oregon MHRF	43
2.6.4	MHRFds_CA – Dry Submaritime California MHRF	44
2.7	Mountain Hemlock Zone [MH]	45
2.7.1	MH Subzones	45
2.7.2	MHmm_WA – Moist Maritime Washington MH	47
2.7.3	MHms_WA – Moist Submaritime Washington MH.....	48
2.7.4	MHds_WA – Dry Submaritime Washington MH.....	49
2.7.5	MHdm_OR – Dry Maritime Oregon MH	50
2.7.6	MHds_OR – Dry Submaritime Oregon MH	51
3	Interior Forested Zones.....	52
3.1	Engelmann Spruce – Subalpine Fir [ESSF].....	52
3.1.1	ESSF Subzones.....	52
3.1.2	ESSFdh_WA – Dry Hot Washington ESSF	55

3.1.3	ESSFmw_WA – Moist Warm Washington ESSF	56
3.1.4	ESSFxc_WA – Very Dry Cold Washington ESSF	57
3.1.5	ESSFhx_WA – Very Dry Hot Washington ESSF	58
3.1.6	ESSFwx_OR – Very Dry Warm Oregon ESSF.....	59
3.1.7	ESSFdm_ID – Dry Mild Idaho ESSF	60
3.1.8	ESSFdw_ID – Very Wet Hot Idaho ESSF	61
3.1.9	ESSFkx_MT – Very Dry Cool Montana ESSF	62
3.1.10	ESSFdk_MT – Dry Cool Montana ESSF	63
3.1.11	ESSFwh_MT – Wet Hot Montana ESSF	64
3.1.12	ESSFwm_MT – Wet Mild Montana ESSF.....	65
3.1.13	ESSFxx_WY – Very Dry Very Hot Wyoming ESSF	66
3.1.14	ESSFkx_WY – Very Dry Cool Wyoming ESSF	67
3.1.15	ESSFxc_CO – Very Dry Cold Colorado ESSF	68
3.1.16	ESSFkx_UT – Very Dry Cool Utah ESSF	69
3.2	Interior Cedar – Hemlock [ICH]	70
1.1.1.	ICH Subzones.....	70
3.2.1	ICHxw_WA – Very Dry Warm Washington ICH.....	72
3.2.2	ICHxh_ID – Very Dry Hot Idaho ICH	73
3.2.3	ICHxw_ID – Very Dry Warm Idaho ICH.....	74
3.2.4	ICHdh_ID – Dry Hot Idaho ICH	75
3.2.5	ICHdw_ID – Dry Warm Idaho ICH.....	76
3.2.6	ICHmh_MT – Moist Hot Montana ICH	77
3.2.7	ICHmw_MT – Moist Warm Montana ICH	78
3.3	Interior Douglas-fir [IDF]	79
3.3.1	IDF Subzones.....	79
3.3.2	IDFxx_WA – Very Dry Very Hot Washington IDF	81
3.3.3	IDFhx_WA – Very Dry Hot Washington IDF	82
3.3.4	IDFdk_WA – Dry Cool Washington IDF	83
3.3.5	IDFdh_WA – Dry Hot Washington IDF	84

3.3.6	IDFdm_WA – Dry Mild Washington IDF.....	85
3.3.7	IDFhx_OR – Very Dry Hot Oregon IDF.....	86
3.3.8	IDFhx_ID – Very Dry Hot Idaho IDF.....	87
3.3.9	IDFxx_MT – Very Dry Very Hot Montana IDF.....	88
3.3.10	IDFdh_MT – Dry Hot Montana IDF.....	89
3.3.11	IDFdm_MT – Dry Mild Montana IDF.....	90
3.3.12	IDFdk_MT – Dry Cool Montana IDF.....	91
3.3.13	IDFdx_MT – Dry Very Hot Montana IDF.....	92
3.3.14	IDFdkx_MT – Dry Cool-Mild Montana IDF.....	93
3.3.15	IDFdx_WY – Dry Very Hot Wyoming IDF.....	94
3.3.16	IDFxm_CO – Very Dry Mild Colorado IDF.....	95
3.3.17	IDFdh_UT – Dry Hot Utah IDF.....	96
3.4	Interior Grand Fir [IGF].....	97
3.4.1	IGF Subzones.....	97
3.4.2	IGFdk_WA – Dry Cool Washington IGF.....	98
3.4.3	IGFdw_OR – Dry Warm Oregon IGF.....	99
3.4.4	IGFmh_OR – Moist Hot Oregon IGF.....	100
3.4.5	IGFxm_OR – Very Dry Mild Oregon IGF.....	101
3.4.6	IGFmm_OR – Moist Mild Oregon IGF.....	102
3.5	Interior White Fir [IWF].....	103
3.5.1	IWF Subzones.....	103
3.5.2	IWFdw_OR – Dry Warm Oregon IWF.....	104
3.5.3	IWFxm_CA – Very Dry Mild California IWF.....	105
3.5.4	IWFxk_NV – Very Dry Cool Nevada IWF.....	106
3.5.5	IWFdm_CO – Dry Mild Colorado IWF.....	107
3.6	Montane Spruce [MS].....	108
3.6.1	MS Subzones.....	108
3.6.2	MSxk_WA – Very Dry Cool Washington MS.....	110
3.6.3	MSdm_WA – Dry Mild Washington MS.....	111

3.6.4	MSxh_OR – Very Dry Hot Oregon MS.....	112
3.6.5	MSmm_ID – Moist Mild Idaho MS.....	113
3.6.6	MSdw_MT – Dry Warm Montana MS.....	114
3.6.7	MSdh_MT – Dry Hot Montana MS.....	115
3.6.8	MSdh_WY – Dry Hot Wyoming MS.....	116
3.6.9	MSdh_UT – Dry Hot Utah MS	117
3.6.10	MSxm_CO – Very Dry Mild Colorado MS.....	118
3.6.11	MSdk_CO – Dry Cool Colorado MS	119
3.6.12	MSxx_NV – Very Dry Very Hot Nevada MS.....	120
3.7	Ponderosa Pine [PP].....	121
3.7.1	PP Subzones	121
3.7.2	PPxh_WA – Very Dry Hot Washington PP.....	123
3.7.3	PPxx_OR – Very Dry Very Hot Oregon PP	124
3.7.4	PPxm_OR – Very Dry Mild Oregon PP.....	125
3.7.5	PPxk_OR – Very Dry Cool Oregon PP	126
3.7.6	PPxw_MT – Very Dry Warm Montana PP	127
3.7.7	PPxw_WY – Very Dry Warm Wyoming PP	128
3.7.8	PPmx_WY – Moist Very Hot Wyoming PP	129
3.7.9	PPxh_CO – Very Dry Hot Colorado PP.....	130
3.8	Sub-boreal Aspen Parkland [SBAP]	131
3.8.1	SPAPfp – Foothills Parkland SBAP	131
4	Juniper, Oak, and Mountain Mahogany Dominated Zones	132
4.1	Pinyon Pine – Juniper Woodland [PPJW].....	132
4.1.1	PPJW Subzones	133
4.1.2	PPJWxh_CA – Very Dry Hot California PPJW.....	135
4.1.3	PPJWxw_NV – Very Dry Warm Nevada PPJW	136
4.1.4	PPJWdw_UT – Dry Warm Utah PPJW	137
4.1.5	PPJWmw_UT – Moist Warm Utah PPJW	138
4.1.6	PPJWwm_CO – Wet Mild Colorado PPJW	139

4.1.7	PPJWdm_WY – Dry Mild Wyoming PPJW	140
4.2	Western Juniper – Pine [WJP]	141
4.2.1	WJP Subzones	141
4.2.2	WJPxm_OR – Very Dry Mild Oregon WJP	142
4.3	Oak Woodland [OW]	143
4.3.1	OWdm_CA – Dry Maritime California OW	144
4.3.2	OWxm_CA – Very Dry Maritime California OW	145
4.3.3	OWmm_OR – Moist Maritime Oregon OW	146
4.3.4	OWwm_OR – Wet Maritime Oregon OW	147
4.4	Montane Mountain Mahogany [MMM]	148
4.4.1	MMMdk_NV – Dry Cool Nevada MMM	149
5	Grassland Zones	150
5.1	Bunchgrass [BG]	150
5.1.1	BG Subzones	150
5.1.2	BGxh_WA Very Dry Hot Washington BG	152
5.1.3	BGdw_WA – Dry Warm Washington BG	152
5.1.4	BGmw_WA – Moist Warm Washington BG	153
5.1.5	BGwm_WA – Wet Mild Washington BG	153
5.1.6	BGdh_OR – Dry Hot Oregon BG	154
5.1.7	BGdw_OR – Dry Warm Oregon BG	154
5.1.8	BGmw_OR – Moist Warm Oregon BG	155
5.1.9	BGmk_NV – Moist Cool Nevada BG	155
5.1.10	BGmk_MT – Moist Cool Montana BG	156
5.1.11	BGmm_MT – Moist Mild Montana BG	156
5.1.12	BGxx_WY – Very Dry Very Hot Wyoming BG	157
5.1.13	BGxxx_WY – Very Dry Very Very Hot Wyoming BG	157
5.2	Great Basin Desert [GBD]	158
5.2.1	GBD Subzones	158
5.2.2	GBDxh_NV – Very Dry Hot Nevada GBD	159

5.2.3	GBDdw_UT – Dry Warm Utah GBD.....	159
5.2.4	GBDxx_UT – Very Dry Very Hot Utah GBD.....	160
5.3	Mixed-grass Prairie [MGP].....	161
5.3.1	MGPmw_MT – Moist Warm Montana MGP	161
5.4	Short Grass Prairie [SGP].....	162
5.4.1	SGPdm_CO – Dry Mild Colorado SGP	162
5.5	Fescue Grassland [FG].....	163
5.5.1	FGff – Foothills Fescue FG.....	163
5.6	Central Valley Grassland [CVG].....	164
5.6.1	CVGdm_CA – Dry Maritime CVG.....	164
6	Mojave and Chaparral Zones.....	165
6.1	Mojave – Sonoran Semi-Desert [MSSD]	165
6.1.1	MSSDun_NV – Nevada MSSD	165
6.2	California Chaparral [CCH]	166
6.2.1	CCHun_CA – California CCH	166
6.3	Madrean Chaparral [MDCH]	167
6.3.1	MDCHun_NV – Nevada MDCH.....	167
7	Literature Cited	168
	Appendix 1: Tree species codes used in edatopic grids.....	173
	Appendix 2: Habitat type / Association codes.....	176

List of Figures

Figure 1. CDFmm_WA tree species suitability and plant associations displayed on edatopic grid.....	5
Figure 2. CDFmm_OR tree species suitability and plant associations displayed on edatopic grid.....	6
Figure 3. CDFxm_CA tree species suitability and plant associations displayed on edatopic grid.	7
Figure 4. CMXwm_OR tree species suitability and plant associations displayed on edatopic grid.....	10
Figure 5. CMXmm_OR tree species suitability and plant associations displayed on edatopic grid.	11
Figure 6. CMXdm_OR tree species suitability and plant associations displayed on edatopic grid.....	12
Figure 7. CMXxm_CA tree species suitability and plant associations displayed on edatopic grid.	13
Figure 8. CRFdh_CA tree species suitability and plant associations displayed on edatopic grid.	15
Figure 9. CRFmh_CA tree species suitability and plant associations displayed on edatopic grid.	16
Figure 10. CWHxm_WA tree species suitability and plant associations displayed on edatopic grid.	19
Figure 11. CWHxm_OR tree species suitability and plant associations displayed on edatopic grid.	20
Figure 12. CWHdm_WA tree species suitability and plant associations displayed on edatopic grid.....	21
Figure 13. CWHdm_WC tree species suitability and plant associations displayed on edatopic grid.....	22
Figure 14. CWHdm_OR tree species suitability and plant associations displayed on edatopic grid.....	23
Figure 15. CWHdm_OC tree species suitability and plant associations displayed on edatopic grid.....	24
Figure 16. CWHds_WA tree species suitability and plant associations displayed on edatopic grid.....	25
Figure 17. CWHms_WA tree species suitability and plant associations displayed on edatopic grid.	26
Figure 18. CWHms_OR tree species suitability and plant associations displayed on edatopic grid.....	27
Figure 19. CWHvm_WA tree species suitability and plant associations displayed on edatopic grid.	28
Figure 20. CWHvm_OR tree species suitability and plant associations displayed on edatopic grid.	29
Figure 21. CWHmh_OR tree species suitability and plant associations displayed on edatopic grid.....	30
Figure 22. CWHwh_WA tree species suitability and plant associations displayed on edatopic grid.	31
Figure 23. CWHwh_OR tree species suitability and plant associations displayed on edatopic grid.	32
Figure 24. CWHvh_WA tree species suitability and plant associations displayed on edatopic grid.	33
Figure 25. CWFwm_OR tree species suitability and plant associations displayed on edatopic grid.....	35
Figure 26. CWFmm_OR tree species suitability and plant associations displayed on edatopic grid.	36
Figure 27. CWFdm_OR tree species suitability and plant associations displayed on edatopic grid.....	37
Figure 28. CWFds_CA tree species suitability and plant associations displayed on edatopic grid.....	38
Figure 29. MHRFmm_OR tree species suitability and plant associations displayed on edatopic grid.	41
Figure 30. MHRFdm_OR tree species suitability and plant associations displayed on edatopic grid.	42
Figure 31. MHRFds_CA tree species suitability and plant associations displayed on edatopic grid.	43
Figure 32. MHmm_WA tree species suitability and plant associations displayed on edatopic grid.	46
Figure 33. MHms_WA tree species suitability and plant associations displayed on edatopic grid.....	47
Figure 34. MHds_WA tree species suitability and plant associations displayed on edatopic grid.....	48
Figure 35. MHdm_OR tree species suitability and plant associations displayed on edatopic grid.	49
Figure 36. MHds_OR tree species suitability and plant associations displayed on edatopic grid.....	50
Figure 37. ESSFdh_WA tree species suitability and plant associations displayed on edatopic grid.....	54
Figure 38. ESSFmw_WA tree species suitability and plant associations displayed on edatopic grid.....	55
Figure 39. ESSFxc_WA tree species suitability and plant associations displayed on edatopic grid.	56
Figure 40. ESSFhx_WA tree species suitability and plant associations displayed on edatopic grid.	57
Figure 41. ESSFwx_OR tree species suitability and plant associations displayed on edatopic grid.	58
Figure 42. ESSFdm_ID tree species suitability and plant associations displayed on edatopic grid.	59
Figure 43. ESSFdw_ID tree species suitability and plant associations displayed on edatopic grid.	60

Figure 44. ESSFxx_MT tree species suitability and plant associations displayed on edatopic grid.	61
Figure 45. ESSFdk_MT tree species suitability and plant associations displayed on edatopic grid.	62
Figure 46. ESSFwh_MT tree species suitability and plant associations displayed on edatopic grid.	63
Figure 47. ESSFwm_MT tree species suitability and plant associations displayed on edatopic grid.	64
Figure 48. ESSFxx_WY tree species suitability and plant associations displayed on edatopic grid.	65
Figure 49. ESSFxx_WY tree species suitability and plant associations displayed on edatopic grid.	66
Figure 50. ESSFxc_CO tree species suitability and plant associations displayed on edatopic grid.	67
Figure 51. ESSFxx_UT tree species suitability and plant associations displayed on edatopic grid.	68
Figure 52. ICHxw_WA tree species suitability and plant associations displayed on edatopic grid.	71
Figure 53. ICHxh_ID tree species suitability and plant associations displayed on edatopic grid.	72
Figure 54. ICHxw_ID tree species suitability and plant associations displayed on edatopic grid.	73
Figure 55. ICHdh_ID tree species suitability and plant associations displayed on edatopic grid.	74
Figure 56. ICHdw_ID tree species suitability and plant associations displayed on edatopic grid.	75
Figure 57. ICHmh_MT tree species suitability and plant associations displayed on edatopic grid.	76
Figure 58. ICHmw_MT tree species suitability and plant associations displayed on edatopic grid.	77
Figure 59. IDFxx_WA tree species suitability and plant associations displayed on edatopic grid.	80
Figure 60. IDFxx_WA tree species suitability and plant associations displayed on edatopic grid.	81
Figure 61. IDFdk_WA tree species suitability and plant associations displayed on edatopic grid.	82
Figure 62. IDFdh_WA tree species suitability and plant associations displayed on edatopic grid.	83
Figure 63. IDFdm_WA tree species suitability and plant associations displayed on edatopic grid.	84
Figure 64. IDFxx_OR tree species suitability and plant associations displayed on edatopic grid.	85
Figure 65. IDFxx_ID tree species suitability and plant associations displayed on edatopic grid.	86
Figure 66. IDFxx_MT tree species suitability and plant associations displayed on edatopic grid.	87
Figure 67. IDFdh_MT tree species suitability and plant associations displayed on edatopic grid.	88
Figure 68. IDFdm_MT tree species suitability and plant associations displayed on edatopic grid.	89
Figure 69. IDFdk_MT tree species suitability and plant associations displayed on edatopic grid.	90
Figure 70. IDFdx_MT tree species suitability and plant associations displayed on edatopic grid.	91
Figure 71. IDFdkx_MT tree species suitability and plant associations displayed on edatopic grid.	92
Figure 72. IDFdx_WY tree species suitability and plant associations displayed on edatopic grid.	93
Figure 73. IDFxm_CO tree species suitability and plant associations displayed on edatopic grid.	94
Figure 74. IDFdh_UT tree species suitability and plant associations displayed on edatopic grid.	95
Figure 75. IGFdk_WA tree species suitability and plant associations displayed on edatopic grid.	97
Figure 76. IGFdw_OR tree species suitability and plant associations displayed on edatopic grid.	98
Figure 77. IGFmh_OR tree species suitability and plant associations displayed on edatopic grid.	99
Figure 78. IGFxm_OR tree species suitability and plant associations displayed on edatopic grid.	100
Figure 79. IGFmm_OR tree species suitability and plant associations displayed on edatopic grid.	101
Figure 80. IWFdw_OR tree species suitability and plant associations displayed on edatopic grid.	103
Figure 81. IWFxm_CA tree species suitability displayed on edatopic grid.	104
Figure 82. IWFxx_NV tree species suitability and plant associations displayed on edatopic grid.	105
Figure 83. IWF dm_CO tree species suitability and plant associations displayed on edatopic grid.	106
Figure 84. MSxx_WA tree species suitability and plant associations displayed on edatopic grid.	109
Figure 85. MSdm_WA tree species suitability and plant associations displayed on edatopic grid.	110
Figure 86. MSxx_OR tree species suitability and plant associations displayed on edatopic grid.	111
Figure 87. MSmm_ID tree species suitability and plant associations displayed on edatopic grid.	112

Figure 88. MSdw_MT tree species suitability and plant associations displayed on edatopic grid.....	113
Figure 89. MSdh_MT tree species suitability and plant associations displayed on edatopic grid.	114
Figure 90. MSdh_WY tree species suitability and plant associations displayed on edatopic grid.	115
Figure 91. MSdh_UT tree species suitability and plant associations displayed on edatopic grid.	116
Figure 92. MSxm_CO tree species suitability and plant associations displayed on edatopic grid.	117
Figure 93. MSdk_CO tree species suitability and plant associations displayed on edatopic grid.	118
Figure 94. MSxx_NV tree species suitability displayed on edatopic grid.	119
Figure 95. PPxh_WA tree species suitability and plant associations displayed on edatopic grid.	122
Figure 96. PPxx_OR tree species suitability and plant associations displayed on edatopic grid.....	123
Figure 97. PPxm_OR tree species suitability and plant associations displayed on edatopic grid.	124
Figure 98. PPxk_OR tree species suitability and plant associations displayed on edatopic grid.....	125
Figure 99. PPxw_MT tree species suitability and plant associations displayed on edatopic grid.	126
Figure 100. PPxw_WY tree species suitability and plant associations displayed on edatopic grid.	127
Figure 101. PPMx_WY tree species suitability and plant associations displayed on edatopic grid.....	128
Figure 102. PPxh_CO tree species suitability and plant associations displayed on edatopic grid.	129
Figure 103. SBAPfp tree species suitability.....	130
Figure 104. PPJWxh_CA tree species suitability displayed on edatopic grid.....	134
Figure 105. PPJWxw_NV tree species suitability and plant associations displayed on edatopic grid.....	135
Figure 106. PPJWdw_UT tree species suitability and plant associations displayed on edatopic grid.....	136
Figure 107. PPJWmw_UT tree species suitability and plant associations displayed on edatopic grid.....	137
Figure 108. PPJWwm_CO tree species suitability displayed on edatopic grid.	138
Figure 109. PPJWdm_WY tree species suitability and plant associations displayed on edatopic grid. ...	139
Figure 110. WJPxm_OR tree species suitability and plant associations displayed on edatopic grid.....	141
Figure 111. OWdm_CA tree species suitability displayed on edatopic grid.	143
Figure 112. OWxm_CA tree species suitability displayed on edatopic grid.	144
Figure 113. OWmm_OR tree species suitability displayed on edatopic grid.....	145
Figure 114. OWwm_OR tree species suitability displayed on edatopic grid.....	146
Figure 115. MMMdk_NV tree species suitability and plant associations displayed on edatopic grid.	148
Figure 116. BGxh_WA tree species suitability displayed on edatopic grid.....	151
Figure 117. BGdw_WA tree species suitability displayed on edatopic grid.	151
Figure 118. BGmw_WA tree species suitability displayed on edatopic grid.	152
Figure 119. BGwm_WA tree species suitability displayed on edatopic grid.	152
Figure 120. BGdh_OR tree species suitability displayed on edatopic grid.	153
Figure 121. BGdw_OR tree species suitability displayed on edatopic grid.....	153
Figure 122. BGmw_OR tree species suitability displayed on edatopic grid.	154
Figure 123. BGmk_NV tree species suitability displayed on edatopic grid.	154
Figure 124. BGmk_MT tree species suitability displayed on edatopic grid.....	155
Figure 125. BGmm_MT tree species suitability displayed on edatopic grid.....	155
Figure 126. BGxx_WY tree species suitability displayed on edatopic grid.	156
Figure 127. BGxxx_WY tree species suitability displayed on edatopic grid.....	156
Figure 128. GBDxh_NV tree species suitability displayed on edatopic grid.	158
Figure 129. GBDdw_UT tree species suitability displayed on edatopic grid.	158
Figure 130. GBDxx_UT tree species suitability displayed on edatopic grid.....	159
Figure 131. MGPmw_MT tree species suitability displayed on edatopic grid.....	160

Figure 132. SGPdm_CO tree species suitability displayed on edatopic grid.	161
Figure 133. FGff tree species suitability displayed on edatopic grid.	162
Figure 134. CVGdm_CA tree species suitability displayed on edatopic grid.	163
Figure 135. MSSDun_NV tree species suitability displayed on edatopic grid.	164
Figure 136. CCHun_CA tree species suitability displayed on edatopic grid.....	165
Figure 137. MDCHun_NV tree species suitability displayed on edatopic grid.	166

List of Tables

Table 1. Tree species of Forested Coastal Biogeoclimatic Zones.....	3
Table 2. CDF Subzones – Climax and Seral Trees of Upland Sites.....	4
Table 3. CMX Subzones – Climax and Seral Trees of Upland Sites	9
Table 4. CRF Subzones – Climax and Seral Trees of Upland Sites.....	14
Table 5. CWH Subzones – Climax and Seral Trees of Upland Sites.....	18
Table 6. CWF Subzones – Climax and Seral Trees of Upland Sites.....	34
Table 7. MHRF Subzones – Climax and Seral Trees of Upland Sites	40
Table 8. MH Subzones – Climax and Seral Trees of Upland Sites	45
Table 9. Tree species of Forested Interior Biogeoclimatic Zones	52
Table 10. ESSF Subzones – Climax and Seral Trees of Upland Sites	53
Table 11. ICH Subzones – Climax and Seral Trees of Upland Sites	70
Table 12. IDF Subzones – Climax and Seral Trees of Upland Sites.....	80
Table 13. IGF Subzones – Climax and Seral Trees of Upland Sites.....	97
Table 14. IWF Subzones – Climax and Seral Trees of Upland Sites.....	103
Table 15. MS Subzones – Climax and Seral Trees of Upland Sites.....	109
Table 16. PP Subzones – Climax and Seral Trees of Upland Sites.....	122
Table 17. Tall Shrub and Tree species of juniper, oak and mountain mahogany dominated Biogeoclimatic Zones.....	133
Table 18. PPJW Subzones – Climax and Seral Trees of Upland Sites	135
Table 19. OW Subzones – Climax and Seral Trees of Upland Sites.....	149
Table 20. Key species of Grassland Zones.....	156

1 INTRODUCTION

Biogeoclimatic Ecosystem Classification (Pojar, Klinka, and Meidinger 1987; MacKenzie and Meidinger 2018) is used in British Columbia to make site specific tree species reforestation decisions (as well as other applications). Due to climate change, it is necessary to consider possibly future climates in tree species selection decisions. MacKenzie and Mahony (2021) describe the ecological approach being taken to make climate-change informed reforestation decisions in British Columbia. To develop their approach, biogeoclimatic (BGC) units, along with their associated ecologically suitable tree species by site conditions, are required for the United States Pacific Northwest. As such, biogeoclimatic principles were applied to the north-western United States with a modelling approach using available plot data from various sources—the methods are described in Part 1 of this report (MacKenzie and Meidinger 2026).

Thirty biogeoclimatic zones were mapped in the U.S. west – eleven of which also occur in British Columbia (Meidinger and Pojar 1991) and two of which occur in Alberta (Natural Regions Committee 2006). Seventeen new biogeoclimatic zones were proposed based on a review of vegetation description reports and data. Most zones have multiple subzones—140 biogeoclimatic subzones were mapped.

This report (Part 2) contains brief descriptions of the biogeoclimatic zones and subzones resulting from the BGC model and presents ecologically suitable tree species by site conditions for each BGC unit.

1.1 PRESENTATION FORMAT

The report presents BGC unit descriptions by zone groupings, as follows:

1. Coastal Forested Zones: Forested BGC units of the maritime and subarctic climates on and inland from the west coast;
2. Interior Forested Zones: Forested BGC units of subcontinental and continental climates inland from the Cascade and Sierra-Nevada mountain ranges;
3. Juniper, Oak, and Mountain Mahogany Dominated Zones: Woodland- and shrub-dominated BGC units of coastal and interior regions;
4. Grassland Zones: grassland-dominated BGC units of coastal and interior regions;
5. Mojave and Chaparral Zones: Desert and chaparral BGC units.

Each zone is briefly described, with subzone descriptions following. The U.S. National Vegetation Classification (USNVC 2025) Macrogroup (and sometimes Group) unit that characterizes the zonal vegetation is presented following the description.

The subzone descriptions include an edatopic grid, displaying ecologically feasible tree species by site units, and, where possible, dominant habitat or vegetation types for the site units (see Figure 1, CDFmm_WA). The edatopic grid is widely used in British Columbia biogeoclimatic ecosystem classification (BEC) guides (e.g., MacKillop and Ehman 2016; MacKillop et al. 2018; Ryan et al. 2022; Klassen et al. 2026) to display the site units for a BGC unit. It is a two-dimensional schematic representation of soil moisture regime (values 1 to 7 on vertical axis) and soil nutrient regime (values A to E on horizontal axis).

Site units are displayed on top of the edatopic grid over their typical range of soil moisture and nutrient regime. Site units are numbered, with the average site unit assigned '101' (see Figure 1). The other units are numbered beginning with the driest as '102'. Site units that are moister than average are numbered from '110' onward.

Each site unit that supports trees has B.C. tree codes (Appendix 1) included in the site unit box on the grid. For example, in Figure 1, the CDFmm_WA/101 has the following tree codes listed: **Fd** [BgDrMb] (CwQgRa). The tree codes in bold type have **high** environmental suitability, those in square brackets have **moderate** environmental suitability, and those in round brackets are of **low** environmental feasibility for the site.

Most BGC unit grids have seven site units; however, where data or number of tree species was limited, fewer site units were recognized.

In this report, the site units are not named, but habitat types or informal plant association names associated with the site units are shown to the right of the edatopic grid (Figure 1), if available. Habitat types are potential natural vegetation units commonly used in U.S. Forest Service plant association guidebooks of the Pacific Northwest. Habitat type codes were assigned to many of the plots acquired for this project. The habitat types presented in this report were summarized from the data for a BGC unit. All habitat type and plant association codes used in this report are listed in Appendix 2 with the full name.

2 COASTAL FORESTED ZONES

2.1 COASTAL DOUGLAS-FIR [CDF]

The Coastal Douglas-fir (CDF) Zone is a lowland zone with a maritime climate, extending from northern California, north through the Willamette Valley and Puget Trough (Franklin and Dyrness 1988), into southwestern British Columbia, primarily on south-east Vancouver Island (Meidinger and Pojar 1991).

The zone is characterized by forests dominated by Douglas-fir (*Pseudotsuga menziesii*), which also regenerates in the shade of the canopy (Table 1). Garry oak (*Quercus garryana*) and arbutus (*Arbutus menziesii*) are common on dry sites. Western redcedar (*Thuja plicata*) dominates on wetter sites. Grand fir (*Abies grandis*) is a generally component of mesic Douglas-fir forests. Common early seral deciduous trees are red alder (*Alnus rubra*) and bigleaf maple (*Acer macrophyllum*). The understory of Douglas-fir forests is usually dominated by salal (*Gaultheria shallon*) and dull Oregon-grape (*Mahonia nervosa*). Other understory species include oceanspray (*Holodiscus discolor*), sword fern (*Polystichum munitum*), vanilla-leaf (*Achlys triphylla*), trailing blackberry (*Rubus ursinus*), and in southern portions, poison oak (*Toxicodendron diversilobum*)

Western hemlock (*Tsuga heterophylla*) increases with elevation and climatic moisture, and the Coastal Western Hemlock (CWH) zone abuts the CDF over its range.

USNVC: Zonal forests are included in Macrogroup M886: Southern Vancouverian Dry Foothill Forest & Woodland

2.1.1 CDF Subzones

Three subzones (Table 2) are recognized, mostly characterizing a latitudinal climatic moisture gradient.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 1. Tree species of Forested Coastal Biogeoclimatic Zones

Scientific Name	CDF*	CMX	CWF	CRF	CWH	MH	MHRF	Common Name
<i>Pseudotsuga menziesii</i>	C**	C	C	C/S	C/S		s	Douglas-fir
<i>Arbutus menziesii</i>	c	C		c				arbutus
<i>Thuja plicata</i>	c			c	C			western redcedar
<i>Abies grandis</i>	c			c				grand fir
<i>Calocedrus decurrens</i>	c	c	C					incense-cedar
<i>Notholithocarpus densiflorus</i>		C/S		C				tanoak
<i>Quercus chrysolepis</i>		C						canyon live oak
<i>Abies concolor</i>		c	C				c	white fir
<i>Chrysolepis chrysophylla</i>		c	c		c		c	giant chinkapin
<i>Chamaecyparis lawsoniana</i>		c						Port Orford-cedar
<i>Umbellularia californica</i>		c		c				California laurel
<i>Sequoia sempervirens</i>				C				coast redwood
<i>Tsuga heterophylla</i>				C	C	c		western hemlock
<i>Abies amabilis</i>					C	C		amabilis fir
<i>Chamaecyparis nootkatensis</i>					c	c		yellow-cedar
<i>Abies procera</i>					c			noble fir
<i>Picea sitchensis</i>					c			Sitka spruce
<i>Tsuga mertensiana</i>						C	C	mountain hemlock
<i>Abies lasiocarpa</i>						c		subalpine fir
<i>Abies magnifica</i>							C	California red fir
<i>Acer macrophyllum</i>	S	S		s	S			bigleaf maple
<i>Quercus garryana</i>	S							Garry oak
<i>Pinus ponderosa</i>	s	s	s					ponderosa pine
<i>Fraxinus latifolia</i>	s							Oregon ash
<i>Alnus rubra</i>	s			s	S			red alder
<i>Cornus nuttallii</i>	s	s			s			western flowering dogwood
<i>Quercus kelloggii</i>	s	s						California black oak
<i>Pinus lambertiana</i>		s	s					sugar pine
<i>Pinus monticola</i>			s		s	s	s	western white pine
<i>Pinus contorta</i>							s	lodgepole pine

* Zone names: CDF: Coastal Douglas-fir; CMX: Coastal Mixed Conifer; CWF: Coastal White Fir; CRF: Coastal Redwood Forest; CWH: Coastal Western Hemlock; MH: Mountain Hemlock; MHRF: Mountain Hemlock – Red Fir.

** **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

Table 2. CDF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	CDFmm_OR	CDFmm_WA	CDFxm_CA	Common Name	BC Tree Code
<i>Pseudotsuga menziesii</i>	C*	C	C	Douglas-fir	Fd
<i>Abies grandis</i>	c	c		grand fir	Bg
<i>Thuja plicata</i>	c	c		western redcedar	Cw
<i>Quercus chrysolepis</i>			c	canyon live oak	Qc
<i>Calocedrus decurrens</i>			c	incense-cedar	Oa
<i>Acer macrophyllum</i>	S	S		bigleaf maple	Mb
<i>Quercus garryana</i>	S		S	Garry oak	Qg
<i>Alnus rubra</i>	s	S		red alder	Dr
<i>Arbutus menziesii</i>	s	s	s	arbutus	Ra
<i>Pinus ponderosa</i>			s	Ponderosa pine	Py
<i>Quercus kelloggii</i>			S	black oak	Qb
<i>Pinus lambertiana</i>			s	sugar pine	Ps

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.1.2 CDFmm_WA – Moist Maritime Washington CDF

This subzone occurs mostly in land areas adjacent to the straits of Juan de Fuca and Georgia, including the San Juan Islands, and in the drier climatic areas of the Puget Trough. These areas are in a strong rain shadow of the Olympic Mountains (Franklin and Dyrness 1988) (see p. 88-89). Zonal sites are characterized by forests of Douglas-fir, often with some grand fir (Table 2) in the understorey of these stands. Garry oak woodlands occur on dry sites and those with a history of indigenous peoples burning.

The CWHxm_WA occurs at elevations above this subzone, or adjacent where the climate is slightly moister. The CDFmm (Green and Klinka 1994) is an equivalent subzone that occurs northward in Canada.

Zonal association: PSME/GASH, PSME/MANE2 (Hall 1998)

CDFmm_WA							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Qg [FdRa](Plc)			102			
2	Fd [QgRa](BgPlc)			103			PSME-ARME/GASH
3		Fd [BgDrMb]		101			PSME/HODI-ROGY
4		(CwQgRa)					PSME/GASH, PSME/BENE
5	110	Fd [DrMb] (CwBg)		FdCwDr [MbSs](Act)		112	
6	111	FdCw [DrMb Bg](Hw)		FdCwDr [ActMbBg](Ss)		113	TSHE/LYAM3, PISI/POMU-OXOR
7							

Tree species codes are presented in Appendix 1 with many codes in Table 2; Habitat type / association codes are in Appendix 2.

Figure 1. CDFmm_WA tree species suitability and plant associations displayed on edatopic grid.

2.1.3 CDFmm_OR – Moist Maritime Oregon CDF

This subzone occurs primarily in the Willamette Valley in Oregon. It also occurs in the Umpqua Valley. Zonal sites are characterized by forests of Douglas-fir, usually with some grand fir (Table 2). Salal and dull Oregon-grape dominate the understory of these stands, often with some oceanspray. Other common understory species are beaked hazelnut (*Corylus cornuta*), common snowberry (*Symphoricarpos albus*), mountain sweet-cicely (*Osmorhiza berteroi*), trailing blackberry (*Rubus ursinus*), white insideout flower (*Vancouveria hexandra*), and broad-leaved starflower (*Trientalis borealis* ssp. *latifolia*).

Before settlement, much of the subzone was prairie and oak savanna—the oak in the Willamette is mostly Garry oak (also called Oregon white oak), although California black oak (*Quercus kelloggii*) is present in the southern Willamette and into the Umpqua valley. Aboriginal communities were probably responsible for most of the fires that created and maintained these open oak conditions. Since settlement, there has been a replacement of prairies and savannas by closed oak forest.

Conceptually, the CWHxm_OR occurs at elevations above this subzone; however, in the mapping, CWHdm_OR also abuts the CDFmm_OR at higher elevations.

Zonal associations: ABGR/MANE2-GASH, PSME/MANE2-GASH, PSME/HODI-SYMPH, PSME/GASH-BENE2, PSME/HODI-MANE2, PSME/MANE2 (McCain and Diaz 2002a).

CDFmm_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1	Qg [RaQbFd]			102		
2	FdQg[QbRaPy](BgMb)			103		ABGR/TODI, PSME/TODI
3		Fd [MbPy]		101		ABGR/MANE2-GASH, PSME/MANE2-GASH, PSME/HODI-SYMPH
4		(BgRaOaDrQg)				PSME/GASH-BENE2, PSME/HODI-MANE2, PSME/MANE2
5	110	Fd[DrMb] (CwBg)	FdDr [CwMb] (ActGp)		112	ABGR/COCO6/VAHE, PSME/COCO6/SYMO/POMU, ABGR/HODI/POMU
6	111	FdCw [DrMb] Bg](Hw)	FdCwDr [ActMbBgOg]		113	THPL/BENE2/POMU
7						

Tree species codes are presented in Appendix 1 with many codes in Table 2; Habitat type / association codes are in Appendix 2.

Figure 2. CDFmm_OR tree species suitability and plant associations displayed on edatopic grid.

2.1.4 CDFxm_CA – Very Dry Maritime California CDF

This subzone is in southwest Oregon (Medford, Rogue Valley) and northern California. Data is limited for this subzone, however, along a gradient from the central portion to the peripheries of the subzone around Medford, OR the gradient is from ponderosa pine to Douglas-fir to grand fir. Arbutus occurs. Sugar pine (*Pinus lambertiana*), and Jeffrey’s pine (*P. jeffreyi*) (on serpentine soils) are characteristic of the valley. Cottonwood (*Populus trichocarpa*) riparian forest occurs along river. Garry oak and California black oak both occur on mesic sites (see Table 2).

Some ‘southern Oregon’ chaparral—*Ceanothus cuneatus*, *Arctostaphylos viscida* and *A. canescens*, with *Ceanothus* on the driest sites occurs and may actually be climax in the valley bottom.

At elevations above this subzone is the CMXdm_OR.

Zonal association: PSME-PIPO/RHDI6, QUGA4/PSME/RHDI6, QUGA4-PSME/TODI (Atzet et al. 1996)

CDFxm_CA							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Qg[PcRaJwQc](Pz)			102			
2	Qg[PyRaQcOa] (FdJwPzQb)			103			QUGA4/CYEC, PIPO/QUKE, PIPO-QUKE/PUTR2/ACOCO
3		FdPyQb		101			
4		[PsRaOaQcQg]					PSME-PIPO/RHDI6, QUGA4-PSME/RHDI6, QUGA4-PSME/TODI
5	110	Fd[PyQbQg] (MbOa)	Fd [Mb](QbOa)		112		
6	111	Fd[MbOa]	Fd [ActMb OaDw]		113		PSME/DRY SHRUB, PSME-PIPO/TODI, PSME-QUCH2/POMU
7							

Tree species codes are presented in Appendix 1 with many codes in Table 2; Habitat type / association codes are in Appendix 2.

Figure 3. CDFxm_CA tree species suitability and plant associations displayed on edatopic grid.

2.2 COASTAL MIXED EVERGREEN [CMX]

The Coastal Mixed Evergreen (CMX) Zone is a lowland to montane zone of southwest Oregon and northern California (Sawyer 2007; Atzet et al. 1996). The zone is characterized by forests dominated by Douglas-fir (*Pseudotsuga menziesii*), with a lower canopy of broad-leaved evergreen trees, usually dominated by tanoak (*Notholithocarpus densiflorus*), arbutus (*Arbutus menziesii*), and/or giant chinkapin (*Chrysolepis chrysophylla*) (Table 1).

Other hardwoods include California laurel (*Umbellularia californica*), canyon live oak (*Quercus chrysolepis*), California black oak (*Quercus kelloggii*), Garry oak (*Quercus garryana*), and bigleaf maple (*Acer macrophyllum*). Other common conifers are grand fir (*Abies grandis*), white fir (*Abies concolor*), Port Orford-cedar (*Chamaecyparis lawsoniana*), incense-cedar (*Calocedrus decurrens*), sugar pine (*Pinus lambertiana*), and ponderosa pine (*Pinus ponderosa*).

The understory is often sparse, but common species can include baldhip rose (*Rosa gymnocarpa*), evergreen huckleberry (*Vaccinium ovatum*), dull Oregon-grape (*Mahonia nervosa*), sword fern (*Polystichum munitum*), and poison oak (*Toxicodendron diversilobum*).

White fir increases with elevation and the Coastal White Fir (CWF) zone occurs at elevation above the CMX. In Oregon, the CMX occurs almost to the coast, where a “hypermaritime” Coastal Western Hemlock subzone (CWHmh_OR) occurs. In California, the hypermaritime band along the coast is replaced by the Coastal Redwood Forest (CRF) zone.

USNVC: Zonal forests are included in Macrogroup M009: Californian Forest & Woodland [*Quercus agrifolia* – *Umbellularia californica* – *Hesperocyparis* spp. Forest & Woodland], specifically, G208 Californian Moist Coastal Mixed Evergreen Forest Group.

2.2.1 CMX Subzones

Four subzones (Table 3) are recognized over a combined west to east and north to south moisture gradient.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 3. CMX Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	CMXxm_CA	CMXdm_OR	CMXmm_OR	CMXwm_OR	Common Name	BC Tree Code
<i>Pseudotsuga menziesii</i>	C*	C	C	C	Douglas-fir	Fd
<i>Quercus chrysolepis</i>	C	C	c	C	canyon live oak	Qc
<i>Calocedrus decurrens</i>	c	c		c	incense-cedar	Oa
<i>Abies concolor</i>	c	c		c	white fir	Bc
<i>Arbutus menziesii</i>		C	c	c	arbutus	Ra
<i>Chrysolepis chrysophylla</i>		c		c	giant chinkapin	Oy
<i>Notholithocarpus densifolius</i>	c		C	C	tanoak	Ot
<i>Tsuga heterophylla</i>			c		western hemlock	Hw
<i>Chamaecyparis lawsoniana</i>			c	c	Port Orford-cedar	Yp
<i>Pinus lambertiana</i>	s	S	s	S	sugar pine	Ps
<i>Acer macrophyllum</i>	s	s	S	s	bigleaf maple	Mb
<i>Quercus kelloggii</i>	S	S			California black oak	Qb
<i>Pinus ponderosa</i>	S	S			ponderosa pine	Py
<i>Quercus wislizeni</i>	S				interior live oak	Qz
<i>Umbellularia californica</i>	s		s		California laurel	Ol
<i>Cornus nuttallii</i>		s	s	s	western flowering dogwood	Gp
<i>Alnus rubra</i>			s		red alder	Dr

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.2.2 CMXwm_OR – Wet Maritime Oregon CMX

This subzone occurs in the western distribution of the zone, in southern Oregon and northern California. Characteristic trees are Douglas-fir, tanoak, arbutus, and canyon live oak (Table 3). Other common trees include white fir, incense cedar, giant chinkapin, and sugar pine. The understory includes dull Oregon-grape, baldhip rose, salal (*Gaultheria shallon*), evergreen huckleberry, beargrass (*Xerophyllum tenax*), prince’s pine (*Chimaphilla umbellata*), Pacific rhododendron (*Rhododendron macrophyllum*), vanilla-leaf (*Achlys triphylla*), and rattle-snake plantain (*Goodyera oblongifolia*).

At lower elevations is either the CMXmm_OR or CMXxm_CA. The CWF zone occurs at elevations above this subzone. In California, it is the CWFds_CA, whereas in Oregon it is the CWFwm_OR. It abuts the CWHdm_OR in the northwest of its range and the CMXdM_OR occurs at equivalent elevations to the east, where the climate is slightly less maritime.

Zonal Habitat types: LIDE3-PSME/GASH-RHMA3, LIDE3-PSME/GASH-BENE2, LIDE3-PSME/GASH-VAOV2, CHAL/RHMA3/GASH (Atzet et al. 1996).

CMXwm_OR						
	A	B	C	D	E	Habitat Types/Associations
0						
1	FdRaQc [QkOtOyPsPyPk](Oa)				102	PSME-QUKE/RHDI6, LIDE2-PSME-QUCH2/RHDI6, LIDE3-PSME-QUCH2/BENE2
2	FdRaQc [OtOyPsOaGp](PzPy)				103	PSME/DRY SHRUB, PSME-QUCH2-LIDE3, PSME-QUCH2/RHDI6
3		FdOt [BcPs](Ra		101		LIDE3-PSME/GASH-RHMA3, LIDE3-PSME/GASH-BENE2, PSME/GASH-RHMA3
4		OyPwQcYpOaMbPkGp)				LIDE3-PSME/GASH-VAOV2, CHLA/RHMA3/GASH, ABCO-LIDE3/CHUM
5	110	FdOt [Yp] (BcPwHwMb)		Yp [FdMb OtBc](Pw)	112	LIDE3/VAOV2-RHMA3-GASH, LIDE3-ACMA3-QUCH2-POMU, CHLA-ABCO/BENE2
6	111	Fd [OtYp] (BcPwHw)		Yp [FdMb OtBc](Pw)	113	LIDE3-CHLA/GASH, ABCO-CADE27/TRLA6
7						

Tree species codes are presented in Appendix 1 with many codes in Table 3; Habitat type / association codes are in Appendix 2.

Figure 4. CMXwm_OR tree species suitability and plant associations displayed on edatopic grid.

2.2.3 CMXmm_OR – Moist Maritime Oregon CMX

This subzone is the westernmost of the four subzones and occurs in the moister, mostly windward slopes, closest to the coast, in southern Oregon and northern California. Characteristic trees are Douglas-fir, tanoak, and arbutus (Table 3). Other common trees include canyon live oak, bigleaf maple, red alder, and California laurel. Port Orford-cedar and western hemlock are locally common in the northern part of the range. The understorey includes dull Oregon-grape, evergreen huckleberry, sword fern, baldhip rose, salal (*Gaultheria shallon*), Pacific rhododendron (*Rhododendron macrophyllum*), and poison-oak.

The CMXwm_OR occurs at elevations above this subzone. At lower elevations to the west, the CWHmh_OR abuts in the northern range, and the CRFdh_CA in the southern range. The CMXdm_OR occurs at equivalent elevations to the east, where the climate is slightly less maritime.

Zonal Habitat types: LIDE3-PSME/GASH-RHMA3, LIDE3-PSME/GASH-BENE2, LIDE3-PSME/GASH-VAOV2, LIDE3-PSME-QUCH2/RHDI6, LIDE3/VAOV2-RHMA3-GASH (Atzet et al. 1996).

CMXmm_OR						
	A	B	C	D	E	Habitat Types/Associations
0						
1	QcRa[PyFdPsQbOtGp](OIoyQg)				102	PSME-QUKE/RHDI6, LIDE3-PSME-QUCH2/BENE2, PSME-QUKE/RHDI6
2	FdRaPs [QcOt](OIoyPyOaGpQb)				103	PSME/DRY SHRUB, PSME-QUCH2-LIDE3
3		FdOt[OIRa]		101		LIDE3-PSME/GASH-RHMA3, LIDE2-PSME-QUCH2/RHDI6
4		(PsOyQcMb)				LIDE3-PSME/GASH-VAOV2, LIDE3-PSME/GASH-BENE2, LIDE3/VAOV2-RHMA3-GASH
5	110	Fd[YpMbDr OtOI] (HwBc)	FdMb[YpDr OtOI] (HwBc)		112	LIDE3-TSHE/VAOV2/POMU, TSHE/POMU, LIDE3-TSHE/VAOV2/POMU-RIP
6	111	FdDr[YpMb OtOI](HwBc)	FdMb[YpDrOt OlDw](HwBcOg)		113	TSHE-LIDE3-UMCA, CHLA/VAOV2POMUM, TSHE/RUSP, CHLA-TSHE/POMU

Tree species codes are presented in Appendix 1 with many codes in Table 3; Habitat type / association codes are in Appendix 2.

Figure 5. CMXmm_OR tree species suitability and plant associations displayed on edatopic grid.

2.2.4 CMXdm_OR – Dry Maritime Oregon CMX

This subzone occurs on the leeward slopes along the coast of southern Oregon and into California.

Characteristic trees are Douglas-fir, arbutus, and canyon live oak (Table 3). Other common trees include sugar pine, ponderosa pine, incense-cedar, white fir, giant chinkapin, and California black oak. The understory includes poison oak, dull Oregon-grape, sword fern, baldhip rose, oceanspray (*Holodiscus discolor*), trailing snowberry (*Symphoricarpos hesperius*), pink honeysuckle (*Lonicera hispidula*), and rattlesnake-plantain (*Goodyera oblongifolia*).

The CWFmm_OR occurs at elevations above this subzone; the CDFxm_CA below. The CMXwm_OR occurs at similar elevations to the west, and the CMXxm_CA to the south.

Zonal Habitat types: ABCO-PSME/ROGY, PSME-ABCO, ABCO/BENE2, ABCO-CADE27/TRLA6, PSME/GASH-BENE2, PSME/HODI/WHMO, PSME-QUCH2/BENE2 (Atzet et al. 1996).

CMXdm_OR							
	A	B	C	D	E		Habitat Types/Associations
0							
1	PyQb[Qg](FdQcRaPz)				102		PIJE-CADE27/ARVI4, PIPO-QUKE, PIPO-PSME, QUGA4-PSME/RHDI6
2	FdPyQb[RaQgQc](PsPz)				103		PSME-QUCH2/RHDI6, PSME-PIPO/RHDI6, PSME-QUKE/RHDI6, PSME-DRY SHRUB
3		Fd[QbPyOaBc			101		PSME/GASH-BENE2, PSME/HODI/WHMO, PSME-QUCH2/BENE2
4		RaPs](QcOtHwOy)					ABCO-PSME/ROGY, PSME-ABCO, ABCO/BENE2, ABCO-CADE27/TRLA6
5	110	Fd[Bc](Ra MbOyHw)		Bc[FdMbOa](HwOy)		112	PSME/ACCI-BENE2, PSME/BENE2/POMU, ABCO/GASH-BENE2
	111	Fd[Bc](MbOaHw)		Bc[MbDrFdOa OgDw](Act)		113	ABCO/BENE2/LIBOL, LIDE3-ACMA3-QUCH2/POMU
7							

Tree species codes are presented in Appendix 1 with many codes in Table 3; Habitat type / association codes are in Appendix 2.

Figure 6. CMXdm_OR tree species suitability and plant associations displayed on edatopic grid.

2.2.5 CMXxm_CA – Very Dry Maritime California CMX

This subzone occurs on forested slopes at elevations above the California Central Valley. To the west of the Valley, it occurs east of the CMXwm_OR where climates are drier. Above the east side of the valley, it occurs above Oak Woodland (OW) and California Chaparral (CCH) zones.

Characteristic trees are Douglas-fir, canyon live oak, California black oak, ponderosa pine, and interior live oak, along with some tanoak, sugar pine and California laurel (Table 3). Common species in the understory are poison oak, sticky whiteleaf manzanita (*Arctostaphylos viscida*), California yerba santa (*Eriodictyon californicum*), and many introduced grasses.

Zonal Associations: Douglas-fir – Canyon live oak (Sawyer 2007).

CMXxm_CA							
	A	B	C	D	E		Habitat Types/Associations
0							
1	PyQcQb[FdPcRaQz](Qg)				102		Quercus douglasii - Pinus sabiniana / Poaceae Woodland
2	PyQbQc [FdRa](PsPcOl)				103		Quercus douglasii Alliance; Quercus chrysolepis - Pinus ponderosa
3		FdPyPs[QcQb]		101			Pseudotsuga menziesii Association
4		Oa](RaOtOlBcOb)					Pseudotsuga menziesii - Quercus chrysolepis
5	110	Fd[PyMbBcOa] Qb		FdMb[PyBcOa]		112	
6	111	Fd[MbBcOa]		FdMb[DwBcOa]		113	Alnus rhombifolia / Salix exigua A. rhombifolia / Salix laevigata
7							

Tree species codes are presented in Appendix 1 with many codes in Table 3; Habitat type / association codes are in Appendix 2.

Figure 7. CMXxm_CA tree species suitability and plant associations displayed on edatopic grid.

2.3 COASTAL REDWOOD FOREST [CRF]

The Coastal Redwood Forest (CRF) Zone occurs along the coast of northern California in an area that is influenced by frequent summer fog. Coast redwood (*Sequoia sempervirens*) characterizes the zone (Table 1) and occurs on a range of sites.

The Coastal Mixed Evergreen (CMX) zone is located inland from the CRF, where there is little to no fog influence.

USNVC: Zonal forests are included in Macrogroup M024: Vancouverian Coastal Rainforest [*M024 Tsuga heterophylla – Picea sitchensis – Sequoia sempervirens* Rainforest], specifically G235: Californian Coastal Redwood Forest.

2.3.1 CRF Subzones

Two subzones (Table 4) are recognized over a north to south moisture gradient.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 4. CRF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	CRFd _h _CA	CRFm _h _CA	Common Name	BC Tree Code
<i>Sequoia sempervirens</i>	C*	C	coast redwood	Oc
<i>Pseudotsuga menziesii</i>	C/S	C/S	Douglas-fir	Fd
<i>Notholithocarpus densiflorus</i>	C	C	tanoak	Ot
<i>Arbutus menziesii</i>	c	c	arbutus	Ra
<i>Umbellularia californica</i>	C	c	California laurel	Ol
<i>Tsuga heterophylla</i>	c	c	western hemlock	Hw
<i>Abies grandis</i>	c	c	grand fir	Bg
<i>Quercus agrifolia</i>	c		California live oak	Qx
<i>Picea sitchensis</i>		c	Sitka spruce	Ss
<i>Alnus rhombifolia</i>	S	s	white alder	Dw
<i>Alnus rubra</i>	s	S	red alder	Dr
<i>Quercus chrysolepis</i>	s		canyon live oak	Qc
<i>Aesculus californica</i>	s		California buckeye	On
<i>Pinus muricata</i>	s		Bishop pine	Pu
<i>Acer macrophyllum</i>	s	s	bigleaf maple	Mb

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.3.2 CRFdh_CA – Dry Hypermaritime California CRF

The subzone occurs south of the CRFmh. Coast redwood (*Sequoia sempervirens*) characterizes the zone. Douglas-fir (*Pseudotsuga menziesii*) and tanoak (*Notholithocarpus densiflorus*) are common associated tree species. It was differentiated from the CRFmh_CA by its lack of Sitka spruce (*Picea sitchensis*). Other trees include arbutus (*Arbutus menziesii*), California laurel (*Umbellularia californica*), and California live oak (*Quercus agrifolia*). Common understory species include evergreen huckleberry (*Vaccinium ovatum*), swordfern (*Polystichum munitum*), and poison oak (*Toxicodendron diversilobum*). See Borchert et al. (1988).

Zonal Association: Coast redwood / Evergreen huckleberry / Sword fern

CRFdh_CA						
	A	B	C	D	E	Habitat Types/Associations
0						
1	QbRa [FdQxQcQg] (QzPkPu)			102		
2	FdRaOI [OcOtQbQz] (QxQc)			103		SESI2-LIDE2/CAGL1-IRDO
3		OcFdOtOI		101		
4		[RaDr] (HwBgMb)				SESE2/POMU1-TROV
5	110	OcFdOIMb [OtDrDw] (HwBg)				SESE2/PTAQL-WOFI//Streamsides; SESE2/MAFA-VIAN (coastal)
6	111	OcOIMb [FdOtDw] (HwBgDr)				
7						

Tree species codes are presented in Appendix 1 with many codes in Table 4; Habitat type / association codes are in Appendix 2.

Figure 8. CRFdh_CA tree species suitability and plant associations displayed on edatopic grid.

2.3.3 CRFmh_CA – Moist Hypermaritime California CRF

The subzone occurs north of the CRFd_h_CA and is known for its coast redwood forests. Common associated tree species are Douglas-fir and tanoak. Sitka spruce and western hemlock (*Tsuga heterophylla*) frequently occur. Red alder (*Alnus rubra*) is common in seral stands. Understorey species include evergreen huckleberry (*Vaccinium ovatum*), swordfern (*Polystichum munitum*), salal (*Gaultheria shallon*), Pacific rhododendron (*Rhododendron macrophyllum*), and red sorrel (*Oxalis oregana*).

Zonal Association: Douglas-fir – Coast redwood / Pacific rhododendron – Evergreen huckleberry (Mahony and Stuart 2000; USNVC 2025)

CRFmh_CA						
	A	B	C	D	E	Habitat Types/Associations
0						
1	[FdRaQcQg] (PkPu)			102		
2	Fd [OcOtRa] (Dr)			103		
3		OcFdOt		101		
4		[HwBgDr] (RaMbSsOl)				Sequsem-Pseumen/Rhodmac; Sequsem-Pseumen/Vaccova;
5	110	OcMbDr [FdOtOlSsHw](BgCw)				Sequsem/Polymun; Sequsem-Tsughet/Polymun
6	111	OcSsDrMb [OtHwOlDw](FdBgYpCw)				Sequsem-Tsughet/Rubuspe; Sequsem-Alnurub/Rubuspe
7						

Tree species codes are presented in Appendix 1 with many codes in Table 4; Habitat type / association codes are in Appendix 2.

Figure 9. CRFmh_CA tree species suitability and plant associations displayed on edatopic grid.

2.4 COASTAL WESTERN HEMLOCK [CWH]

The Coastal Western Hemlock (CWH) Zone is a lowland to montane zone of western Washington and Oregon, and north along the coast of British Columbia to southeast Alaska (Franklin and Dyness 1988; Meidinger and Pojar 1991). The diagnostic climax tree species is western hemlock (*Tsuga heterophylla*) (Table 1). Western redcedar (*Thuja plicata*) is a common climax tree species over much of the zone. Amabilis (or silver) fir (*Abies amabilis*) and yellow-cedar (*Chamaecyparis nootkatensis*) are important climax species of higher elevation or more northern portions of the zone (although amabilis fir only occurs in extreme SE Alaska). Douglas-fir (*Pseudotsuga menziesii*) is a long-lived successional species that is common in the conterminous U.S. portion of zone and could be considered a 'climax' species on some sites. Other important late seral to climax species vary with geographic area and site and include Sitka spruce (*Picea sitchensis*), noble fir (*Abies procera*) and giant chinkapin (*Chrysolepis chrysophylla*). Red alder (*Alnus rubra*) is the most wide-ranging successional species. Bigleaf maple (*Acer macrophyllum*) is a major successional species in the conterminous US. Western white pine (*Pinus monticola*) is a successional species in much of the zone.

Salal (*Gaultheria shallon*), dull Oregon-grape (*Mahonia nervosa*), vanilla-leaf (*Achlys triphylla*) and sword fern (*Polystichum munitum*) are common understory species in drier climatic areas with a maritime climate. Oval-leaved and Alaskan blueberry (*Vaccinium ovalifolium*, *V. alaskaense*), and deer fern (*Blechnum spicatum*) are key understory species in moister maritime climates.

The Mountain Hemlock (MH) zone occurs at elevations above the CWH.

USNVC: Zonal forests are included in Macrogroup M024: Vancouverian Coastal Rainforest [*M024 Tsuga heterophylla* – *Picea sitchensis* – *Sequoia sempervirens* Rainforest]

2.4.1 CWH Subzones

Fifteen subzones (Table 5) are recognized over three major climatic belts that are parallel to the coast and the mountain ranges: hypermaritime, maritime and submaritime, as well as a latitudinal gradient.

Vegetation descriptions in this section are for zonal (or "average") sites. The zonal habitat types used for the data summaries are listed.

Table 5. CWH Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	CWH xm_WA	CWH xm_OR	CWH dm_WA	CWH dm_OR	CWH dm_WC	CWH dm_OC	CWH ds_WA	CWH ms_WA	CWH ms_OR	CWH vm_WA	CWH vm_OR	CWH mh_OR	CWH wh_OR	CWH wh_WA	CWH vh_WA	Common Name	BC Tree Code
<i>Tsuga heterophylla</i>	C*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	western hemlock	Hw
<i>Thuja plicata</i>	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	western redcedar	Cw
<i>Abies grandis</i>	c	c					c	c	c							grand fir	Bg
<i>Calocedrus decurrens</i>		c		c												incense-cedar	Oa
<i>Abies amabilis</i>							c	C	C	C	C					amabilis fir	Ba
<i>Abies procera</i>								c	c	c	c					noble fir	Bp
<i>Abies lasiocarpa</i>								c								subalpine fir	Bl
<i>Chamaecyparis nootkatensis</i>										c						yellow-cedar	Yc
<i>Chamaecyparis lawsoniana</i>												c				Port Orford-cedar	Yp
<i>Picea sitchensis</i>					c	c							C	C	C	Sitka spruce	Ss
<i>Umbellularia californica</i>													c			California laurel	Ol
<i>Pseudotsuga menziesii</i>	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	Douglas-fir	Fd
<i>Alnus rubra</i>	S	s	S	S	S	S				s	s	S	S	S	S	red alder	Dr
<i>Acer macrophyllum</i>	S	S	S	S	s	s							s	s	s	bigleaf maple	Mb
<i>Cornus nuttallii</i>	s	s	s	s												western flowering dogwood	Gp
<i>Chrysolepis chrysophylla</i>		s		s		s			s		s					giant chinquapin	Oy
<i>Arbutus menziesii</i>		s														arbutus	Ra
<i>Pinus monticola</i>							s	s	s	s	s					western white pine	Pw
<i>Betula papyrifera</i>							s									paper birch	Ep
<i>Malus fusca</i>															s	Pacific crab apple	Up

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.4.2 CWHxm_WA – Very Dry Maritime Washington CWH

This subzone is primarily of the lowlands and submontane slopes of the Puget Trough Mountains of Washington. Although western hemlock is the ultimate climax species, and occurs in many stands, Douglas-fir dominates the forest cover due to past disturbance history. Common associated tree species (Table 5) are western redcedar, grand fir (*Abies grandis*), red alder, and bigleaf maple, the latter two being strongly associated with successional developing stands. The main understorey species are salal, dull Oregon-grape, trailing blackberry (*Rubus ursinus*), oceanspray (*Holodiscus discolor*), vine maple (*Acer circinatum*), and sword fern.

In areas with a dry enough climate for the CWHxm_WA, it occurs at elevations below the CWHdm_WA. The CWHxm_WA is a southern variation of the CWHxm in British Columbia (Green and Klinka 1994).

Zonal Habitat types: TSHE/GASH/POMU, TSHE/GASH-MANE2, TSHE/GASH, PSME/MANE2-GASH (Henderson et al. 1989; Topik, Halverson, and Brockway 1986)

CWHxm_WA						
	A	B	C	D	E	Habitat Types/Associations
0						
1	Fd [Plc] (RaQg)			102		
2	Fd (CwHwDrMbRaQgPlc)			103		TSHE/GASH, PSME/GASH, TSHE/MANE2-DRY
3		Fd[HwCw		101		TSHE/MANE2-GASH, TSHE/GASH-MANE2,
4		MbDr](BgRaPlcPw)				TSHE/ACTR, TSHE/GASH-VAOV2, PSME/MANE2-GASH
5	110	HwDr[CwFdAct Mb](BgPwVb)	FdCw[HwDrMb OgActPw](Bg)		112	TSHE/POMU-TITR, TSHE/POMU, TSHE/GASH/POMU, TSHE/MANE2/POMU
6	111	HwCw[FdDrMb](BgPw)	FdCw[HwDrMb OgActBgPw]		113	TSHE/OPHO/MAST4, TSHE/ATFI, TSHE/LYAM3
7						

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 10. CWHxm_WA tree species suitability and plant associations displayed on edatopic grid.

2.4.3 CWHxm_OR – Very Dry Maritime Oregon CWH

This subzone occurs mostly on submontane slopes of the western Cascade Mountains of Oregon and into southern Washington, in areas that are climatically drier than the CWHdm_OR. There are some occurrences in the Coast Range southwest of Eugene, and in the Willamette Valley south of Eugene, Oregon. Although Douglas-fir dominates the forest cover, western hemlock is prominent in most stands (Table 5). Western redcedar often occurs in these stands—incense-cedar (*Calocedrus decurrens*) sometimes occurs. Common deciduous species are red alder and bigleaf maple. Giant chinkapin and Douglas-fir are long-lived seral species and can persist in stands for long time periods. The main understorey species are salal, dull Oregon-grape, vine maple (*Acer circinatum*), Pacific rhododendron (*Rhododendron macrophyllum*), and trailing blackberry (*Rubus ursinus*).

The CWHxm_OR typically occurs at elevations between the CDFmm_OR and the CWHdm_OR.

Zonal Habitat types: TSHE/RHMA3-GASH-NWO Cascades, TSHE/MANE2/GASH-NWO Cascades, TSHE/MANE2-NWO Cascades, TSHE/RHMA3/MANE2-NWO Cascades (McCain and Diaz 2002b; McCain and Diaz 2002a)

CWHxm_OR							
	A	B	C	D	E		Habitat Types/Associations
0							
1	Fd [Ra] (QgPy)			102			PSME-TSHE/RHMA3, TSHE/RHMA3-GASH
2	Fd [Hw] (QgCwRaOyPy)			103			TSHE/GASH, PSME/HODI-MANE2, PSME/HODI/WHMO, TSHE/GASH-HODI
3		FdHw[CwMb		101			TSHE/MANE2-GASH, ABGR/MANE2, PSME/MANE2
4		Oa] (BgRaOyDrPyPw)					TSHE/MANE2, PSME-TSHE/MANE2, PSME/MANE2-GASH
5	110	HwCw[FdDrMb] (BgOaPw)	FdCw[HwDrMb OgActBgPw](Oa		112		TSHE/POMU, TSHE/MANE2/POMU, TSHE/ACCI/POMU, TSHE/GASH/POMU
6	111	HwCw[FdDrMb] (BgPw)	FdCw[HwDrMb OgActBgPw]		113		TSHE/OPHO, TSHE/RUSP, TSHE/LYAM3
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 11. CWHxm_OR tree species suitability and plant associations displayed on edatopic grid.

2.4.4 CWHdm_WA – Dry Maritime Washington CWH

This subzone occurs on submontane slopes of the lee side of the Olympic Mountains and Coast Range of Washington, and in the western Cascade mountains of Washington. Douglas-fir and western hemlock are the dominant species in the overstory of most forest stands (Table 5). Western redcedar often occurs as well. Red alder and bigleaf maple are common in successional stands. The main understorey species are salal, dull Oregon-grape, vine maple (*Acer circinatum*), sword fern, and red huckleberry (*Vaccinium parviflorum*).

Mostly occurs at elevations between the CWHxm_WA and CWHvm_WA; however, in the western part of its range, it abuts the CWHdm_WC, a hypermaritime-influenced CWHdm. The CWHdm_WA subzone is a southern variation of the CWHdm in British Columbia (Green and Klinka 1994).

Habitat types: TSHE/GASH-BENE, TSHE/RHMA-GASH, TSHE/BENE, TSHE/BENE-GASH, TSHE/ACCI-BENE, TSHE/GASH, TSHE/ACTR (Henderson et al. 1989; Topik, Halverson, and Brockway 1986; Henderson et al. 1992).

CWHdm_WA						
	A	B	C	D	E	Habitat Types/Associations
0						
1	[Fd] (HwRaPlc)			102		PSME/HODI-ROGY, TSHE/RHMA3/GASH; TSHE/GASH-VAOV2
2	Fd [Hw] (CwDr)			103		TSHE/GASH, PSME/GASH, PSME/GASH-HODI
3		FdHw		101		TSHE/MANE2-GASH, TSHE/GASH-MANE2, TSHE/MANE2
4		[CwDrMb](Act)				TSHE/ACTR, TSHE/ACCI-MANE2, TSHE/MANE2
5	110	HwCw[FdMbDr]	FdCw[ActMbDr] (BgHwSs)		112	TSHE/TITR, TSHE/MANE2/POMU, TSHE/GASH/POMU, TSHE/POMU, ETC
6	111	HwCw[FdMbDr]	Cw[SsActFdMb DrBg](Hw)		113	TSHE/OPHO-ATFI, TSHE/RUSP, TSHE/OPHO, TSHE/LYAM3
7						

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 12. CWHdm_WA tree species suitability and plant associations displayed on edatopic grid.

2.4.5 CWHdm_WC – Dry Maritime Washington Coast CWH

This subzone occurs on submontane slopes of the windward side of the Olympic Mountains and Coast Range of Washington, just inland from the “hypermaritime” climate of the coast.

Douglas-fir and western hemlock are the dominant species in the overstory of most forest stands (Table 5); however, Sitka spruce occurs frequently. Western redcedar often occurs as well. Red alder is a common seral species. The main understorey species are red wood-sorrel (*Oxalis oregana*), salal, oval-leaved blueberry, deer fern, sword fern, red huckleberry (*Vaccinium parviflorum*), and salmonberry (*Rubus spectabilis*).

The CWHdm_WC mostly occurs at elevations between the CWHwh_WA and the CWHvm_WA, but where the Coast Range is low, it can abut the CWHdm_WA.

Habitat types: TSHE/VAAL, TSHE/VAAL-GASH, and TSHE/POMU-GASH (Henderson et al. 1989).

CWHdm_WC							
	A	B	C	D	E		Habitat Types/Associations
0							
1	Fd [Hw]			102			TSHE/Dep.
2	FdHw (CwDr)			103			TSHE/GASH
3		FdHw		101			
4		[CwSsDr]					TSHE/VAAL, TSHE/VAAL-GASH, TSHE/POMU-GASH
5	110	Hw [CwFdSsDr] (Mb)	FdCw [HwSs MbDr] (Act)		112		TSHE/OXOR, TSHE/VAAL/OXOR, TSHE/POMU-OXOR, TSHE/POMU-TITR
6	111	HwCw [SsMbDr] (Fd)	CwHw [FdSs MbDr] (Act)		113		PISI/OXOR, TSHE/GASH/OXOR, TSHE/LYAM
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 13. CWHdm_WC tree species suitability and plant associations displayed on edatopic grid.

2.4.6 CWHdm_OR – Dry Maritime Oregon CWH

This subzone occurs primarily on the submontane slopes of the Coast Range and Cascade Mountains of Oregon and southern Washington, inland from the moister climate along the coast. Douglas-fir and western hemlock dominate the forest cover, although western redcedar and giant chinkapin often occur (Table 5). Common successional species are red alder and bigleaf maple. The main understorey species are salal, dull Oregon-grape, Pacific rhododendron (*Rhododendron macrophyllum*), vine maple (*Acer circinatum*), red huckleberry (*Vaccinium parviflorum*), and sword fern.

The CWHdm_OR mostly occurs at elevations between the CWHxm_OR and the CWHvm_OR. However, towards the west coast, it abuts the CWHdm_OC.

Zonal Habitat types: TSHE/MANE2-GASH, TSHE/RHMA3-MANE2, TSHE/MANE2 (McCain and Diaz 2002b; McCain and Diaz 2002a).

CWHdm_OR							
	A	B	C	D	E		Habitat Types/Associations
0							
1	[Fd] (HwRaOy)			102			TSHE/RHMA3/XETE, TSHE/GASH
2	Fd [HwOy] (RaOaGp)			103			TSHE/GASH-RHMA3, TSHE/RHMA3-GASH, PSME/HODI/WHMO
3		FdHw		101			TSHE/MANE2-GASH, TSHE/GASH-BENE2, PSME/MANE2
4		[CwMbDrOy](OaGp)					TSHE/ACCI-GASH, TSHE/RHMA3-MANE2, TSHE/MANE2, TSHE/ACTR
5	110	HwFd[CwMbDr](BgOa)		FdCw[HwDrMb](Bg)	112		TSHE/MANE2/POMU, TSHE/GASH/POMU, TSHE/POMU, TSHE/POMU-OXOR
6	111	Hw [FdCwDrMb](Bg)		Cw[HwDrMbActBg](Ss)	113		TSHE/OXOR, TSHE/RUSP-ACCI, TSHE/RUSP, TSHE/LYAM
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 14. CWHdm_OR tree species suitability and plant associations displayed on edatopic grid.

2.4.7 CWHdm_OC – Dry Maritime Oregon Coast CWH

This subzone occurs on the windward, submontane slopes of the Coast Range of Oregon, inland from the “hypermaritime” climate along the coast.

Douglas-fir and western hemlock dominate the forest cover, although Sitka spruce occurs frequently (Table 5). Western redcedar is common. Common successional species are red alder and bigleaf maple. The main understorey species are salal, red huckleberry, Pacific rhododendron (*Rhododendron macrophyllum*), evergreen huckleberry (*Vaccinium ovatum*), salmonberry (*Rubus spectabilis*), red wood-sorrel (*Oxalis oregana*), Siberian springbeauty (*Claytonia siberica*), and sword fern.

The CWHdm_OC mostly occurs at elevations between the CWHwh_OR and the CWHdm_OR.

Zonal Habitat types: PISI/MEFE-VAPA, TSHE/GASH-NWO Coast, TSHE/RHMA3-VAOV2, TSHE/VAOV2, TSHE/MANE2-GASH-NWO Coast (McCain and Diaz 2002b).

CWHdm_OC							
	A	B	C	D	E		Habitat Types/Associations
0							
1	Fd (Hw)			102			TSHE/GASH
2	Fd [Hw] (Dr)			103			TSHE/GASH-RHMA3, TSHE/RHMA3-GASH
3		FdHw		101			TSHE/MANE2-GASH-NWO, TSHE/GASH
4		[SsDr](CwMb)					PISI/MEFE-VAPA, TSHE/RHMA3-VAOV2, TSHE/VAOV2
5	110	Hw[FdCw SsDr](Mb)		FdCwSs [HwDrMb]		112	TSHE/RHMA3/POMU, PISI/OXOR, TSHE/POMU, TSHE/OXOR
6	111	HwDr[FdCwSs] (Mb)		FdCwSs [HwDrMb]		113	TSHE/RUSP, TSHE/RUSP-ACCI, PISI/RUSP, PISI/OPHO, TSHE/OPHO
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 15. CWHdm_OC tree species suitability and plant associations displayed on edatopic grid.

2.4.8 CWHds_WA – Dry Submaritime Washington CWH

This subzone occurs in the eastern Cascade Mountains of northern Washington, south to the central Oregon Cascades. Douglas-fir, western hemlock, and western redcedar are the dominant forest overstory species; however, grand fir is also common (Table 5). Western white pine and bigleaf maple can occur in successional stands. The main understorey species are dull Oregon-grape, vine maple (*Acer circinatum*), falsebox (*Paxistima myrsinites*), and twinflower (*Linnaea borealis*). Black huckleberry (*Vaccinium membranaceum*) and queen’s cup (*Clintonia uniflora*) are often present.

The CWHds_WA occurs in maritime climatic areas at elevations below the CWHms_WA, in its northern distribution, or the CWHms_OR in the south. This subzone is a southern variation of the CWHds in British Columbia (Green and Klinka 1994).

Zonal Habitat types: TSHE/BENE (WEN), TSHE/ACCI/CLUN, TSHE/MANE2, TSHE/PAMY/CLUN2 (Lillybridge et al. 1995).

CWHds_WA							
	A	B	C	D	E		Habitat Types/Associations
0							
1	[FdPl](Py)			102			TSHE/BENE, ABGR/SPBEL/PTAQ, PSME/PAMY, PSME/ARUV
2	Fd[BgPl](HwCwPyEp)			103			
3		Fd		101			Bg alliance, TSHE/ACCI/CLUN, TSHE/ACTR, TSHE/PAMY,
4		[BgCwHwPw](BaEpMb)					ABGR/ACTR, ABGR/HODI
5	110	Hw [CwFdPw] (Ep)	BgCw [FdPw Act](BaHw)		112		
6	111	Hw [CwFd] (DrSx)	BgCw [ActSx] (FdDrHw)		113		THPL/OPHO, TSHE/ASCA3, ALSI-OPHO
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 16. CWHds_WA tree species suitability and plant associations displayed on edatopic grid.

2.4.9 CWHms_WA – Moist Submaritime Washington CWH

This subzone occurs in the eastern Cascade Mountains of Washington, where the climate is still influenced somewhat by the Pacific. Amabilis fir, western hemlock, and Douglas-fir are the main canopy tree species (Table 5). Western redcedar or subalpine fir (*Abies lasiocarpa*) can be a component. Western white pine occurs in younger stands. The main understorey species are black huckleberry (*Vaccinium membranaceum*), twinflower (*Linnaea borealis*), and queen’s cup (*Clintonia uniflora*).

The CWHms_WA typically occurs at elevations above the CWHds_WA and below the MHms_WA; however, it also occurs below the ESSFmw_WA in the northeastern part of its range. To the east, it abuts the IGFdk_WA as the climate transitions into a more typical continental climate. This subzone is a southern variation of the CWHms in British Columbia (Green and Klinka 1994).

Zonal Habitat types: ABAM/VAME-PYSE, ABAM/VAME-ORSE, ABAM/VAME/CLUN (WEN), ABAM/VAME/CLUN2 & ABAM/ACCI (Brockway et al. 1983; Lillybridge et al. 1995).

CWHms_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	PI [FdLwPy](HwHm)			102		PSME/PAMY; TSHE/MANE2
2	Fd[HwLw](BaBgCwPwHm)			103		Ba, Fd and Hw alliances
3		FdHwBa		101		ABAM/VAME/CLUN, ABAM/VAME-PYSE, TSHE/BENE
4		[BgPwCw] (BpHm)				ABAM/XETE, ABAM/MEFE, ABAM/VAME-ORSE
5	110	HwCw[BaBl] (Hm)	CwFd[HwBgBaA ctSs](BlBpPw)		112	ABAM/GYDR; TSHE/ACCI/ACTR
6	111	HwCw[BaBl] (Hm)	Cw[FdHwBaAct Ss](BlBpDr)		113	ABAM/OPHO
7						

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 17. CWHms_WA tree species suitability and plant associations displayed on edatopic grid.

2.4.10 CWHms_OR – Moist Submaritime Oregon CWH

This is the easternmost subzone of the CWH zone in Oregon and southern Washington, occurring at mid elevations of the Cascade Mountains where the climate is becoming less maritime. Amabilis fir, western hemlock and Douglas-fir are the main canopy tree species (Table 5). Black huckleberry and beargrass (*Xerophyllum tenax*) are key understorey species; others include Pacific rhododendron, prince’s pine (*Chimaphila umbellata*), queen’s cup, bunchberry (*Cornus canadensis*) and twinflower.

The CWHms_OR typically occurs at elevations below the MHdm_OR. It abuts the CWHdm_OR to the west.

Zonal Habitat types: ABAM/VAME/XETE, ABAM/RHMA/XETE, ABAM/VAME/CLUN (Brockway et al. 1983; McCain and Diaz 2002a; Hemstrom et al. 1982).

CWHms_OR							
	A	B	C	D	E		Habitat Types/Associations
0							
1	PI [Fd](HwHm)			102			ABGR/ARUV
2	Fd[Hw](BaBgCwPwHm)				103		ABAM/MANE, ABAM/VAME/XETE, ABAM/RHMA3/XETE, ABAM/RHMA3-MANE2
3		BaHwFd		101			ABAM/RHMA3-VAAL/COCA13, ABAM/VAAL/COCA13
4		[PwBpCw](BgOyHm)					ABAM/VAME/CLUN, ABAM/MEFE, ABAM/VAAL, ABCO/BENE/ACTR
5	110	HwCw[Ba] (FdHm)		CwFd[HwBaBpA ctDr](BgPw)		112	ABAM/TITR, ABAM/TIUN, TSHE/ACTR, ABAM-TSHE/VAME/ACTR
6	111	HwCw[Ba](Hm)		Cw[FdHwBaBpA ctSx](Dr)		113	ABAM/OPHO
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 18. CWHms_OR tree species suitability and plant associations displayed on edatopic grid.

2.4.11 CWHvm_WA – Very Wet Maritime Washington CWH

This subzone occurs on the submontane and montane slopes of Olympic Mountains and the western slopes of the Cascade Mountains of Washington. Amabilis fir and western hemlock are the characteristic dominant tree species (Table 5). Western redcedar often occurs; Douglas-fir is infrequent. The key understorey species are Alaskan blueberry (*Vaccinium alaskaense*) and oval-leaved blueberry (*Vaccinium ovalifolium*); others include five-leaved bramble (*Rubus pedatus*), deer fern (*Blechnum spicant*), bunchberry (*Cornus canadensis*), and queen’s cup (*Clintonia uniflora*).

The CWHvm_WA typically occurs at elevations above the CWHdm_WA and below the MHmm_WA. This subzone is a southern variation of the CWHvm in British Columbia (Green and Klinka 1994).

Zonal Habitat types: ABAM/VAAL/CLUN, ABAM/VAOV/CLUN2, ABAM/VAOV, ABAM/VAAL (Brockway et al. 1983; Hemstrom et al. 1982; Franklin et al. 1988).

CWHvm_WA							
	A	B	C	D	E		Habitat Types/Associations
0							
1	HwCwFd (BaYcHm)			102			TSHE/GASH-BENE, TSHE/GASH, TSHE/BENE, TSHE/GASH-XETE
2	HwCwFd [Ba] (DrPwYcHm)			103			TSHE/BENE-CHME, ABAM/BENE
3		HwCwBa		101			ABAM/VAAL-CLUN, ABAM/VAAL, ABAM/VAAL-GASH,
4		[PwFdDr] (BpYcMbHm)					ABAM/VAAL-BENE, TSHE/VAAL, ABAM/VAAL
5	110	HwCwBa[Dr] (YcHm)		CwBa [HwDrMb]	112		TSHE/POMU-TITR, ABAM/VAAL-TIUN, ABAM/VAAL-MADI2, ABAM/TIUN-STRO
6	111	HwCwBa[Dr][Ss] YcHm)		CwBaSs[HwDr MbAct](Hm)	113		ABAM/OPHO-VAAL, TSHE/OPHO-ATFI, ABAM/RUSP-BLSP, ABAM/LYAM
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 19. CWHvm_WA tree species suitability and plant associations displayed on edatopic grid.

2.4.12 CWHvm_OR – Very Wet Maritime Oregon CWH

This subzone occurs at mid elevations of the western slopes of the Cascade Mountains of Oregon. Amabilis fir and western hemlock are the characteristic dominant tree species (Table 5). Douglas-fir often occurs; noble fir (*Abies procera*) is infrequent. The key understorey species are Alaskan blueberry (*Vaccinium alaskaense*), oval-leaved blueberry (*Vaccinium ovalifolium*), and vine maple (*Acer circinatum*). Black huckleberry (*V. membranaceum*) is often present; other species include bunchberry (*Cornus canadensis*), queen’s cup (*Clintonia uniflora*), dwarf bramble (*Rubus lasiococcus*), and beargrass (*Xerophyllum tenax*).

This subzone occurs at elevations above the CWHdm_OR. Where mountains are high enough, the CWHvm_OR occurs below the MHdm_OR.

Zonal Habitat types: ABAM/VAOV, ABAM/VAAL, ABAM/VAAL/COCA13, ABAM/MEFE (McCain and Diaz 2002a).

CWHvm_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1	HwFd (CwBaHm)			102		TSHE/RHMA3-GASH, TSHE/RHMA3-MANE2, TSHE/MANE2-DRY
2	HwFd[CwBa] (DrHm)			103		TSHE/GASH, ABAM/GASH
3		FdHwBa		101		TSHE/ACTR, ABAM/VAAL-GASH, ABAM/VAAL/COCA13, ABAM/VAAL
4		[CwBpPwDr] (OyHm)				TSHE/BENE, TSHE/MANE2-GASH, ABAM/RHMA3-VAAL/COCA13
5	110	HwCwBa[Dr] (FdHm)	CwBa[HwDrBpFd](MbHm)		112	ABAM/TITR, ABAM/TIUN, ABAM/OXOR, ABAM/ACCI/TITR, TSHE/POMU
6	111	HwCwBa[Dr] (Hm)	CwBa[HwDr Act](FdHm)		113	ABAM/OPHO, TSHE/OPHO/MAST4, TSHE/VAAL-OPHO, TSHE/LYAM
7						

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 20. CWHvm_OR tree species suitability and plant associations displayed on edatopic grid.

2.4.13 CWHmh_OR – Moist Hypermaritime Oregon CWH

This subzone occurs as a narrow strip along the outer coast of southern Oregon. Sitka spruce, western hemlock, and Douglas-fir are the main trees. Port Orford-cedar (*Chamaecyparis lawsoniana*), shore pine (*Pinus contorta* var. *contorta*), California laurel (*Umbellularia californica*), and red alder often occur (Table 5). The understory is dominated by shrubs such as evergreen huckleberry (*Vaccinium ovatum*), red huckleberry (*V. parviflorum*), salal, Pacific rhododendron (*Rhododendron macrophyllum*), cascara (*Frangula purshiana*), and California wax-myrtle (*Morella californica*).

The CWHmh_OR occurs in the “fog belt” along the coast. To the south is the CRFdm_CA and to the north is the CWHwh_OR. The CMXmm_OR abuts this subzone on its eastern edge.

Zonal Habitat types: CHLA/VAOV2, TSHE/VAOV2, PISI/GASH-VAOV2 (McCain and Diaz 2002b; Hemstrom and Logan 1986; Christy, Kagan, and Wiedemann 1998).

CWHmh_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1	PI (FdHwSsDr)			102			PICOC-PISI/VAOV2, PICOC-PSME/MYCA-VAOV2
2	Fd [SsPlcHw](Dr)			103			
3		HwFdSs		101			
4		[DrYpKc](Cw)					CHLA/VAOV2, PISI/GASH-VAOV2, TSHE/VAOV2
5	110	Hw[SsCwYpDr] (FdKc)	HwSs[FdCwDr Yp](MbKcOl)		112		PSME/RUSP/POMU, PISI-ABCO/RUSP, TSHE/RUSP, TSHE/RUSP-ACCI
6	111	Hw[CwDrYp] (SsFdPlc)	HwSs[FdCw DrYp] (Mb)		113		
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 21. CWHmh_OR tree species suitability and plant associations displayed on edatopic grid.

2.4.14 CWHwh_WA – Wet Hypermaritime Washington CWH

This subzone occurs on the windward slopes of the Coast Range in Washington and just into north coastal Oregon. Characteristic trees are western hemlock, Sitka spruce, and Douglas-fir. Western redcedar is often present (Table 5). Red alder is the main deciduous tree species. The understory is characterized by Cascara buckthorn (*Frangula purshiana*), salal, salmonberry (*Rubus spectabilis*), sword fern, and redwood sorrel (*Oxalis oregana*).

The CWHwh_WA occurs along the coast, just inland from the CWHvh_WA, and at elevations below the CWHdm_WC. To the south is the CWHwh_OR.

Zonal Habitat types: TSHE/VAOV-GASH, TSHE/GASH/OXOR, TSHE/VAOV, TSHE/VAAL/OXOR (Henderson et al. 1989; McCain and Diaz 2002b).

CWHwh_WA							
	A	B	C	D	E		Habitat Types/Associations
0							
1	[PlcFdHw](CwDr)			102			TSHE/GASH, TSHE/VAOV2
2	FdHwCw [Ss](DrPlc)			103			TSHE/MANE2, PSME/MANE2
3		FdHwCw		101			TSHE/VAOV-GASH, TSHE/GASH/OXOR, TSHE/VAOV
4		[SsDr](MbBa)					TSHE/VAAL/OXOR
5	110	CwHw[Dr](Fd)		HwSs[FdCwDr] (MbActUp)		112	TSHE/POMU-OXOR, TSHE/ACCI/POMU, TSHE/POMU, PISI/POMU
6	111	CwHw[Dr](Fd)		HwSs[FdCwDr] (MbActUp)		113	TSHE/RUSP, PISI/RUSP, TSHE/RUSP-ACCI, TSHE/RUSP-GASH
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 22. CWHwh_WA tree species suitability and plant associations displayed on edatopic grid.

2.4.15 CWHwh_OR – Wet Hypermaritime Oregon CWH

This subzone occurs as a narrow strip along the outer coast of mid to north coast Oregon. Sitka spruce and Douglas-fir are the characteristic trees, although western hemlock, shore pine (*Pinus contorta* var. *contorta*), and red alder are common (Table 5). The understorey is dominated by shrubs such as evergreen huckleberry (*Vaccinium ovatum*) and salal. Pacific rhododendron (*Rhododendron macrophyllum*) often occurs.

The CWHwh_OR occurs in the “fog belt” along the coast. To the south is the CWHmh_OR and to the north is the CWHvh_WA. The CWHdm_OC abuts this subzone to the east.

Zonal Habitat types: PICOC-PSME/MYCA-VAOV2, PICOC-PISI/VAOV2, TSHE/RHMA3-VAOV2, PISI/GASH, PISI/VAOV2 (McCain and Diaz 2002b; Hemstrom and Logan 1986; Christy, Kagan, and Wiedemann 1998)

CWHwh_OR							
	A	B	C	D	E		Habitat Types/Associations
0							
1	Plc [FdHw]			102			PICOC/CYSC4/AMAR4, PICOC/ARUV, PICOC/ARCO3
2	FdPlc [SsHw](Dr)			103			
3		FdHwSs		101			PICOC-PISI/VAOV2, PICOC-PSME/MYCA-VAOV2, PSME/PHMA3-VAOV2
4		[PlcDr](Cw)					TSHE/RHMA3-VAOV2, PISI/VAOV2, PISI/GASH
5	110	Hw[SsDr] (FdCw)		HwSs[FdDr] (Cw)		112	PISI/POMU, PISI/OXOR, PISI/MEFE-VAPA
6	111	Hw[SsDr] (FdCw)		HwSs[FdDr] (Cw)		113	PISI/RUSP, PISI/RUSP-GASH, TSHE/RUSP
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 23. CWHwh_OR tree species suitability and plant associations displayed on edatopic grid.

2.4.16 CWHvh_WA – Very Wet Hypermaritime Washington CWH

This subzone occurs as a narrow strip along the outer coast of Washington, from the NW tip of the Olympic Peninsula south to extreme NW Oregon. Western hemlock, Sitka spruce, Douglas-fir, and western redcedar are the primary canopy trees (Table 5). Red alder is a common deciduous tree. The understorey is characterized by the shrubs salal, salmonberry (*Rubus spectabilis*), Cascara buckthorn (*Frangula purshiana*), and evergreen huckleberry (*Vaccinium ovatum*), and the ferns deer fern and sword fern.

The CWHvh_WA is a southern variation of the CWHvh1 in British Columbia (Green and Klinka 1994). The CWHwh_WA occurs inland from this subzone.

Zonal Habitat types: PISI/GASH, TSHE/GASH, TSHE/VAOV-GASH (Henderson et al. 1989).

CWHvh_WA							
	A	B	C	D	E		Habitat Types/Associations
0							
1	[Plc](HwCwDr)			102			PSME/GASH, TSHE/GASH-VAOV2
2	HwCw[FdSs](DrUpPlc)			103			
3		HwCw		101			
4		[FdSsDr](Up)					PISI/GASH, TSHE/GASH, TSHE/VAOV-GASH
5	110	CwHw[Dr]		HwSs[CwDr] (Up)		112	TSHE/GASH/POMU, TSHE/POMU, PISI/POMU
6	111	CwHw[Dr]		HwSs[CwDr] (UpActPlc)		113	TSHE/RUSP, TSHE/RUSP-ACCI, TSHE/RUSP-GASH, TSHE/LYAM3
7							

Tree species codes are presented in Appendix 1 with many codes in Table 5; Habitat type / association codes are in Appendix 2.

Figure 24. CWHvh_WA tree species suitability and plant associations displayed on edatopic grid.

2.5 COASTAL WHITE FIR [CWF]

The Coastal White Fir (CWF) Zone is a mid-elevation (lower montane) zone of southwestern Oregon and northern California. It is characterized by white fir (*Abies concolor*) as a climax tree species (Franklin and Dyrness 1988; Sawyer 2007) (Table 1). Other common trees are Douglas-fir (*Pseudotsuga menziesii*), incense-cedar (*Calocedrus decurrens*), sugar pine (*Pinus lambertiana*), and at upper elevations, Shasta red fir (*Abies magnifica* var. *shastensis*) or California red fir (*Abies magnifica*). In the Oregon range of the zone, western white pine (*Pinus monticola*) and giant chinquapin (*Chrysolepis chrysophylla*) are more frequent.

The forest understorey is quite diverse and dominated by the shrubs dull Oregon-grape (*Mahonia nervosa*), trailing snowberry (*Symphoricarpos hesperius*), and oceanspray (*Holodiscus discolor*), and herbs such as vanilla-leaf (*Achlys triphylla*), twinflower (*Linnaea borealis*), prince's pine (*Chimaphila umbellata*), and sword fern (*Polystichum munitum*).

Historically, the CWF was included in the Mixed Conifer vegetation zone (Allen 2005).

Shasta red fir increases with elevation, and the Mountain Hemlock – Shasta Fir (MHRF) zone occurs above the CWF. At elevations below the CWF, the Coastal Mixed Evergreen (CMX) zone is generally found. Western hemlock (*Tsuga heterophylla*) increases in the moister, northern portions of the CWF—the Coastal Western Hemlock (CWH) abuts this zone to the north.

USNVC: Zonal forests are included in Macrogroup M023: Southern Vancouverian Montane-Foothill Forest [*Calocedrus decurrens* – *Pinus jeffreyi* – *Abies lowiana* Forest], specifically G344: Californian Montane Conifer Forest & Woodland.

2.5.1 CWF Subzones

Four subzones (Table 6) are recognized over a climatic moisture and continentality gradient.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 6. CWF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	CWFds_CA	CWFdm_OR	CWFfm_OR	CWFfw_OR	Common Name	BC Tree Code
<i>Abies concolor</i>	C*	C	C	C	white fir	Bc
<i>Calocedrus decurrens</i>	c	c	c	c	incense-cedar	Oa
<i>Abies magnifica</i>	c			c	California red fir	Bm
<i>Chrysolepis chrysophylla</i>		c	c	c	giant chinkapin	Oy
<i>Tsuga heterophylla</i>			c		western hemlock	Hw
<i>Quercus chrysolepis</i>				c	canyon live oak	Qc
<i>Pseudotsuga menziesii</i>	s	S	S	S	Douglas-fir	Fd
<i>Pinus lambertiana</i>	s	s	s	s	sugar pine	Ps
<i>Pinus ponderosa</i>	s	S	s		ponderosa pine	Py
<i>Pinus jeffreyi</i>	s				Jeffrey pine	Pz
<i>Quercus kelloggii</i>	s				California black oak	Qb
<i>Pinus contorta</i>	s				lodgepole pine	Pl
<i>Pinus monticola</i>		s	s	s	western white pine	Pw
<i>Acer macrophyllum</i>			s	s	bigleaf maple	Mb

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.5.2 CWFwm_OR – Wet Maritime Oregon CWF

The CWHwm_OR occurs in SW Oregon and NW California on mid- to high-elevation land areas along the Coast Range. Zonal forests are dominated by white fir and Douglas-fir (Table 6). Other frequent trees are incense-cedar, sugar pine, giant chinquapin, and arbutus. Shasta red fir increases in abundance with elevation. This subzone also has some tanoak (*Notholithocarpus densiflorus*) and Port Orford-cedar (*Chamaecyparis lawsoniana*), reflecting a more maritime climate.

The forest understorey is quite diverse, comprised of dull Oregon-grape, baldhip rose (*Rosa gymnocarpa*), beaked hazelnut (*Corylus cornuta*), trailing snowberry, oceanspray, red huckleberry (*Vaccinium parviflorum*), common whipplea (*Whipplea modesta*), vanilla-leaf, twinflower, prince's pine, and sword fern.

In Oregon and adjacent California, this subzone occurs at elevations above the CMXwm_OR. Further into California it occurs above the climatically drier CWFdm_OR.

Zonal Habitat types: ABCO/BENE2, ABCO-CADE27/TRLA6, ABCO/BENE2/ACTR, ABCO-ABMAS/QUSA2, ABCO-ABMAS/ACTR (Atzet et al. 1996)

CWFwm_OR						Associations
	A	B	C	D	E	
0						
1	FdQcRaOaOy [PsPySr](OtPk)				102	PSME-QUCH2/BENE2, PSME-QUCH2/RHDI6, LIDE3-PSME-QUCH2/BENE2, ABCO/QUVA
2	FdOa [RaQcPsBcOyPy](PzOt)				103	PSME-ABCO, ABCO-PSME/ROGY, PSME/DRY SHRUB, ABCO-LIDE3/CHUM, ABCO/BENE2/LIBOL
3		FdBc			101	CHLA-ABCO/BENE2, ABCO-ABMAS/QUSA2, ABCO-ABMAS/ACTR
4				[PsPwOaOy](PzBm)		ABCO/BENE2, ABCO-CADE27/TRLA6, ABCO/BENE2/ACTR
5			Fd Bc (OaBm)		110	PSME/BENE2/POMU, ABCO/SYMO, ABCO/RHMA3-QUSA2
6	111	Yp [BcFd]		FdBc [Mb](YpDr)	113	
7						

Tree species codes are presented in Appendix 1 with many codes in Table 6; Habitat type / association codes are in Appendix 2.

Figure 25. CWFwm_OR tree species suitability and plant associations displayed on edatopic grid.

2.5.3 CWFmm_OR – Moist Maritime Oregon CWF

The CWFmm_OR occurs in SW Oregon, on mid- to high-elevation land areas along the Cascade Range, inland and north from the CWFwm_OR. Forests are similar to the CWFwm_OR but lack tanoak and Port Orford-cedar and have a moderate amount of western hemlock (Table 6). Zonal forests are dominated by white fir and Douglas-fir. Other frequent trees are incense-cedar, sugar pine, and giant chinquapin. Shasta red fir can occur at higher elevations. This subzone also has some arbutus on dry sites.

The forest understorey is diverse, comprised of dull Oregon-grape, baldhip rose (*Rosa gymnocarpa*), trailing snowberry, rattlesnake plantain (*Goodyera oblongifolia*), common whipplea (*Whipplea modesta*), vanilla-leaf, twinflower, prince's pine, pathfinder (*Adenocaulon bicolor*), and trailing blackberry (*Rubus ursinus*).

This subzone occurs above the CWHdm_OR in the northern half of its distribution and above the CMXdm_OR in its southern range. The MHRFmm_OR occurs above.

Zonal Habitat types: ABCO-CADE25/TRLA6, ABCO/BENE2/LIBOL, ABCO/BENE2/ACTR, TSHE-ABCO/BENE2 (Atzet et al. 1996).

CWFmm_OR						Associations
	A	B	C	D	E	
0						
1	FdOaPyRa[Ps](BcOyQcGp)				102	PSME-PIPO/RHDI6, PSME-QUCH2/BENE2
2	FdOaRa[PsBcOy](GpPy)				103	PSME-CACH6/BENE2, PSME/DRY SHRUB, PSME-CADE27/BEPI2, PSME/HODI/WHMO
3		FdBc [OyOz			101	ABCO-PSME/ROGY, ABCO/BENE2, ABCO-CADE27/TRLA6, PSME-ABCO
4		PsHw](PwGpPyBm)				ABCO/BENE2/ACTR, ABCO/BENE2/LIBOL, TSHE-ABCO/BENE2
5	110	FdBc[Hw](Oa)	Fd [MbOaBc PsHw](GpPy)		112	ABCO/GASH-BENE2, ABCO/RHMA3-BENE2, PSME/GASH-RHMA3
6	111	FdBcHw	Fd[MbBc Hw](CwPsGp)		113	TSHE/ACCI-RHMA3, TSHE/RHMA3-GASH, TSHE/GASH-RHMA3,
7						

Tree species codes are presented in Appendix 1 with many codes in Table 6; Habitat type / association codes are in Appendix 2.

Figure 26. CWFmm_OR tree species suitability and plant associations displayed on edatopic grid.

2.5.4 CWFdm_OR – Dry Maritime Oregon CWF

The CWFdm_OR occurs in SW Oregon and NW California, on mid- to high-elevation land areas along the Coast and Cascade ranges, inland from the CWFwm_OR. Forests are similar to the CWFwm_OR but lack tanoak or Port Orford-cedar and have more Ponderosa pine (Table 6). Zonal forests are dominated by white fir and Douglas-fir. Other frequent trees are incense-cedar, sugar pine, and giant chinquapin. Shasta red fir increases in abundance with elevation. This subzone also has some arbutus on dry sites.

The forest understorey is diverse, comprised of dull Oregon-grape, baldhip rose (*Rosa gymnocarpa*), trailing snowberry, rattlesnake plantain (*Goodyera oblongifolia*), common whipplea (*Whipplea modesta*), vanilla-leaf, twinflower, prince's pine, pathfinder (*Adenocaulon bicolor*), and trailing blackberry (*Rubus ursinus*).

This subzone mostly occurs above the CMXdm_OR. The MHRFdm_OR typically occurs above, but in some part of California, the CWFwm_OR occurs at higher elevations. The CWFmm_OR occurs at similar elevations northward where western hemlock is common.

Zonal Habitat types: ABCO-CADE25/TRLA6, ABCO/SYMO, ABCO-CACH6/PAME/CHUM, ABCO/ARNE, ABCO-PSME/ROGY (Atzet et al. 1996).

CWFdm_OR						Associations	
	A	B	C	D	E		
0							
1	FdOaRaPy[QbPs](BcOyQg)				102	PSME-PIPO/RHDI6, PSME-CADE27/BEPI2, PSME-QUCH2/BENE2	
2	FdOaPy[RaOyPsBc](Qb)				103	PSME-ABCO/SYMO, PSME/DRY SHRUB, PSME/ARNE, PIPO-PSME	
3		FdBc			101	ABCO/ARNE, PSME-ABCO, ABCO-PSME/ROGY	
4		[OyOaPs] (RaGpPy)				ABCO/SYMO, ABCO-CADE27/TRLA6, ABCO-CACH6/PAMY/CHUM	
5	110	FdBc(OaOy)		FdBc(OaOy) (PwPsGpPy)		112	ABCO/BENE2, ABCO/BENE2/LIBOL
6	111	FdBc		FdBc[Mb](Pw PsDw)		113	ABCO-ABMAS/CHUM-ANDE3
7							

Tree species codes are presented in Appendix 1 with many codes in Table 6; Habitat type / association codes are in Appendix 2.

Figure 27. CWFdm_OR tree species suitability and plant associations displayed on edatopic grid.

2.5.5 CWFds_CA – Dry Submaritime California CWF

This subzone occurs on the leeward slopes of the Coast Mountains and the windward slopes of the Cascade and Sierra Nevada mountains of northern California, where the climate has a somewhat maritime influence (i.e., submarine). Our data is limited for this subzone; however, forests are dominated by white fir, often with some Douglas-fir, ponderosa pine, incense-cedar, sugar pine, and/or Jeffrey pine (Table 6). California red fir increases in abundance with elevation. Giant sequoia occurs in this subzone.

Conceptually, the CWFds_CA occurs at elevations above the CMXxm_CA; however, the CWHdm_OR often occurs in between the two subzones. In its southeastern extent, it abuts the IWfxm_CA. The MHRFds_CA is generally the subalpine forested zone at higher elevations.

Zonal Association: White fir – Douglas-fir /Huckleberry oak; White fir – Douglas-fir /Trailing snowberry

CWFds_CA							Associations
	A	B	C	D	E		
0							
1	QbPyPsPz			102			BcQb/Arctpat-Quervac; BcQb/Arctnev-Quervac; Bc/Ceancor; Bc/Ceanint
2	[QcFdBcOa]						
3		BcFdOa		101			BcFd/Quervac; BcFd/Sympmol
4		[QbObPyPsPz](PIBm)					
5		Bc			110		Bc/Ribes; Bc/Salix; Bc/Carex
6		[PyPsPzFdOa](PI)					
7							

Tree species codes are presented in Appendix 1 with many codes in Table 6; Habitat type / association codes are in Appendix 2.

Figure 28. CWFds_CA tree species suitability and plant associations displayed on edatopic grid.

2.6 MOUNTAIN HEMLOCK – RED FIR ZONE [MHRF]

The Mountain Hemlock – Red Fir (MHRF) Zone is a high montane to subalpine zone of the Sierra Nevada and Cascade mountain ranges of California and southern Oregon, characterized by red fir (*Abies magnifica*, both vars. *magnifica* and *shastensis*) and mountain hemlock (*Tsuga mertensiana*) as the dominant tree species on mature, zonal sites (Table 1). White fir (*A. concolor*) is common in mature forests at lower elevations. Western white pine (*Pinus monticola*) and Sierra lodgepole pine (*P. contorta* var. *murrayana*) are common successional tree species.

Some common understorey species include pinemat manzanita (*Arctostaphylos nevadensis*), greenleaf manzanita (*A. patula*), grouseberry (*Vaccinium scoparium*), prince's pine (*Chimaphilla umbellata*), and one-sided wintergreen (*Orthilia secunda*).

The Coastal White Fir (CWF) zone occurs at elevations below the MHRF over most of the range although on the lee side of the Sierra Nevada Mountains, the Interior White Fir (IWF) zone often occurs below the MHRF.

USNVC: Zonal forests are included in Macrogroup M025: Vancouverian Subalpine-High Montane Forest [*Abies magnifica* – *Tsuga mertensiana* – *Pinus contorta* var. *murrayana* Forest], specifically G749: Sierra-Cascade Red Fir – Mountain Hemlock Forest Group.

Comment: It is possible that subalpine elevations, at least in California, could be characterized as a new Sierra Nevada Subalpine zone—open woodland of mountain hemlock, whitebark pine, Sierra lodgepole pine (ssp. *murrayana*), western white pine, and Sierra juniper. However, as mountain hemlock is the most common tree in this elevational belt, the zone has been included in the MHRF.

2.6.1 MHRF Subzones

Three subzones (Table 7) are recognized for the high montane portion of this zone, that encompass continentality and climatic moisture gradients. There are conceptually an additional three subzones for the subalpine elevations, termed “parkland”, but our data does not allow their characterization. They would be coded with a ‘p’ appended to the code for the montane subzone, e.g., the subalpine above the MHRFs would be coded MHRFdsp.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 7. MHRF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	MHRFds_CA	MHRFdm_OR	MHRFmm_OR	Common Name	BC Tree Code
<i>Abies concolor</i>	C*	C	c	white fir	Bc
<i>Abies magnifica</i>	C	C	C	red fir	Bm
<i>Tsuga mertensiana</i>	c	c	C	mountain hemlock	Hm
<i>Calocedrus decurrens</i>		c		incense-cedar	Oa
<i>Abies procera</i>			c	noble fir	Bp
<i>Abies amabilis</i>			c	amabilis fir	Ba
<i>Pinus monticola</i>	S	s	s	western white pine	Pw
<i>Pinus jeffreyi</i>	s			Jeffrey pine	Pz
<i>Pinus lambertiana</i>	s			sugar pine	Ps
<i>Pinus contorta</i> var. <i>murrayana</i>	S		S	Sierra lodgepole pine	Pl
<i>Pseudotsuga menziesii</i>		s	s	Douglas-fir	Fd
<i>Chrysolepis chrysophylla</i>		s	s	giant chinquapin	Oy

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.6.2 MHRFmm_OR – Moist Maritime Oregon MHRF

This subzone occurs mostly in southern Oregon, on the windward side of the Cascade Mountains. Mountain hemlock is a common climax species along with red fir (Table 7), with mountain hemlock increasing in dominance with elevation. Sierra lodgepole pine and western white pine are common successional species. Grouseberry, prince’s pine, and one-sided wintergreen characterize the understory. Other frequent species include black huckleberry (*Vaccinium membranaceum*) and dwarf bramble (*Rubus lasiococcus*).

The CWFmm_OR occurs at elevations below the MHRFmm_OR. The MHRFmm_OR can abut the MHdm_OR on its western edge (in the north) and the MHRFds_CA on its eastern edge.

Zonal Habitat types: TSME/VASC/CHUM, ABMAS/VAME/CHUM, ABSH/VAME/CHUM, TSME/HERB, TSME-ABMAS/RULA2/PYSE and TSME/VASC (Atzet et al. 1996)

MHRFmm_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1				102		PICO-TSME/DEP, ABMAS-TSME/ARNE/CHUM, TSME/ARNE/CHUM,
2	[BmHmPIPw](FdPa)					TSME/VASC/CHUM, TSME/VASC, ABSH-TSME/ARNE/CAIN3
3		BmHm		101		TSME/HERB, TSME-ABMAS/VAME/CHUM, ABAM-TSME/VAME/ACTR
4		[BcPIPwBp] (FdOy)				ABCO-ABMAS/CHUM-ANDE3, ABMAS/VAME/CHUM, TSME-ABMAS/RULA2/PYSE
5					110	ABCO/BENE2/ACTR, ABCO-ABMAS/ACTR, ABAM/ROGY/ACTR
6		BcBm [HmFdPw] (BaOa)				
7						

Tree species codes are presented in Appendix 1 with many codes in Table 7; Habitat type / association codes are in Appendix 2.

Figure 29. MHRFmm_OR tree species suitability and plant associations displayed on edatopic grid.

2.6.3 MHRFdm_OR – Dry Maritime Oregon MHRF

This subzone occurs in southern Oregon and northern California on the windward side of the Cascade and Sierra Nevada mountains, respectively. Red fir is the main climax species, co-occurring with white fir at lower elevations. Mountain hemlock is a frequent climax species, especially at higher elevations. Western white pine and Douglas-fir (*Pseudotsuga menziesii*) are common successional species (Table 7). Common understorey species are falsebox (*Paxistima myrsinites*), trailing snowberry (*Symphoricarpos hesperius*), Columbian windflower (*Anemone deltoidei*), prince’s pine, one-sided wintergreen, and star-flowered false Solomon’s-seal (*Maianthemum stellatum*).

The MHRFdm_OR occurs at elevations above the CWF. In Oregon it occurs mostly above the CWFmm_OR, although sometimes the CWFwm_OR. In California, it also occurs above the CWFds_CA.

Zonal Habitat types: ABCO-ABMAS/CHUM-ANDE3, ABCO-ABSH/CHUM-ANDE3, ABMAS/OSCH, ABMAS/VAME/CHUM (Atzet et al. 1996)

MHRFdm_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1				102		ABCO/XETE, ABMAS-PICO/ARNE/CHUM, TSME/VAME/PYSE
2	Bm [PwPIBcPz] (HmFdPy)					ABSH/ARNE, ABSH-TSME/ARNE/CAIN3, TSME/VASC/CHUM
3		BmBc		101		ABCO-ABMAS/CHUM-ANDE3, TSME-ABMAS/VAME/CHUM,
4		[FdOyPwHm](PsOa)				ABMAS/VAME/CHUM, ABMAS-ABCO/SYMO/CHUM
5					110	ABMAS/OSCH, ABCO-ABMAS/QUSA2, ABCO-ABMAS/ACTR
6		BmBc (HmOa)				TSME/HERB, ABMAS-ABCO/QUSA2/PYSE
7						

Tree species codes are presented in Appendix 1 with many codes in Table 7; Habitat type / association codes are in Appendix 2.

Figure 30. MHRFdm_OR tree species suitability and plant associations displayed on edatopic grid.

2.6.4 MHRFds_CA – Dry Submaritime California MHRF

This is the most extensive of the subzones, occurring primarily in the Sierra Nevada Mountains of California and the lee side of the Cascade Mountains of southern Oregon. Red fir is the main climax species, co-occurring with white fir at lower elevations. Mountain hemlock is a frequent climax species. Western white pine and Sierra lodgepole pine are the most prominent successional trees, but Jeffrey pine (*P. jeffreyi*) and sugar pine (*P. lambertiana*) are frequent (Table 7). The understory appears to be sparse with the main species being pinemat manzanita, prince’s pine, and long-stoloned sedge (*Carex inops*).

The MHRFds_CA typically occurs at elevations above the CWFds_CA; however, to the east it also occurs above the IWF zone—usually IWFdw_OR. In its northern range, the MHRFds_CA abuts the MHRFmm_OR on its western edge.

Zonal Habitat types: ABMAS/ARNE, ABCO-ABGR/CHUM, ABMAS/CHUM (Simpson 2007) and unpublished ABSH/ARNE from “Timbercrater”, “Unionpeak”, “Sunnotch”, and “Castlecrest”

MHRFds_CA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	BcBm			102		ABCO/CEVE-ARPA6-pumice, ABCO/CEVE-CHCHC4
2	[PIPYPw](FdPaPzPs)					
3		Bm		101		ABSH/ARNE, ABMAS/ARNE, ABMAS/CHUM
4		[BcPIPwPs](HmOy)				
5					110	TSME/VASC
6		BmHm [PI] (BcPwOa)				
7						

Tree species codes are presented in Appendix 1 with many codes in Table 7; Habitat type / association codes are in Appendix 2.

Figure 31. MHRFds_CA tree species suitability and plant associations displayed on edatopic grid.

2.7 MOUNTAIN HEMLOCK ZONE [MH]

The Mountain Hemlock (MH) Zone is a high montane to subalpine zone of the Cascade Mountains of Washington and Oregon, and north along the Coast Mountains of British Columbia to southeast Alaska (Franklin and Dyrness 1988; Meidinger and Pojar 1991). The key tree species dominating most sites are mountain hemlock (*Tsuga mertensiana*) and amabilis (or silver) fir (*Abies amabilis*) (Table 1). Subalpine fir (*A. lasiocarpa*) occurs locally in much of the zone but is particularly common in the areas with a subarctic climate, i.e., transitional to a continental climate. Yellow-cedar (*Chamaecyparis nootkatensis*) is common in the northern parts of the zone. Western white pine (*Pinus monticola*) is a successional species in much of the zone and Sierra lodgepole pine (*P. contorta* var. *murrayana*) is a common successional tree species in the southern distribution of the zone.

Black huckleberry (*Vaccinium membranaceum*) and dwarf bramble (*Rubus lasiococcus*) are understorey species that occur over much of the zone. In the moister climate, northern area, white-flowered rhododendron (*Rhododendron albiflorum*), false azalea (*Menziesia ferruginea*), Sitka mountain-ash (*Sorbus sitchensis*) and pink mountain-heather (*Phyllodoce empetriformis*) are frequent. In the drier climate southern areas, grouseberry (*V. scoparium*) is a common understorey species.

The Coastal Western Hemlock (CWH) zone occurs at elevations below the MH over most of the range, especially on the windward side of the mountains. On the lee side, the Interior White Fir (IWF) or Interior Grand Fir zones can occur below the MH.

USNVC: Zonal forests are included in Macrogroup M025: Vancouverian Subalpine-High Montane Forest [*Abies magnifica* – *Tsuga mertensiana* – *Pinus contorta* var. *murrayana* Forest], specifically G849: North-Central Pacific Mountain Hemlock – Silver Fir Woodland Group.

2.7.1 MH Subzones

Five subzones (Table 8) are recognized for the high montane portion of this zone, that encompass continentality and latitudinal gradients. Although there are conceptually an additional five subzones for the subalpine elevations, termed “parkland”, our data does not allow their characterization. They would be coded with a ‘p’ appended to the code for the montane subzone, e.g., the subalpine above the MHmm would be coded MHmmp.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 8. MH Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	MHmm_WA	MHms_WA	MHdm_OR	MHds_OR	MHds_WA	Common Name	BC Tree Code
<i>Tsuga mertensiana</i>	C*	C	C	C	C	mountain hemlock	Hm
<i>Abies amabilis</i>	C	C	C	C	C	amabilis fir	Ba
<i>Chamaecyparis nootkatensis</i>	c	c				yellow-cedar	Yc
<i>Abies lasiocarpa</i>		C	c	C	C	subalpine fir	Bl
<i>Picea engelmannii</i>		c			c	Engelmann spruce	Se
<i>Abies procera</i>			c		c	noble fir	Bp
<i>Pinus monticola</i>		s	s	s	s	western white pine	Pw
<i>Pinus albicaulis</i>		s		s	s	whitebark pine	Pa
<i>Pseudotsuga menziesii</i>			S			Douglas-fir	Fd
<i>Pinus contorta</i>			s	S	s	lodgepole pine	Pl

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

2.7.2 MHmm_WA – Moist Maritime Washington MH

This subzone occurs on the windward slopes of the Cascade Mountains of northern Washington and on the Olympic Peninsula. Mountain hemlock and amabilis fir are the main climax tree species, often with some yellow-cedar (Table 8). Medium height shrubs dominate the understorey, including white-flowered rhododendron, false azalea, oval-leaved and Alaskan blueberry (*Vaccinium ovalifolium*, *V. alaskaense*), and black huckleberry. Common dwarf shrubs are dwarf bramble and five-leaved bramble (*Rubus pedatus*).

The MHmm_WA typically occurs at elevations above the CWHvm_WA.

Zonal Habitat types: TSME/VAME, TSME/VAME (WEN), TSME/VAME-VAAL, TSME/VAME-VAOV, TSME/RHAL-VAME, TSME/RHAL2/VAME and TSME/RHAL2-VAOV (Henderson et al. 1989; Henderson et al. 1992).

MHmm_WA							Habitat Types/Associations
	A	B	C	D	E		
0							
1				102			TSME/VAME, TSME/RHAL-VAME, TSME/PHEM-VADE
2		BaHm (Yc)					TSME/VAME-XETE, TSME/MEFE-VAME
3		BaHm		101			TSME/VAME-VAAL, TSME/VAAL, TSME/RHAL-VAAL
4		[YcBp] (HwPwBl)					TSME/VAAL-CLUN
5	110	Hm[BaYc](HwBl)	Ba[HmYc](HwBl)		112		TSME/VAAL-ERMO, TSME/CLPY-RUPE, TSME/VAAL-MADI2, TSME/VAME-STRO
6	111	Hm[BaYc](BIHw)	Ba[HmYc](HwBl)		113		TSME/TIUN-STRO, TSME/VAAL-STRO, TSME/CABI, TSME/VAME/VASI
7							

Tree species codes are presented in Appendix 1 with many codes in Table 8; Habitat type / association codes are in Appendix 2.

Figure 32. MHmm_WA tree species suitability and plant associations displayed on edatopic grid.

2.7.3 MHms_WA – Moist Submaritime Washington MH

This subzone is found on the lee side of the Cascade Mountains of Washington. Mountain hemlock and amabilis fir are the main climax tree species, sometimes with yellow-cedar (Table 8). The main understorey species are white-flowered rhododendron, black huckleberry, oval-leaved blueberry, dwarf bramble, and pink mountain-heather; grouseberry is sometimes present.

The MHms_WA occurs at elevations above the CWHms_WA. It abuts the MHmm_WA on its western edge.

Zonal Habitat types: TSME/PHEM-VADE, TSME/RHAL-VAME, TSME/VAME (WEN) (Henderson et al. 1992; Lillybridge et al. 1995).

MHms_WA							
	A	B	C	D	E		Habitat Types/Associations
0							
1	Pa [BlHm](PIBa)			102			PIAL/VASC/LUHI, TSME/VASC/LUHI, PIAL/JUCO4, ABLA2/LUHI
2	[HmBlBaPw](Hw)			103			TSME/LUHI, ABLA2/ARLA-POPU, ABLA2/VADE, TSME/VAME, ABLA2/RHAL
3		BaHm		101			TSME/MEFE-VAME, ABAM/VAME-PYSE, ABAM/RHAL-VAME
4		[BlPw](SxYcHwBp)					TSME/RHAL-VAME, TSME/VAME, TSME/RULA, ABAM/RULA
5	110	Hm[BaBlYc](Hw)		Ba[HmBlSxYc](Hw)		112	
6	111	Hm[BaBlYc]		Ba[HmBlSxYc]		113	ABAM/VAME-VASI, ABLA2/VASI
7							

Tree species codes are presented in Appendix 1 with many codes in Table 8; Habitat type / association codes are in Appendix 2.

Figure 33. MHms_WA tree species suitability and plant associations displayed on edatopic grid.

2.7.4 MHds_WA – Dry Submaritime Washington MH

The MHds_WA occurs on the lee side of the Cascade Mountains in Washington State around Gifford Pinchot National Forest and Mt. Rainier National Park. Mountain hemlock is the main climax tree species (Table 8) often with amabilis fir and/or subalpine fir. Black huckleberry and dwarf bramble are common in the understorey, often with false azalea or white-flowered rhododendron, and on drier sites, some grouseberry and beargrass (*Xerophyllum tenax*).

This subzone is typically found in the transitional climate in between the MHms_WA and the ESSFmw_WA, but may also abut the MHmm_WA .

Zonal Habitat types: TSME/RHAL, ABAM/VAME/CLUN2, ABAM/MEFE, ABAM/RHAL2-VAME, TSME/VAME/CLUN (Franklin et al. 1988; Diaz et al. 1997)

MHds_WA						
	A	B	C	D	E	Habitat Types/Associations
0						
1	[HmPa](PIBaBl)			102		TSME/PHEM-VADE, TSME/LUHI, TSME/LUGLH
2	Hm[BaBl](PIPa)			103		TSME/VAME/XETE, ABAM/VAME/XETE
3		HmBa		101		TSME/MEFE, ABAM/RHAL2-VAME, TSME/VAME/CLUN
4		[Bl](BpPw)				TSME/RHAL, ABAM/VAME/CLUN2, ABAM/MEFE
5	110	Hm[BaBl]		Ba[HmBlSx]	112	ABAM/ACTR, ABAM/TITRU,
6	111	Hm[BaBl]		Ba[HmBlSx]	113	ABAM/VAME/VASI, TSME/CAREX
7						

Tree species codes are presented in Appendix 1 with many codes in Table 8; Habitat type / association codes are in Appendix 2.

Figure 34. MHds_WA tree species suitability and plant associations displayed on edatopic grid.

2.7.5 MHdm_OR – Dry Maritime Oregon MH

This subzone is primarily of the windward slopes of the Cascade Mountains of Oregon and southern Washington. Mountain hemlock and amabilis fir dominate the forest cover (Table 8). Subalpine fir and noble fir (*Abies procera*) are often present. Sierra lodgepole pine (*ssp. murrayana*) and western white pine are common successional species; Douglas-fir occasionally occurs on zonal sites but is more common on drier sites. The main understorey species are black huckleberry, grouseberry, and beargrass (*Xerophyllum tenax*).

The MHdm_OR occurs at elevations above the CWHvm_OR, or sometimes, the CWHms_OR. To the east it abuts the MHds_OR or MHRFmm_OR.

Zonal Habitat types: TSME/VAME/XETE, TSME/VAME/XETE-NWO, TSME/VASC, TSME/VASC-NWO, ABAM/VAME/XETE (McCain and Diaz 2002a; McCain and Diaz 2002b)

MHdm_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Hm[BaPw](FdPI)			102			TSME/RHAL, TSME/PHEM-VADE, TSME/RHAL2/XETE
2	HmBa[Pw](BIFdPI)			103			TSME/VAME, TSME/RHAL-VAME, TSME/XETE/VAMY
3		BaHm		101			ABAM/VAME/XETE, TSME/VASC, TSME/VAME/CLUN2,
4		[BpBIPw](FdHwPI)					TSME/VAME/XETE
5	110	Hm[BaBI](YcHw)		Ba[HmBI BpSx] (YcHw)	112		ABAM/TITR, TSME/LUGLH, TSME/PHEM-VADE
6	111	Hm[BaBIYc](Hw)		Ba[HmYcBI BpSx](Hw)	113		
7							

Tree species codes are presented in Appendix 1 with many codes in Table 8; Habitat type / association codes are in Appendix 2.

Figure 35. MHdm_OR tree species suitability and plant associations displayed on edatopic grid.

2.7.6 MHds_OR – Dry Submaritime Oregon MH

This subzone is found on the lee side of the Cascade Mountains of Oregon. Mountain hemlock is the main climax tree species (Table 8) often with amabilis fir. Subalpine fir is often present. Sierra lodgepole pine (*ssp. murrayana*) is the most prominent successional species although western white pine often occurs. Grouseberry is the dominant understorey species often with some black huckleberry and dwarf bramble.

The MHdm_OR abuts the MHds_OR to the west. At lower elevations, to the east, is the IWFdw_OR.

Zonal Habitat types: TSME/VASC, TSME/VASC-NWO, TSME/VASC-DES, TSME/CAIN4 (Simpson 2007; Volland 1985)

MHds_OR					Habitat Types/Associations	
	A	B	C	D	E	
0						
1	[HmPaPl](BaBlPw)			102		PICO/VAME/XETE, PICO/XETE, TSME/ARNE, PICO-TSME/VAME/XETE
2	Hm[BaBlPwPl]			103		TSME/VASC, TSME-ABAM/VAME-VASC, TSME-ABAM/VAME-ACTR
3		HmBa		101		TSME-ABAM/VAME/RULA, ABAM/VAME/RULA, TSME/VAME-SOSI2
4		[PwBl](BcPl)				TSME/VAME/XETE, TSME-ABAM/VAME/XETE, ABAM/VAME/XETE
5	110	Hm[BaBl]	Ba[HmBl]		112	TSME-ABAM/VAME/CLUN
6	111	Hm[BaBl]	Ba[HmBlSx]		113	ABAM/RHLA2/CLUN2, ABAM/VAME/CLUN2,
7						

Tree species codes are presented in Appendix 1 with many codes in Table 8; Habitat type / association codes are in Appendix 2.

Figure 36. MHds_OR tree species suitability and plant associations displayed on edatopic grid.

3 INTERIOR FORESTED ZONES

3.1 ENGELMANN SPRUCE – SUBALPINE FIR [ESSF]

The Engelmann Spruce – Subalpine Fir (ESSF) Zone is a high montane and subalpine, forested zone of the sub-continental and continental climates of the mountains of the western cordillera. It ranges from British Columbia and Alberta, as far south as New Mexico in the Rocky Mountains (Meidinger and Pojar 1991; Pfister et al. 1978; Cooper, Neiman, and Roberts 1991; Lillybridge et al. 1995).

Mature forests are characterized by Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) (Table 9). Lodgepole pine (*Pinus contorta*) is the most common seral species. Whitebark pine (*Pinus albicaulis*) is a common component of the canopy in many climates, and mountain hemlock (*Tsuga mertensiana*) occurs in some wetter climatic areas of the interior and along the Coast or Cascade mountains (where the ESSF abuts the Mountain Hemlock zone).

The understorey varies considerably. In the U.S. range, common shrubs are black huckleberry (*Vaccinium membranaceum*), falsebox (*Paxistima myrsinites*), false azalea (*Menziesia ferruginea*), western mountain-ash (*Sorbus scopulina*), white-flowered rhododendron (*Rhododendron albiflorum*), thimbleberry (*Rubus parviflorus*), Sitka alder (*Alnus alnobetula* ssp. *sinuata*), black gooseberry (*Ribes lacustre*), and Utah honeysuckle (*Lonicera utahensis*). Herbs include beargrass (*Xerophyllum tenax*), grouseberry (*Vaccinium scoparium*), elk sedge (*Carex geyeri*), mountain arnica (*Arnica latifolia*), heart-leaved arnica (*Arnica cordifolia*), pinegrass (*Calamagrostis rubescens*), and western meadowrue (*Thalictrum occidentale*).

The ESSF generally occurs above the Montane Spruce (MS) Zone but in moister climates it occurs above the Interior Cedar – Hemlock (ICH) Zone.

USNVC: Zonal forests are included in Macrogroup M020: Rocky Mountain Subalpine-High Montane Forest [*Abies lasiocarpa* – *Picea engelmannii* – *Pinus albicaulis* Rocky Mountain Forest]

3.1.1 ESSF Subzones

Fifteen subzones (Table 10) are recognized that encompass temperature, climatic moisture, and species distribution gradients. There are an additional 11 parkland subzones.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 9. Tree species of Forested Interior Biogeoclimatic Zones

Scientific Name	PP*	IDF	IGF	ICH	IWF	MS	ESSF	SBAP	Common Name
<i>Pinus ponderosa</i>	C**	S	S	s	S				ponderosa pine
<i>Pseudotsuga menziesii</i>	c	C	C	S	S	S			Douglas-fir
<i>Abies grandis</i>			C	C					grand fir
<i>Thuja plicata</i>				C					western redcedar
<i>Tsuga heterophylla</i>				C					western hemlock
<i>Abies concolor</i>					C				white fir
<i>Abies lasiocarpa</i>						C	C		subalpine fir
<i>Picea engelmannii</i>				c		C	C		Engelmann spruce
<i>Tsuga mertensiana</i>							c		mountain hemlock
<i>Pinus contorta</i>		S	s	S	S	S	S		lodgepole pine
<i>Larix occidentalis</i>		s	s	S		s			western larch
<i>Pinus monticola</i>				s	s				western white pine
<i>Betula papyrifera</i>				s					paper birch
<i>Populus tremuloides</i>					s	s		C	trembling aspen
<i>Pinus albicaulis</i>							S		whitebark pine

* Zone names: PP: Ponderosa Pine; IDF: Interior Douglas-fir; IGF: Interior Grand Fir; ICH: Interior Cedar – Hemlock; IWF: Interior White Fir; MS: Montane Spruce; ESSF: Engelmann Spruce – Subalpine Fir; SBPS: Sub boreal Aspen Parkland

** **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

Table 10. ESSF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	ESSF xh WA	ESSF xx WY	ESSF xk MT	ESSF xk WY	ESSF xk UT	ESSF xc CO	ESSF xc WA	ESSF xw OR	ESSF dh WA	ESSF dw ID	ESSF dm ID	ESSF dk MT	ESSF mw WA	ESSF wm MT	ESSF wh MT	Common Name	BC Tree Code
<i>Abies lasiocarpa</i>	C*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	subalpine fir	Bl
<i>Picea engelmannii</i>	c	C	C	C	C	C	C	C	C	C	C	C	c	C	C	Engelmann spruce	Se
<i>Abies lasiocarpa</i> var. <i>arizonica</i>						c										corkbark fir	Bla
<i>Abies grandis</i>								c	c	c						grand fir	Bg
<i>Abies amabilis</i>									c				c			amabilis fir	Ba
<i>Tsuga mertensiana</i>									c	c			c			mountain hemlock	Hm
<i>Pinus contorta</i>	S	S	S	S	S	S	S	S	S	s	S	S	s	S	S	lodgepole pine	Pl
<i>Pseudotsuga menziesii</i>	s						s		s	s			s	s		Douglas-fir	Fd
<i>Larix occidentalis</i>	S														S	western larch	Lw
<i>Pinus albicaulis</i>			S	S			s	s			s	s	s	s		whitebark pine	Pa
<i>Populus tremuloides</i>			s	s	S	S										trembling aspen	At
<i>Pinus monticola</i>									s	s						western white pine	Pw

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.1.2 ESSFdh_WA – Dry Hot Washington ESSF

This subzone occurs at mid elevations, in a sub-continental climate, on the eastern side of the Cascade Mountains. The ESSFdh_WA is transitional between the ESSFmw_WA, which occurs at higher elevations, and the IGFdk_WA, which occurs at elevations below. The ESSFdh_WA is similar to the ESSFdh in British Columbia.

Zonal forests of this subzone are dominated by subalpine fir, Engelmann spruce, and lodgepole pine (Table 10) but can also have some grand fir or Douglas-fir. Mountain hemlock, amabilis fir (*Abies amabilis*), or western white pine can also occur, due to proximity to subarctic climates. The shrub layer is well developed with falsebox and black huckleberry dominating, along with black gooseberry, Sitka alder, and thimbleberry.

Zonal Habitat types: ABLA2/VAME, ABAM/VAME-PYSE, ABAM/VAME/CLUN, ABLA2/RHAL (Lillybridge et al. 1995; Williams and Lillybridge 1983)

ESSFdh_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	[FdPaPy] (BILw)			102		PSME/SYOR, PSME/CARU, PSME/CAGE
2	Fd[BIBgPaLw](PISe)			103		ABLA2/PAMY, ABLA2/VASC, ABLA2/ARLA-POPU, ABLA2/CARU, ABGR/ARCO, PSME/PAMY, ABGR/CARU, PSME/PAMY, ABGR/BENE
3		PIBISe[FdPa		101		TSME/VAME, TSME/RHAL-VAME
4		HmBaPwBg](At)				ABLA2/VAME, ABAM/VAME-PYSE, ABAM/VAME/CLUN, ABLA2/RHAL
5		BI [SeBaHwCw](Pw)			110	ABLA2/RULA, ABAM/RULA, ABLA2/GYDR, ALSI/GYDR
6		SeBI [BaHwCw]			111	PIEN/CASCP2, ABAM/TITRU, ALIN/GLEL, Piceeng-Athyfil
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 37. ESSFdh_WA tree species suitability and plant associations displayed on edatopic grid.

3.1.3 ESSFmw_WA – Moist Warm Washington ESSF

This subzone occurs at high elevations, in a sub-continental climate, on the eastern side of the Cascade Mountains. It occurs at elevations above the ESSFdh_WA. It is similar to the ESSFmw (Lloyd et al. 1990) in British Columbia.

Zonal forests of this subzone are dominated by subalpine fir (Table 10). Engelmann spruce, mountain hemlock, and amabilis fir commonly occur as well. Lodgepole pine is the most common seral species. Douglas-fir can occur but is more frequent on drier sites on warm aspects. The understory is dominated by white-flowered rhododendron and black huckleberry (including blue huckleberry – *Vaccinium globulare*), along with dwarf bramble (*Rubus lasiococcus*), grouseberry, and mountain arnica.

On its western edge it abuts the MHms_WA. At upper elevations, subalpine parkland occurs (**ESSFmwp_WA**).

Zonal Habitat types: AMAM/RHAL-VAME, ABLA2/RHAL, ABAM/VAME/CLUN (Williams and Lillybridge 1983; Lillybridge et al. 1995)

ESSFmw_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	PI [FdPa] (PyBl)			102		PIAL/JUCO4, ABLA2/CARU, ABLA2/PAMY/CARU, PIAL/CARU, PSME/PAMY/CARU
2	[LwSe] (BlFdPaBaPl)			103		ABLA2/PAMY, ABLA2/VASC, PIAL/VASC/LUHI, TSME/VASC/LUHI
3		BlSe [Ba]		101		ABLA2/VADE, ABLA2/VAME, ABLA2/VASC/LUHI, TSME/RHAL-VAME
4		(HwHmFdPIPwBg)				ABAM/RHAL-VAME, ABLA2/RHAL, ABAM/VAME/CLUN, ABLA2/LUHI
5		BlSe [BaHm]		110		ABAM/TITRU, ABLA2/ARLA-POPU, ABLA2/RULA, ABLA2/GYDR
6		BlSe [Ba]		111		ABAM/ATFI, ABAM/OPHO, ABLA2/OPHO, PIEN/EQUIS
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 38. ESSFmw_WA tree species suitability and plant associations displayed on edatopic grid.

3.1.4 ESSFxc_WA – Very Dry Cold Washington ESSF

This subzone occurs at high elevations in northwest Washington, between the Okanogan River valley and the Lake Chelan/Ross Lake National Recreation Areas. On its northern boundary, it abuts the ESSFxc1 in British Columbia (Lloyd et al. 1990; Ryan et al. 2022).

Zonal forests of this subzone are dominated by Engelmann spruce and subalpine fir, with considerable lodgepole pine, and some whitebark pine (Table 10). Grouseberry is a key understorey dwarf shrub. It often occurs with falsebox, white-flowered rhododendron, black gooseberry, Sitka valerian (*Valeriana sitchensis*), broadleaf lupine (*Lupinus latifolius*), and heart-leaved arnica. Trapper's tea (*Rhododendron neoglandulosum*) is a common shrub on nutrient-poor sites.

This subzone occurs at elevations above the MSxk_WA. It abuts the ESSFmw_WA on its western edge. Subalpine larch occurs at upper elevations in the parkland subzone (**ESSFxcp_WA**). PIAL/VASC/LUHI, LALY/VASC/LUHI, and ABLA2/RHAL/LUHI habitat types are common at parkland elevations.

Zonal Habitat types: ABLA2/RHAL, ABLA2/VAME, ABLA2/VASC/LUHI (Lillybridge et al. 1995; Williams and Lillybridge 1983).

ESSFxc_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	PI [PaFdBI] (La)			102		ABLA2/CARU, PIAL/CARU, PSME/CARU, PIAL/JUCO4, ABLA2/VASC/CARU
2	PI[FdBIpa](SeLaAt)			103		ABLA2/PAMY, ABLA2/VASC
3				101		PIAL/VASC/LUHI, LALY/VASC/LUHI, ABLA2/RHAL/LUHI
4		BISePI (AtPa)				ABLA2/RHAL, ABLA2/LEGL-VASC, ABLA2/VAME, ABLA2/VASC/LUHI
5			BISePI		110	ABLA2/RHAL/SETR, ATFI-GYDR, ABLA2/TRCA3
6			SeBI (PI)		111	PIEN/CASCP2, PIEN/EQUIS, ABLA2/TRLA4, ALIN/CACA
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 39. ESSFxc_WA tree species suitability and plant associations displayed on edatopic grid.

3.1.5 ESSF_{xh}_WA – Very Dry Hot Washington ESSF

This subzone occurs at high elevations, mostly in the western portion of Colville National Forest in northern Washington State.

Zonal forests of this subzone are dominated by subalpine fir and lodgepole pine, with some Engelmann spruce, western larch, and whitebark pine (Table 10). Low bilberry (*Vaccinium myrtillus*) and pinegrass are the main understorey species. Falsebox, Sitka alder, black huckleberry, white-flowered rhododendron, silky lupine (*Lupinus sericeus*), and heart-leaved arnica are also common.

This subzone occurs at elevations above MS_{dm}_WA.

Zonal Habitat types: ABLA2/VAME, ABLA2/VASC, ABLA2/LIBOL (Williams et al. 1995).

ESSF _{xh} _WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	[FdPI] (BILa)			102		PSME/CARU
2	PIFd [BILw] (La)			103		ABLA2/CARU
3				101		
4	PI [BILwFd] (Se)					ABLA2/VAME, ABLA2/VASC, ABLA2/LIBOL
5	BI [PI] (FdLwSe)			110		ABLA2/RHAL, ABLA2/TRCA3
6		BISe (PI)		111		PIEN/EQUIS
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 40. ESSF_{xh}_WA tree species suitability and plant associations displayed on edatopic grid.

3.1.6 ESSFwx_OR – Very Dry Warm Oregon ESSF

This subzone occurs at high elevations in northeastern Oregon and into nearby Idaho.

Zonal forests of this subzone are dominated by Engelmann spruce, subalpine fir, and lodgepole pine (Table 10). Whitebark pine occurs sometimes. Black huckleberry and Utah honeysuckle are the main shrubs. Grouseberry is a key understorey dwarf shrub. It often occurs with Ross' sedge (*Carex rossii*), elk sedge, heart-leaved arnica, and showy Jacob's-ladder (*Polemonium pulcherrimum*).

This subzone mostly occurs at elevations above the MSxh_OR. At upper elevations, subalpine parkland occurs (**ESSFwxp_OR**).

Zonal Habitat types: ABLA2/VAME, ABLA2/VASC, ABLA2-PIEN/MEFE, ABLA2-PIEN/POPU, ABLA2/POPU, PICO(ABLA2)/VASC (Johnson and Simon 1987; Johnson and Clausnitzer 1992).

ESSFwx_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1	[PaBIPI] (FdLwPy)			102		PIAL/RIMO/POPU, PIAL/CAGE, ABLA2-PIAL/CAGE, ABLA2/FEVI
2	BI[PaPIFd](SeLwAt)			103		ABLA2/ARCO, ABLA2/CAGE, ABLA2-PIAL/VASC/ARCO, ABLA2/ARCO, ABLA2/CARU
3				101		ABLA2-PIEN/POPU, ABLA2/POPU, PICO(ABLA2)/VASC
4		BIPI [Se](BgPaHm)				ABLA2/VAME, ABLA2/VASC, ABLA2-PIEN/MEFE, ABLA2-PIEN/LEGL
5		BISe [PI]			110	ABLA2-PIEN/ARCO, ABLA2/STAM, ABLA2-PIEN/SETR
6			BISe (PI)		111	ABLA2/LEGL/CASC5, ABLA2/VAUL/CASC5, ABLA2/SAAR4
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 41. ESSFwx_OR tree species suitability and plant associations displayed on edatopic grid.

3.1.7 ESSFdm_ID – Dry Mild Idaho ESSF

This subzone occurs at high elevations in the mountains of central Idaho. It extends somewhat into the Bitterroot Mountains of western Montana.

Zonal forests of this subzone are dominated by Engelmann spruce, subalpine fir, lodgepole pine, and whitebark pine (Table 10). The understory is dominated by false azalea, beargrass, and grouseberry. Other common herbs include elk sedge, yellow glacier lily (*Erythronium grandiflorum*), bracted lousewort (*Pedicularis bracteosa*), and mountain arnica.

This subzone occurs at elevations above the MSmm_ID. At upper elevations, subalpine parkland occurs (**ESSFdm_ID**).

Zonal Habitat types: ABLA/MEFE, ABLA/XETE-VAGL, ABLA/XETE-VASC, ABLA/XETE-LUHI (Steele et al. 1981; Pfister et al. 1978).

ESSFdm_ID						Habitat Types/Associations
	A	B	C	D	E	
0						
1	[PaPI BIFd]			102		PIAL-ABLA/FEID
2	PIBI [PaFd] (Se)			103		ABLA/CAGE, ABLA/CARU
3				101		
4		PIBISe [Pa] (Fd)				ABLA/MEFE, ABLA/XETE-VAGL, ABLA/XETE-VASC, ABLA/XETE-LUHI
5			BISe [PI]		110	ABLA/Ribelac, ABLA/STAM, ABLA/Senetri
6		SeBI [PI]			111	ABLA/CACA, ABLA/CACA-LEGL
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 42. ESSFdm_ID tree species suitability and plant associations displayed on edatopic grid.

3.1.8 ESSFdw_ID – Very Wet Hot Idaho ESSF

This subzone occurs at high elevations in the mountains along the border between northern Idaho and northwestern Montana.

Zonal forests of this subzone are dominated by subalpine fir, mountain hemlock, and Engelmann spruce (Table 10). Lodgepole pine and western white pine are important seral trees. At lower elevations, western larch, Douglas-fir, and western redcedar can occur. The shrub understory is dominated by black huckleberry and false azalea. Sitka alder is often present. Beargrass is the dominant herb. Grouseberry can occur, along with mountain arnica, and queen’s cup (*Clintonia uniflora*).

This subzone typically occurs at elevations above the ICHdw_ID and extends to the height of land. In the northern part of its range, it appears to occur below the ESSFwm_MT.

Zonal Habitat types: ABLA/MEFE, ABLA/CLUN2, TSME/CLUN2-MEFE, TSME/MEFE-XETE (Cooper, Neiman, and Roberts 1991).

ESSFdw_ID						Habitat Types/Associations
	A	B	C	D	E	
0						
1	FdPI [Lw] (BI)			102		BEPA/COCO6, PSME/VAME, ABLA/XETE,
2	FdPI [BISe] (HmLw)			103		TSME/XETE, ABLA/XETE, PICO/XETE
3		BISe		101		ABLA/MEFE, ABLA/CLUN2
4		[PIHmPw](LwBgFd)				TSME/CLUN2-MEFE, TSME/MEFE-XETE
5	110	BISe[PIHmBg](FdCw)				ABGR/ASCA, ABGR/SETR, THPL/ASCA2, TSHE-THPL/POMU
6	111	BISe[PICwHwHmBg]				ABLA/CACA4, TSME/VACCI/CALEH2, ABLA/CACA4-LEGL, THPL/ATFI
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 43. ESSFdw_ID tree species suitability and plant associations displayed on edatopic grid.

3.1.9 ESSF_{xk}_MT – Very Dry Cool Montana ESSF

This subzone occurs at high elevations in the mountains of western Montana, and into eastern Idaho. It is one of the most eastern of the ESSF subzones in northern Montana – the other being the ESSF_{dk}_MT.

Zonal forests of this subzone are dominated by subalpine fir, Engelmann spruce, lodgepole pine, and whitebark pine (Table 10). The shrub understorey is lightly developed with some false azalea, thimbleberry, birch-leaved spirea (*Spiraea betulifolia* ssp. *lucida*), and Utah honeysuckle. Grouseberry and beargrass are key understorey species, occurring along with elk sedge and mountain arnica.

In its northern range, it abuts the ESSF_{wm}_MT to the west, and on its southern edge it abuts the ESSF_{xk}_WY. It occurs at elevations above the MS_{dw}_MT or MS_{dh}_MT. At upper elevations, subalpine parkland occurs (ESSF_{xkp}_MT).

Zonal Habitat types: ABLA/XETE/VASC, ABLA/XETE/VAME, ABLA/XETE, ABLA/VASC, ABLA-PIAL/VASC, PIAL/ABLA (Pfister et al. 1978; Steele et al. 1981, 1983).

ESSF _{xk} _MT							Habitat Types/Associations
	A	B	C	D	E		
0							
1	[FdPaPfPI] (BISe)			102			PSME/JUCO, PSME/CARU, PIFL/JUCO6, PIFL/FEID, PSME/FEID
2	PI [FdBIPaSe]			103			ABLA/CARU, ABLA/CAGE2, ABLA/VASC-CARU, PIAL/VASC
3				101			ABLA/XETE/VASC, PICO/VASC, ABLA/XETE/VAME, ABLA/XETE
4		PISePa [BI] (Fd)					ABLA/VASC, ABLA-PIAL/VASC, PIAL/ABLA
5		BIPISe [Pa]		110			PIBIPa/MEFE, PIBIPa/ARLA-SETR, BIPa/Veravir
6			SeBI [PI]		111		SeBI/LEGL/SETR, SeBI/CACA, Se/CAUT
7							

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 44. ESSF_{xk}_MT tree species suitability and plant associations displayed on edatopic grid.

3.1.10 ESSFdk_MT – Dry Cool Montana ESSF

This subzone occurs at high elevations in the mountains of northwestern Montana. On its northern boundary, it abuts the ESSFdk1 (MacKillop et al. 2018), which occurs mostly in British Columbia but extends into Montana in some areas near the border with Canada. The ESSFdk_MT is one of the most eastern of the ESSF subzones in northern Montana—the other being the ESSFk_MT.

Zonal forests of this subzone are dominated by subalpine fir and Engelmann spruce, with some lodgepole pine and whitebark pine (Table 10). The shrub and dwarf shrub layers are dominated by false azalea, black huckleberry, beargrass, grouseberry, and elk sedge.

The ESSFdk_MT occurs at elevations above the MSdw_MT. The ESSFdk_MT abuts the ESSFk_MT on its southern edge. At upper elevations, subalpine parkland occurs (**ESSFdkp_MT**).

Zonal Habitat types/associations: PIBI-Xeroten-Vaccsco, ABLA/XETE/VAME, BISE-Vaccsco-Arnilat; ABLA/CLUN2-MEFE (Pfister et al. 1978).

ESSFdk_MT							Habitat Types/Associations
	A	B	C	D	E		
0							
1				102			
2	BI [PIPa] (FdSeLaLw)						FdBI - Junicom - Arctuva - Pseuspi, ABLA/LUGLH-VASC, ABLA-PIAL/VASC
3				101			ALBA/XETE-VASC, ABLA/XETE/VAME, ABLA/CLUN2-XETE
4		BISe [PI] (FdPaLw)					BISe-Vaccsco-Arnilat; ABLA/CLUN2-MEFE, ABLA/LUGLH, ABLA/MEFE
5			BISe (PI)		110		BI-Menzfer-Violgla; BI-Heramax; BI-Rubupar; BI-Alnuvir-Ribelac
6		BI [Act] (PISe)			111		BI-Oplohor, BI-Senetri-Valesit
7							

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 45. ESSFdk_MT tree species suitability and plant associations displayed on edatopic grid.

3.1.11 ESSFwh_MT – Wet Hot Montana ESSF

This subzone occurs at mid elevations, primarily in the mountains of northwestern Montana, but also to the west in northern Idaho, and northeastern Washington. This is a transitional subzone between ICH and more typical ESSF forests at higher elevations.

Zonal forests of this subzone are dominated by subalpine fir, Engelmann spruce, western redcedar, and western hemlock (Table 10). Lodgepole pine and western white pine are important seral trees. Other seral tree species include western larch, lodgepole pine, western white pine, and Douglas-fir. The shrub layer is dominated by Sitka alder, false azalea, Utah honeysuckle, and black huckleberry. Queen's cup (*Clintonia uniflora*), beargrass, and grouseberry are dominant in the herb layer.

This subzone typically occurs at elevations above the ICHmw_MT and below the ESSFwm_MT. Near the British Columbia border, it is replaced by ESSFwh3 (MacKillop and Ehman 2016).

Zonal Habitat types: ABLA2/XETE, TSHE/XETE, ABLA2/RHAL/XETE, ABLA2/RHAL, TSHE/CLUN, TSHE/MEFE, BI-Menzfer-Loniuta-Paximyr-Clinuni (Cooper, Neiman, and Roberts 1991; Pfister et al. 1978)

ESSFwh_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1				102		
2	FdLw [BIPi] (Se)					Fd-Spirbet-Xeroten
3		BiSe [LwPI]		101		ABLA2/XETE, TSHE/XETE, ABLA2/RHAL/XETE, ABLA2/RHAL
4		(FdHwCw)				TSHE/CLUN, TSHE/MEFE, BI-Menzfer-Loniuta-Paximyr-Clinuni
5		BiSe [HwCw]		110		TSME/GYDR, BI-Menzfer-Rhodalb-Gymndry-Athyfil
6		BiSe [HwCw]		111		TSHE/ATFI, Se-Oplohor, BI-Ribelac-Senetri
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 46. ESSFwh_MT tree species suitability and plant associations displayed on edatopic grid.

3.1.12 ESSFwm_MT – Wet Mild Montana ESSF

This subzone occurs at high elevations in the mountains of northwestern Montana, northern Idaho, and northwestern Washington.

Zonal forests of this subzone are dominated by subalpine fir and Engelmann spruce (Table 10). Lodgepole pine and western white pine are seral species but do not tend to dominate many stands. At lower elevations, western hemlock or western redcedar can occur. The shrub understorey is dominated by white-flowered rhododendron, false azalea, Sitka alder, and black huckleberry. The most common herbs are beargrass, queen's cup (*Clintonia uniflora*), and round-leaved violet (*Viola orbiculata*).

This subzone mostly occurs at elevations above the ICHdw_ID, and towards the British Columbia border, also above the ICHmw4 (MacKillop and Ehman 2016), which ranges into B.C. It also occurs above the ESSFdw_ID in some places. The ESSFwm_MT abuts the ESSFwk_MT in the southeast part of its range and is west of the ESSFdk_MT in the northeastern part of its range. It also abuts the ESSFwm3 (MacKillop and Ehman 2016), another B.C. unit that extends into the U.S. At upper elevations, subalpine parkland occurs (**ESSFwmp_MT**).

Zonal Habitat types: ABLA2/RHAL, ABLA2/CLUN, ABLA2/VAME, BIPa alliance, BI alliance (Cooper, Neiman, and Roberts 1991; Pfister et al. 1978)

ESSFwm_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1	PI [FdLw] (PaBl)			102		Fd-Arctuva, Fd-Spirbet, PaBl woodland, Fd woodland, Pa
2	BIPI [SeFd] (PaPw)			103		ABLA2/RHAL-XETE, PIAL-ABLA2/RHAL/XETE, ABLA2/RHAL-XETE, ABLA2/XETE
3				101		
4	BISe [Pl](FdPwPa)					ABLA2/RHAL, ABLA2/CLUN, ABLA2/VAME, BIPa alliance, BI alliance
5	BISe (PIHwCw)			110		ABLA2/TRCA3, ABLA2/GYDR, BISe-Stream p
6	BISe (PIHwCw)			111		ABLA2/RHAL/SETR, PIEN/CASCP2, ABLA2/ATF1, Dm alliance
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 47. ESSFwm_MT tree species suitability and plant associations displayed on edatopic grid.

3.1.13 ESSFxx_WY – Very Dry Very Hot Wyoming ESSF

This subzone occurs at high elevations in the mountains of north central Wyoming. It is the furthest east of the ESSF subzones in Wyoming.

Zonal forests of this subzone are dominated by subalpine fir, Engelmann spruce, and lodgepole pine; whitebark pine is mostly absent (Table 10). The shrub understorey is lightly developed with some common juniper (*Juniperus communis*). Grouseberry dominates the ground layer.

The ESSFxx_WY occurs at elevations above the MSdh_WY. At upper elevations, subalpine parkland occurs (**ESSFxxp_WY**).

Zonal Habitat types: ABLA-PIEN/VASC, ABLA-PIEN/ARCO9, ABLA/VASC (Johnston 1987).

ESSFxx_WY						Habitat Types/Associations
	A	B	C	D	E	
0						
1	PIPf (Fd)			102		PIFL2/JUCO6, PIFL2/LEK12, PSME/MARE11-JUCO6
2	PISe [Bl] (Fd)			103		ABLA/JUCO, ABLA-PIEN/JUCO6, PICO/JUCO6, PIEN/JUCO6
3				101		PICO/VASC
4		BIPISe (At)				ABLA-PIEN/VASC, ABLA-PIEN/ARCO9, ABLA/VASC
5		SeBl [Pl]			110	ABLA-PIEN/LIBO3/VASC, ABLA-PIEN/RUPA
6			SeBl [Pl]		111	PIEN/RIMO2
7						

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 48. ESSFxx_WY tree species suitability and plant associations displayed on edatopic grid.

3.1.14 ESSF_{xk}_WY – Very Dry Cool Wyoming ESSF

This subzone occurs at high elevations in the mountains of western Wyoming, southwest Montana, and into east-central Idaho.

Zonal forests of this subzone are dominated by subalpine fir, Engelmann spruce, lodgepole pine, and whitebark pine (Table 10). The shrub understorey is lightly developed with some common juniper (*Juniperus communis*), birch-leaved spirea (*Spiraea betulifolia* ssp. *lucida*), and shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*). Grouseberry, elk sedge, and heart-leaved arnica are common understorey herbs/dwarf shrubs. In contrast to the ESSF_{xk}_MT, this subzone lacks beargrass.

The ESSF_{xk}_WY occurs at elevations above the MS_{dh}_WY. To the north, it abuts the ESSF_{xk}_MT, and to the south it abuts the ESSF_{xc}_CO. At upper elevations, subalpine parkland occurs (**ESSF_{xkp}_WY**).

Zonal Habitat types: PICO/VASC, ABLA-PIEN/VASC, ABLA/VASC, ABLA-PIAL/VASC, ABLA-PIAL/VASC, ABLA/ARCO9 (Pfister et al. 1978; Steele et al. 1983).

ESSF _{xk} _WY							Habitat Types/Associations
	A	B	C	D	E		
0							
1	[FdPaPfPI] (BISe)			102			PIFL/JUCO6, ABLA/PIEN/JUCO6, PIFL/FEID, PSME/FEID, PSME/JUCO, PSME/CARU,
2	PI [FdBI PaSe]			103			ABLA/CAGE2, ABLA-PIEN/CAGE2
3				101			PICO/VASC, ABLA-PIEN/VASC
4	PISePa [BI] (Fd)						ABLA/VASC, ABLA-PIAL/VASC, ABLA-PIAL/VASC, ABLA/ARCO9
5	BIPISe [Pa]			110			ABLA/VAME, ABLA/VASC-THOC, ABLA/THOC
6	SeBI [PI]			111			ABLA/CACA4, ABLA-PIEN/RIBES, ABLA/RIMO2
7							

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 49. ESSF_{xk}_WY tree species suitability and plant associations displayed on edatopic grid.

3.1.15 ESSFxc_CO – Very Dry Cold Colorado ESSF

This subzone occurs at high elevations in the mountains of Colorado, but also occurs in eastern Utah, in conjunction with ESSFxc_UT.

Zonal forests of this subzone are dominated by subalpine fir and Engelmann spruce (Table 10). Lodgepole pine and aspen are important seral trees. Corkbark fir (*Abies lasiocarpa* var. *arizonica*) and Rocky Mountain bristlecone pine (*Pinus aristida*) are scattered in this subzone but are most prevalent in southern Colorado.

The shrub understorey is poorly developed and includes low bilberry (*Vaccinium myrtillus*) and some common juniper (*Juniperus communis*). The herb layer commonly has grouseberry, heart-leaved arnica, elk sedge, wild strawberry (*Fragaria virginiana*), and tall fringed bluebells (*Mertensia ciliata*).

This subzone typically occurs at elevations above the MSdk_CO, but also is found above the MSxm_CO. At upper elevations, subalpine parkland occurs (ESSFxc_cp_CO).

Zonal Habitat types: ABLA-PIEN/VAMY2, ABLA-PIEN/VASC, ABLA-PIEN/ARCO9, PIEN/VAMY2, ABLA-PIEN/CAGE2, ABLA-PIEN/JUCO6 (Alexander 1988; Johnston 1987)

ESSFxc_CO							Habitat Types/Associations
	A	B	C	D	E		
0							
1	[BIPIPfAt] (FdPb)			102			
2	PI [BISeAt] (Fd)			103			PICO/VASC
3				101			PIEN/VAMY2, ABLA-PIEN/CAGE2, ABLA-PIEN/JUCO6
4	PIBISe [Bla] (At)						ABLA-PIEN/VAMY2, ABLA-PIEN/VASC, ABLA-PIEN/ARCO9
5	BISe [PI]				110		ABLA-PIEN/RIBES
6	BISe [Sp]				111		ABLA-PIEN/SETR
7							

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 50. ESSFxc_CO tree species suitability and plant associations displayed on edatopic grid.

3.1.16 ESSF_{xk}_UT – Very Dry Cool Utah ESSF

This subzone occurs at high elevations in the mountains of Utah, but also occurs in western Colorado, in conjunction with ESSF_{xc}_CO.

Zonal forests of this subzone are dominated by subalpine fir and Engelmann spruce (Table 10). Lodgepole pine and aspen are important seral trees. The shrub understorey is mostly mountain snowberry (*Symphoricarpos oreophilus*), but also various currants/gooseberries, including mountain prickly gooseberry (*Ribes montigenum*). The herb layer is poorly characterized due to limited data.

This subzone typically occurs at elevations above the MS_{dh}_UT. At upper elevations, subalpine parkland occurs (ESSF_{xkp}_UT).

Zonal Habitat types: ABLA/VASC (Youngblood and Mauk 1985).

ESSF _{xk} _UT							Habitat Types/Associations
	A	B	C	D	E		
0							
1	[BIPIfAt] (Fd)			102			ABLA/CAR05, ABLA/JUCO6, ABLA/CAR05, PICO/JUCO6, POTR5-ABLA/JUCO6
2	PI [BISeAt] (Fd)			103			PICO/VASC
3				101			
4		PIBISe (At)					ABLA/MARE11, ABLA/VASC, POTR5/SYOR2
5		BISe [PI]			110		ABLA/RIMO2
6		BISe			111		
7							

Tree species codes are presented in Appendix 1 with many codes in Table 10; Habitat type / association codes are in Appendix 2.

Figure 51. ESSF_{xk}_UT tree species suitability displayed on edatopic grid.

3.2 INTERIOR CEDAR – HEMLOCK [ICH]

The Interior Cedar – Hemlock (ICH) Zone occurs at low- to mid-elevations in mesic to moist, continental, temperate climates of the interior mountain ranges of Washington (Lillybridge et al. 1995; Williams et al. 1995), Idaho (Cooper, Neiman, and Roberts 1991), Montana (Pfister et al. 1978), and southern British Columbia (Meidinger and Pojar 1991). Mature forests are characterized by western hemlock (*Tsuga heterophylla*) and/or western redcedar (*Thuja plicata*) (Table 9). Grand fir (*Abies grandis*) is common in forests in the U.S. range. Douglas-fir (*Pseudotsuga menziesii*) is a common seral species and as it is long-lived, it is often a component of older forests. Other common seral tree species are western larch (*Larix occidentalis*), lodgepole pine (*Pinus contorta*), and ponderosa pine (*Pinus ponderosa*). In cooler climates, Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) are components of older stands.

The understorey varies considerably. In the U.S. range, common shrubs are black huckleberry (*Vaccinium membranaceum*), falsebox (*Paxistima myrsinites*), common snowberry (*Symphoricarpos albus*), birch-leaved spirea (*Spiraea betulifolia* ssp. *lucida*), Utah honeysuckle (*Lonicera utahensis*), and thimbleberry (*Rubus parviflorus*). Herbs include pinegrass (*Calamagrostis rubescens*), round-leaved violet (*Viola orbiculata*), queen's cup (*Clintonia uniflora*), twinflower (*Linnaea borealis*), prince's pine (*Chimaphila umbellata*), and star-flowered false Solomon's-seal (*Maianthemum stellatum*).

Engelmann spruce and subalpine fir increase in abundance with elevation, and the Engelmann Spruce – Subalpine Fir (ESSF) zone usually occurs at elevations above the ICH.

USNVC: Zonal forests are included in Macrogroup M500: Central Rocky Mountain Mesic Lower Montane Forest [*Tsuga heterophylla* – *Abies grandis* – *Larix occidentalis* Lower Montane Forest], specifically, G217: Central Rocky Mountain Interior Western Red-cedar – Western Hemlock Forest Group.

1.1.1.ICH Subzones

Seven subzones (Table 11) are recognized, primarily over climatic moisture, temperature, and longitudinal gradients.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 11. ICH Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	ICHxw_WA	ICHxh_ID	ICHxw_ID	ICHdh_ID	ICHdw_ID	ICHmh_MT	ICHmw_MT	Common Name	BC Tree Code
<i>Thuja plicata</i>	C*	C	C	C	C	C	C	western redcedar	Cw
<i>Abies grandis</i>	c	C	C	C	C		c	grand fir	Bg
<i>Tsuga heterophylla</i>				c	C	c	C	western hemlock	Hw
<i>Picea engelmannii</i>			c		c	c	c	Engelmann spruce	Se
<i>Abies lasiocarpa</i>			c		c	c	c	subalpine fir	Bl
<i>Tsuga mertensiana</i>								mountain hemlock	Hm
<i>Larix occidentalis</i>	S	s	s	s	S	S	S	western larch	Lw
<i>Pseudotsuga menziesii</i>	S	S	S	S	S	S	S	Douglas-fir	Fd
<i>Pinus contorta</i>	S			s	S	S	S	lodgepole pine	Pl
<i>Pinus ponderosa</i>	S	s		s	s			ponderosa pine	Py
<i>Betula papyrifera</i>	s	s		s	s	S		paper birch	Ep
<i>Populus tremuloides</i>	s					s	s	trembling aspen	At
<i>Pinus monticola</i>				s	s	s	s	western white pine	Pw

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.2.1 ICHxw_WA – Very Dry Warm Washington ICH

This subzone occurs at low to mid elevations, mostly in Washington, but extends into some low elevation, warm valleys in Idaho.

Zonal forests of this subzone are dominated by Douglas-fir and western larch, with some western redcedar (Table 11). Western hemlock is absent. Other seral tree species on these sites are lodgepole and ponderosa pine. Grand fir is sometime present, but it is not a significant component. The shrub layer is well developed with black huckleberry, falsebox, common snowberry, oceanspray (*Holodiscus discolor*), mallow ninebark (*Physocarpus malvaceus*), tall Oregon-grape (*Mahonia aquifolium*), birch-leaved spirea, Douglas maple (*Acer glabrum* var. *douglasii*), and baldhip rose (*Rosa gymnocarpa*). The herb layer is lightly developed.

This subzone occurs at elevations above the IDFdh_WA in the western part of its range, whereas in the east, it occurs in valley bottoms, at elevations below the ICHdw_ID.

Zonal Habitat types: THPL/CLUN, THPL/VAME (Williams et al. 1995)

ICHxw_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		PyFd		102		PIPO-PSME/PSSPS(AGSP), PIPO/AGSP
2		Fd [PyLw] (PI)		103		PSME/PHMA, PSME/PHMA-LIBOL, PSME/CARU, PSME/SYAL, PSME/VAME
3		FdLw [CwPyPIEp]				
4		(BgHw)		101		THPL/CLUN, THPL/VAME
5	110	Cw [BIPiFd AtLw](HwSe)		CwLw [FdAt Ep](BgBl)	112	THPL/ARNU3, TSHE/ARNU3, THPL/GYDR, TSHE/GYDR
6	111	Se [BICw](Fd)		CwAct [SeFd]	113	ALIN/EQUIS, PIEN/EQUIS
7						

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 52. ICHxw_WA tree species suitability and plant associations displayed on edatopic grid.

3.2.2 ICHxh_ID – Very Dry Hot Idaho ICH

This subzone occurs at low to mid elevations (500-1200 m) in northern Idaho from the community of Elk River, north of the Dwarshak Reservoir, SSE to the Selway River, mostly in the Nez-Perce–Clearwater National Forest.

Zonal forests are characterized by Douglas-fir, grand fir, and western redcedar (Table 11). Western hemlock is absent. Ponderosa pine is a common seral tree species; western larch and paper birch are other frequent seral species. The main understorey shrubs are common snowberry, Douglas maple (*Acer glabrum*), oceanspray (*Holodiscus discolor*), saskatoon (*Amelanchier alnifolia*), and thimbleberry. The herb layer is mostly Idaho goldthread (*Coptis occidentalis*), star-flowered false Solomon's-seal, queen's cup, bracken fern (*Pteridium aquilinum*), and Hooker's fairybells (*Prosartes hookeri*).

It mostly occurs at elevations above the IGFxm_OR and below the ICHxw_ID. In its northern range it can occur below the ICHdw_ID.

Zonal Habitat types: THPL/CLUN, ABGR/CLUN (Cooper, Neiman, and Roberts 1991; Pfister et al. 1978)

ICHxh_ID							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Py [Fd] (Bg)			102			PyFd/Amelaln/Calarub, Py/Agrospi, PIPO/SYAL
2	Fd [Py] (Bg)			103			ABGR/PHMA5, Fd/Holodis
3		BgFd		101			
4		[Cw] (PILwEp)					THPL/CLUN2, ABGR/CLUN2
5	110	Bg[CwFdLw] (PIPwEp)		BgCw[FdLw Ep] (PIPw)	112		THPL/ASCA2, ABGR/ASCA2
6	111	Cw [Bg](Fd)		Cw[BgSeAct] (FdEp)	113		THPL/ADPE, THPL/ATFI-ADPE, THPL/ATFI-ATFI
7							

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 53. ICHxh_ID tree species suitability and plant associations displayed on edatopic grid.

3.2.3 ICHxw_ID – Very Dry Warm Idaho ICH

This subzone occurs at moderately high elevations (1200-1600 m) in northern Idaho from the community of Elk River, north of the Dwarshak Reservoir, SSE to the Selway River, mostly in the Nez-Perce-Clearwater National Forest.

Zonal forests are characterized by Douglas-fir, grand fir, and western redcedar (Table 11). Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) can occur on zonal sites but are more common on moister sites. Western hemlock is absent. Ponderosa pine and western larch are frequent seral tree species.

The main understorey shrubs are common snowberry, Douglas maple (*Acer glabrum*), thimbleberry, saskatoon (*Amelanchier alnifolia*), black huckleberry, common snowberry, and false azalea (*Menziesia ferruginea*). The herb layer is mostly Idaho goldthread (*Coptis occidentalis*), star-flowered false Solomon's-seal, queen's cup, bracken fern (*Pteridium aquilinum*), and beargrass (*Xerophyllum tenax*).

It mostly occurs at elevations above the ICHxh_ID and below the ESSFdw_ID.

Zonal Habitat types: THPL/CLUN2, ABGR/CLUN2 (Cooper, Neiman, and Roberts 1991; Pfister et al. 1978)

ICHxw_ID							Habitat Types/Associations
	A	B	C	D	E		
0							
1		Fd (Py)		102			PSME/CAGE2, PSME/PHMA5, PSME/PHMA5/CARU
2		Fd (BgPy)		103			PSME/PHMA5-PHMA5, ABGR/PHMA5-PHMA5
3		BgFd		101			ABGR/CLUN2-CLUN2, ABGR/CLUN2-MEFE, ABGR/CLUN2-PHMA5
4		[LwCw] (SeBIPI)					THPL/CLUN2-CLUN2, THPL/CLUN2-TABR2, THPL/CLUN2-XETE
5	110	Bg [FdCwSe] (LwPIPwEpBl)		BgSe [CwFd Lw] (PIPwEp)	112		THPL/ASCA2 (ASCA2, TABR2 & MEFE vars), ABGR/ASCA2ABLA/CLUN2-MEFE
6	111	Bg[CwSe] (FdPwEpBl)		CwSeBg [Fd] (EpPwBl)	113		THPL/ATFI-ATFI
7							

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 54. ICHxw_ID tree species suitability and plant associations displayed on edatopic grid.

3.2.4 ICHdh_ID – Dry Hot Idaho ICH

This subzone occurs at low elevations, mostly in northern Idaho, about as far south as Potlatch, ID, and extends into NW Montana.

Zonal forests are characterized by Douglas-fir, grand fir, and western redcedar (Table 11). Western hemlock occurs somewhat, but is more prevalent in the ICHdw_ID, which occurs at higher elevations. Ponderosa pine and western larch are common seral tree species.

The understory is shrubby, with saskatoon (*Amelanchier alnifolia*), common snowberry, Douglas maple (*Acer glabrum*), oceanspray (*Holodiscus discolor*), and mallow ninebark (*Physocarpus malvaceous*). The herb layer is mostly pinegrass, bracken fern (*Pteridium aquilinum*), and star-flowered false Solomon's-seal.

It mostly occurs at elevations below the ICHdw_ID. The IDFdh_WA occurs at lower elevations to the west, where climates are drier.

Zonal Habitat types: THPL/CLUN, (ABGR/CLUN) (Cooper, Neiman, and Roberts 1991; Pfister et al. 1978)

ICHdh_ID						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd]		102		PyFd/Pseuspi (PIPO-PSME/AGSP?) PSME/CARU-ARUV
2		Fd[PIPyLw](BgEpAt)		103		FdPl/Calarub, PSME/CARU-CARU
3		BgFdPICwLw		101		
4		[Pw] (PyAtEp)				THPL/CLUN, (ABGR/CLUN)
5	110	CwFd[PLwBgSe Pw](HwBLEp)		CwFd[LwBgPw EpSe](BIPIHw)	112	CwBg/Polymun-Adiaale THPL/ASCA, THPL/GYDR
6	111	CwSe[BgBIFd] (EpPwHw)		Cw[ActSeBgFd Ep](PwBIHw)	113	THPL/Athyfil-Asarcau (Dr & Dm minor) THPL/ATFI
7						

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 55. ICHdh_ID tree species suitability and plant associations displayed on edatopic grid.

3.2.5 ICHdw_ID – Dry Warm Idaho ICH

This subzone occurs at mid elevations, mostly in eastern Washington and northern Idaho, but extending into NW Montana.

Zonal forests are dominated by Douglas-fir, grand fir, and western redcedar, with a component of western hemlock (Table 11). Western larch and lodgepole pine are common seral tree species. The main understorey shrubs are black huckleberry, falsebox, Douglas maple (*Acer glabrum*), thimbleberry, and birch-leaved spirea. Key herbs are queen's cup, twinflower, prince's pine (*Chimaphila umbellata*), and round-leaved violet (*Viola orbiculata*).

In the north part of its range, the ICHdw_ID occurs at elevations above the ICHxw_WA. In the central part of its range it occurs above the ICHdh_ID and in the southern part, above the ICHxh_ID. In parts of Montana it occurs adjacent to the ICHmw_MT or ICHmh_MT

Zonal Habitat types: TSHE/CLUN, THPL/CLUN, ABGR/VAME/CLUN, ABGR/ACGLD/CLUN (Cooper, Neiman, and Roberts 1991; Pfister et al. 1978; Williams et al. 1995).

ICHdw_ID							Habitat Types/Associations
	A	B	C	D	E		
0							
1		PyFd		102			PIPO-PSME/AGSP
2		Fd [LwPy]	(PIPwBg)	103			PSME/PHMA, PSME/PHMA-LIBOL, PSME/CARU, PSME/VAME, ABGR/PHMA
3		BgFdLw	[CwHwAt				
4		PIPw]	(SeEpPy)	101			TSHE/CLUN, THPL/CLUN, ABGR/VAME/CLUN, ABGR/ACGLD/CLUN
5	110	CwFdBgPwLw[H	w](SeBlAtEpHm)	CwSe	[BgHwBl](Ep)	112	THPL/ARNU3, TSHE/GYDR, TSHE/ARNU3
6	111	CwFdBgPw[Lw	SeEpAt](HwHm)	Cw [SeActEp]	(BlHw)	113	TSHE/OPHO, THPL/OPHO, TSHE/ATFI, THPL/ATFI

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 56. ICHdw_ID tree species suitability and plant associations displayed on edatopic grid.

3.2.6 ICHmh_MT – Moist Hot Montana ICH

This subzone occurs in northwestern Montana, primarily in Glacier National Park.

Zonal forests are dominated by Douglas-fir, western hemlock, and western redcedar, with a component of Engelman spruce and subalpine fir (Table 11). Western larch, lodgepole pine, and paper birch are common seral tree species. The main understorey shrubs are black huckleberry, Douglas maple (*Acer glabrum*), common snowberry, thimbleberry, birch-leaved spirea, and Utah honeysuckle. Key herbs are queen's cup, star-flowered false Solomon's-seal, Hooker's fairybells (*Disporum hookeri*), pathfinder (*Adenocaulon bicolor*), beargrass (*Xerophyllum tenax*), three-leaved foamflower (*Tiarella trifoliata*), and wild sarsaparilla (*Aralia nudicaulis*).

The ICHmh_MT occurs at elevations above the ICHdh_ID and below the MSdw_MT.

Zonal Habitat types: THPL/CLUN2-CLUN2, TSHE/CLUN2-CLUN2 (Pfister et al. 1978)

ICHmh_MT							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Fd [EpPy] (Lw)			102			FdPl/Amelaln-Sympalb/Pseuspi. FdEp/Acergla/Pseuspi
2	LwFdPl [Pw](BISePy)			103			FdLw/Spirbet/Calarub, FdLw/Sympalb/Caregey
3		CwFdLw		101			THPL/CLUN2-CLUN2, TSHE/CLUN2-CLUN2
4		[SeEpPIPwAt] (Hw)					TSHE/CLUN-XETE
5	110	LwFd [CwAtSe EpPwPIHw] (BI)		CwLwFd[AtSe EpPwHwBl] (PI)		112	THPL/GYDR, TSHE/GYDR, TSHE/ASCA-ARNU
6	111	SeBl [Cw] (PwHwAct)		Se [CwEpAct] (BIPw)		113	THPL/OPHO, THPL/ATFI, PICEA/EQAR, Populus balsamifera ssp. trichocarpa / Cornus sericea Forest
7							

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 57. ICHmh_MT tree species suitability and plant associations displayed on edatopic grid.

3.2.7 ICHmw_MT – Moist Warm Montana ICH

This subzone occurs in northwestern Montana, mostly west and south of Lake Koochanusa.

Zonal forests are dominated by western hemlock and western redcedar, with a component of Engelmann spruce and subalpine fir (Table 11). Grand fir is sometimes present. Douglas-fir, western larch, lodgepole pine, and western white pine are common seral tree species. The main understorey shrubs are false azalea (*Menziesia ferruginea*), Sitka alder (*Alnus alnobetula* ssp. *sinuata*), thimbleberry, birch-leaved spirea, grouseberry (*Vaccinium scoparium*), and Utah honeysuckle. Key herbs are queen's cup, twinflower, and three-leaved foamflower (*Tiarella trifoliata*).

The ICHmw_MT abuts the ICHdm (MacKillop and Ehman 2016), which occurs to the north; and mostly occurs at elevations below the ESSFwh_MT; however, due mostly to mapping issues, it also abuts the ESSFwm_MT or sometimes MSdw_MT, at higher elevations.

Zonal Habitat types: TSHE/CLUN2, TSHE/CLUN2-CLUN2, THPL/CLUN2-CLUN2 (Pfister et al. 1978)

ICHmw_MT							Habitat Types/Associations
	A	B	C	D	E		
0							
1	PIFd [Lw](Py)			102			PSME/SYAL-CARU
2	PILwFd [Pw] (PyCw)				103		PSME/LIBO3-SYAL
3		FdLw [AtCwHwSeBg]					
4		Pw](BlEpPl]		101			TSHE/CLUN2, THPL/CLUN2-CLUN2, TSHE/CLUN2-CLUN2
5	110	Cw[FdLwHwPw BgSeBl](PlAt)	Cw[FdLwPwBgS eAtEp](Hw)		112		THPL/GYDR, TSHE/GYDR, THPL/CLUN2-ARNU2
6	111	Cw [HwSe] (BgBl)	Cw[SeActBg] (Pw)		113		THPL/OPHO, THPL/ATFI
7							

Tree species codes are presented in Appendix 1 with many codes in Table 11; Habitat type / association codes are in Appendix 2.

Figure 58. ICHmw_MT tree species suitability and plant associations displayed on edatopic grid.

3.3 INTERIOR DOUGLAS-FIR [IDF]

The Interior Douglas-fir (IDF) Zone occurs at low- to mid-elevations in dry, continental, temperate climates of the intermountain plateaus and interior mountain valleys and slopes of Washington (Lillybridge et al. 1995; Williams et al. 1995), northern Oregon (Franklin and Dyrness 1988), Idaho (Cooper, Neiman, and Roberts 1991; Steele et al. 1981; 1983), Montana (Pfister et al. 1978), and southern British Columbia (Meidinger and Pojar 1991).

Douglas-fir (*Pseudotsuga menziesii*) is the key climax species of this zone (Table 9). Ponderosa pine (*Pinus ponderosa*) is the most common seral species. Other frequent seral trees are lodgepole pine (*Pinus contorta*) and western larch (*Larix occidentalis*).

The understory shrub cover is generally light and characterized by birch-leaved spirea (*Spiraea betulifolia* ssp. *lucida*), common snowberry (*Symphoricarpos albus*), and saskatoon (*Amelanchier alnifolia*). The forb and grass cover is higher and includes pinegrass (*Calamagrostis rubescens*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), arrowleaf balsamroot (*Balsamorhiza sagittata*), kinnikinnick (*Arctostaphylos uva-ursi*), yarrow (*Achillea millefolium*), and heart-leaved arnica (*Arnica cordifolia*).

The Ponderosa Pine (PP) zone often occurs in drier and warmer climates at elevations below the IDF. In dry climatic areas, the Montane Spruce (MS) zone occurs at elevations above the IDF, whereas in moister climates, the Interior Cedar – Hemlock (ICH) zone occurs above.

USNVC: Zonal forests are included in Macrogroup M501: Central Rocky Mountain Dry Lower Montane-Foothill Forest [*Pinus ponderosa* var. *ponderosa* – *Pseudotsuga menziesii* – *Pinus flexilis* Central Rocky Mountain Dry Forest], mostly G210: Central Rocky Mountain Douglas-fir - Pine Forest, and G215: Middle Rocky Mountain Montane Douglas-fir Forest & Woodland

3.3.1 IDF Subzones

Sixteen subzones (Table 12) are recognized in a series of gradients affecting climatic moisture and temperature, including sub-continental to continental, latitude, longitude, and elevation.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 12. IDF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	IDFxx_ WA	IDFxx_ WA	IDFxx_ WA	IDFxx_ WA	IDFxx_ WA	IDFxx_ OR	IDFxx_ ID	IDFxx_ MT	IDFxx_ MT	IDFxx_ MT	IDFxx_ MT	IDFxx_ MT	IDFxx_ MT	IDFxx_ WY	IDFxx_ CO	IDFxx_ UT	Common Name	BC Tree Code
<i>Quercus garryana</i>	C*																Garry oak	Qg
<i>Pseudotsuga menziesii</i>	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Douglas-fir	Fd
<i>Abies grandis</i>	c					c	c			c							grand fir	Bg
<i>Juniperus scopulorum</i>								c				c	c	c	c		Rocky Mountain juniper	Jr
<i>Quercus gambelii</i>																C	Gambel oak	Qa
<i>Pinus ponderosa</i>	S	S	S	s	S	S	S	S	S	*		s		s	s	S	ponderosa pine	Py
<i>Populus tremuloides</i>											S	s	S	s	S	S	trembling aspen	At
<i>Larix occidentalis</i>			s	S							s						western larch	Lw
<i>Pinus contorta</i>				S	S						s	S		S			lodgepole pine	Pl
<i>Pinus flexilis</i>														s			limber pine	Pf

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.3.2 IDfxx_WA – Very Dry Very Hot Washington IDF

This subzone occurs at low elevations, along the east slope of the Cascade Mountains from northern Oregon to central Washington State.

Zonal forest stands are dominated by Douglas-fir and ponderosa pine (Table 12). Garry oak (*Quercus garryana*) also occurs in this subzone. Common snowberry, oceanspray (*Holodiscus discolor*), and saskatoon are the most frequent shrubs. The herb layer is mostly pinegrass and elk sedge (*Carex geyeri*), with some heart-leaved arnica.

This subzone mostly occurs at elevations between the PPxx_OR and the IGF (IGFdw_OR or IGFdk_WA). It abuts the IDfXh_WA on its northern boundary (which lacks Garry oak).

Zonal Habitat types: PSME/CARU, PSME/SPBEL, PSME/SPBEL/CARU (Simpson 2007; Lillybridge et al. 1995).

IDfxx_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd] (Qg)		102		PIPO/PUTR/AGSP, PSME/PUTR, PSME/PUTR/AGSP, PIPO/AGSP
2		Py [FdQg]		103		PSME/CAGE, PSME/SYOR, PSME/SYAL/AGSP, QUGA/CARU-CAGE
3				101		
4			Fd [PyQg]			PSME/CARU, PSME/SPBEL, PSME/SPBEL/CARU
5	110	Fd [Py](BgQg)		Fd [PyBgQg]		112 PSME/SYAL, PSME/SYAL/CARU, QUGA/COCO2-SYAL
6	111	Fd (LwAt)		Act[BgLw] (FdMbDwDrQg)		113 POTR2/COST, ALIN/EQUIS, POTR/SYAL, ALIN/COST
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 59. IDfxx_WA tree species suitability and plant associations displayed on edatopic grid.

3.3.3 IDFxh_WA – Very Dry Hot Washington IDF

This subzone occurs at low elevations, east of the Cascade Mountains, including the Okanogan-Wenatchee National Forest.

Zonal forest stands are dominated by Douglas-fir and ponderosa pine (Table 12). Common snowberry, birch-leaved spirea, saskatoon, and falsebox (*Paxistima myrsinites*) are the most frequent shrubs. The herb layer is mostly pinegrass, with some bluebunch wheatgrass, elk sedge (*Carex geyeri*), arrowleaf balsamroot, and heart-leaved arnica.

This subzone mostly occurs at elevations above the PPxh_WA, although sometimes it abuts the Bunchgrass Zones (BG), with no PP—conceptually there should be some PPxh_WA. In the northern part of the range, the IDFdK_WA occurs above this subzone; in the southern part, the IGFdk_WA occurs above. To the south is the IDFxX_WA, which has Garry oak.

Zonal Habitat types: PSME/CARU, PSME/SPBEL/CARU, PSME/PAMY/CARU (Williams and Lillybridge 1983; Lillybridge et al. 1995).

IDFxh_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd]		102		PIPO/AGSP, PSME/PUTR/AGSP, PIPO/PUTR/AGSP, PSME/AGSP
2		Py [Fd]		103		PSME/ARUV, PSME/ARUV/CARU, PSME/CARU-AGSP, PSME/SYOR
3				101		
4			Py [Fd]			PSME/CARU, PSME/SPBEL/CARU, PSME/PAMY/CARU
5	110	Fd [Py] (At)		Fd [PyAt]		112 PSME/SYAL/CARU, PSME/SYAL, PSME/SPBEL, PSME/PAMY
6	111	Fd [Se] (At)		Fd [SeAct]		113 PIEN/COST, POTR2/ALIN, POTR2/COST, ABLA2/LIBOL, PIEN/SYAL
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 60. IDFxh_WA tree species suitability and plant associations displayed on edatopic grid.

3.3.4 IDFdk_WA – Dry Cool Washington IDF

This subzone occurs at mid elevations, east of the Cascade Mountains, including the Okanogan-Wenatchee National Forest.

Zonal forest stands are dominated by Douglas-fir, with lodgepole pine and ponderosa pine (Table 12). The most common shrubs are falsebox (*Paxistima myrsinites*), saskatoon, and birch-leaved spirea. The herb layer is dominated by pinegrass, with some kinnikinnick, balsamroot, heart-leaved arnica, and northwestern sedge (*Carex concinnoides*),

This subzone occurs at elevations between the IDFxh_WA and the MSxk_WA.

Zonal Habitat types: PSME/ARUV/CARU, PSME/CARU, PSME/PAMY/CARU (Williams and Lillybridge 1983; Lillybridge et al. 1995).

IDFdk_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd]		102		PSME/PUTR/AGSP, PSME/AGSP, PSME/CARU-AGSP, PIPO alliance
2		FdPy (Pl)		103		PSME/ARUV, PSME/SPBEL,/CARU, PSME/SYOR
3				101		PSME/ARUV/CARU
4		Fd [PyPl] (AtLw)				PSME/CARU, PSME/PAMY/CARU, PSME alliances, PICO alliance
5	110	FdPl [Py](At)		Fd [PlAt](Py)	112	PSME/SYAL/CARU, PSME/PAMY, PSME/VAMY/CARU, PSME/VAME
6	111	Se [AtFd BIPI](Cw)		Se [FdAt](Cw)	113	ABLA2/VAME, PIEN/COST, PIEN/EQUIS
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 61. IDFdk_WA tree species suitability and plant associations displayed on edatopic grid.

3.3.5 IDFdh_WA – Dry Hot Washington IDF

This subzone occurs at low elevations, in northeastern Washington, east of the Okanogan River, extending east into northwestern Idaho. It is a southern variation of the IDFdh in British Columbia, which also extends south into Washington State.

Zonal forest stands are dominated by Douglas-fir and ponderosa pine (Table 12). At higher elevations, western larch can sometimes occur. The most frequent shrubs are common snowberry, mallow ninebark (*Physocarpus malvaceus*), tall Oregon-grape (*Mahonia aquifolium*), oceanspray (*Holodiscus discolor*), saskatoon, and birch-leaved spirea. Pinegrass dominates the understorey. Other common understorey plants are kinnikinnick, twinflower (*Linnaea borealis*), and heart-leaved arnica.

The PPxh_WA occurs at elevations below the IDFdh_WA. In its western range, the IDFdm_WA is found at higher elevations, but to the east, where the climate gets moister, the ICHxw_WA occurs above. In some eastern areas, the IDFdh_WA abuts the ICHdw_ID. It abuts the IDFdh (from B.C.) in some valleys near the Canadian border.

Zonal Habitat types: PSME/CARU, PSME/PHMA-LIBOL, PSME/CARU-ARUV (Williams et al. 1995; Cooper, Neiman, and Roberts 1991).

IDFdh_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd]		102		PIPO-PSME/AGSP, PIPO-PSME/PSSPS, PIPO/PSSPS
2		PyFd		103		PSME/SYOR, PSME/PHMA, PSME/HODI
3				101		
4		FdPy [Lw]				PSME/CARU, PSME/PHMA-LIBOL, PSME/CARU-ARUV
5	110	Fd [LwPyAt] (EpPl)		Fd [LwAtBg](Ep)	112	PSME/SYAL, PSME/VACA, PSME/VAME
6	111	Se [FdEpPl](At)		SeAct [FdEp] (LwAtBgCw)	113	ABLA2/COCA, ABLA2/LIBOL, POTR2/ALIN, PIEN/COCA, PIEN/EQUIS
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 62. IDFdh_WA tree species suitability and plant associations displayed on edatopic grid.

3.3.6 IDFdm_WA – Dry Mild Washington IDF

This subzone occurs at mid elevations, in northeastern Washington, east of the Okanogan River. It is a southern variation of the IDFdm1 in British Columbia (Lloyd et al. 1990), which also extends south into Washington State.

Douglas-fir is the climax species of zonal forests (Table 12). Lodgepole pine and western larch are the main seral tree species. At lower elevations, ponderosa pine can also occur. The shrub cover is very light—the most frequent shrubs are common snowberry, birch-leaved spirea, falsebox (*Paxistima myrsinites*), and black/blue huckleberry (*Vaccinium membranaceum/globulare*). Pinegrass dominates the understorey. Other common understorey plants are the dwarf shrubs kinnikinnick and twinflower (*Linnaea borealis*), as well as the forbs silky lupine (*Lupinus sericeus*) and heart-leaved arnica.

This subzone occurs at elevations between the IDFdh_WA and MSdm_WA. To the north, it abuts the IDFdm1 (from B.C.).

Zonal Habitat type: PSME/CARU (Williams et al. 1995)

IDFdm_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		FdPy		102		PIPO-PSME/AGSP, PSME/SYOR, PSME/ARUV/CARU
2		Fd [LwPy]		103		PSME/PHMA, PSME/PHMA-LIBOL
3				101		
4		FdLw [PI]				PSME/CARU, PSME/VAME
5	110	FdLwPI[BiSe](At)		FdLw[AtSe](Bi)	112	PSME/SYAL, ABLA2/VAME, ABLA2/LIBOL
6	111	Se[PIBi](FdAt)		Se[BiActAt](Fd)	113	PIEN/COCA, PIEN/EQUIS, ABLA2/TRCA3, PICO/CACA, PIPO/CAUT
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 63. IDFdm_WA tree species suitability and plant associations displayed on edatopic grid.

3.3.7 IDFxh_OR – Very Dry Hot Oregon IDF

This subzone occurs at mid elevations, mostly in central Oregon in the Ochoco, Malheur, and western Umatilla National Forests.

Douglas-fir is the main climax species of zonal forests (Table 12). Ponderosa pine is the primary seral tree species. Grand fir/ white fir (*Abies concolor*) can occur on moister sites, especially near the boundary with the IGF. Elk sedge (*Carex geyeri*) is the main species in the understory of mesic sites, often with a bit of pinegrass. On moist sites, the shrub cover increases, with common or mountain snowberry (*Symphoricarpos oreophilus*) being most frequent. On dry sites bluebunch wheatgrass and Idaho fescue (*Festuca idahoensis*) often occur.

This subzone mostly occurs at elevations between the PPxm_OR and the IGFmh_OR,

Zonal Habitat type: PSME/CAGE2, PSME/CARU (Johnson and Simon 1987; Johnson and Clausnitzer 1992)

IDFxh_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Jw				JUOC/FEID-PSSPS, FEID-AGSP
2		Py [Jw] (Fd)		102		PIPO/PSSPS, PIPO/CAGE
3				101		PIPO/CARU
4			PyFd (Om)			PSME/CAGE2, PSME/CARU
5	110	FdPy (BgBc)		FdPy (BgBc)	112	PIPO/SYAL, PSME/HODI, PSME/SYAL
6	111	Bg [FdPyBc]		Bg [FdPyBc]	113	ABGR/CARU
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 64. IDFxh_OR tree species suitability and plant associations displayed on edatopic grid.

3.3.8 IDFxh_ID – Very Dry Hot Idaho IDF

This subzone occurs at low elevations, mostly in west central Idaho, north and east of Boise.

Douglas-fir is the main climax species of zonal forests (Table 12). Ponderosa pine is the primary seral tree species. Grand fir can occur on moister sites, especially near the boundary with the IGF. The shrub cover is mostly mountain snowberry (*Symphoricarpos oreophilus*), mallow ninebark (*Physocarpus malvaceus*), and birch-leaved spirea. Pinegrass and elk sedge (*Carex geyeri*) dominate the understorey; other species are bluebunch wheatgrass and arrowleaf balsamroot.

This subzone mostly occurs at elevations between the PPxh_WA and the IGFmm_OR (or sometimes, MSmm_ID); however, in the northern portion of its range it occurs below the IGFxm_OR. It abuts the IDFDx_MT to the east in portions of its southern range.

Zonal Habitat types: PSME/CARU, PSME/SPBE, PSME/PHMA, PSME/PHMA5/PIPO (Johnson and Simon 1987).

IDFxh_ID						Habitat Types/Associations
	A	B	C	D	E	
0						
1		grasslands				FEID-KOCR, FEID/AGSP-BASA, FEID-AGSP-LUSE
2		Py		102		PIPO/SYAL, PIPO/SPBE, PIPO/FEID, PIPO/PSSPS
3				101		PSME/CARU, PSME/SPBE
4			Py [Fd]			PSME/PHMA, PSME/PHMA5/PIPO
5	110	FdPy (BgAt)		FdPy [BgAt]	112	PSME/SYAL, PSME/ACGL-PHMA
6	111	Se[Fd](AtBgPl)		Se[BgFdActAt]	113	ABGR/TRCA3
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 65. IDFxh_ID tree species suitability and plant associations displayed on edatopic grid.

3.3.9 IDfxx_MT – Very Dry Very Hot Montana IDF

This subzone occurs at low elevations, around Lake Koochanusa, south of British Columbia, and further south around Flathead Lake and Flathead Indian Reservation. The IDfxx_MT is a southern variation of the IDfxx2 in British Columbia (MacKillop et al. 2018).

Zonal forest stands are dominated by Douglas-fir and ponderosa pine (Table 12). Rocky Mountain juniper (*Juniperus scopulorum*) is common in this subzone. Saskatoon (*Amelanchier alnifolia*) and common snowberry are common shrubs, but pinegrass dominates the understory—along with some bluebunch wheatgrass, Idaho fescue, and/or rough fescue (*F. campestris*).

At elevations above this subzone, the IDfdm_MT occurs in the northern part of the range, whereas IDfdh_MT mostly occurs above it in the southern part of the range. Near the Canadian border, the IDfxx_MT abuts the IDfxx2 (MacKillop et al. 2018), a unit from British Columbia that occurs in Montana near the border.

Zonal Habitat types: PSME/CARU-AGSP, PSME/CARU (Pfister et al. 1978).

IDfxx_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		grassland		Gg		non-treed
2		(Jr)				
3				101		FdPy-Physmal-Pseuspi, PIPO/AGSP, PSME/FEID, PSME/AGSP,
4		Py [Fd]				PSME/CARU-AGSP, PSME/CARU
5	110	Fd[Py](EpAt)		ActFd[AtEp]	112	Act-Acergla-Corycor, PSME/SYAL-CARU, PSME/PHMA5-CARU,
6	111	Fd (At)		Act[AtEp]	113	ActDm-Cornsto-Equiarv
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 66. IDfxx_MT tree species suitability and plant associations displayed on edatopic grid.

3.3.10 IDFd_h_MT – Dry Hot Montana IDF

This subzone occurs at low elevations, in the Missoula, Kalispell, and Flathead Lake regions of Montana. It is similar to the IDFx_x_MT, but being a slightly moister climate, there is more Douglas-fir and moister sites have a greater variety of tree species.

Zonal forest stands are dominated by Douglas-fir and ponderosa pine (Table 12). Western larch appears at higher elevations. The dominant shrubs are common snowberry, mallow ninebark (*Physocarpus malvaceus*), and saskatoon. Pinegrass dominates the understorey—along with some bluebunch wheatgrass and elk sedge (*Carex geyeri*).

This subzone occurs between the IDFx_x_MT and the IDFd_m_MT, where the elevation sequence has all three subzones. In areas lacking the IDFx_x_MT, the IDFd_h_MT occurs at lower elevations than the IDFd_m_MT.

Zonal Habitat types: PSME/CARU-AGSP, PSME/CARU (Pfister et al. 1978).

IDFd _h _MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd]		102		PIPO/PSSPS
2		Py [Fd]		103		PSME/PSSPS
3				101		PSME/PHMA5/CARU, PSME/SYAL-CARU, PSME/PHMA5-PHMA5,
4		FdPy [Lw]				PSME/CARU-AGSP, PSME/CARU
5	110	Fd[LwPy](PIAt)		Fd[LwPyAt](Ep)	112	PIPO/SYAL-SYAL, PSME/SYAL-SYAL,
6	111	Se[FdPl](LwAt)		Se[FdEp ActAt](LwBgCw)	113	THPL/CLUN2, PSME/VACA13
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 67. IDFd_h_MT tree species suitability and plant associations displayed on edatopic grid.

3.3.11 IDFdm_MT – Dry Mild Montana IDF

This subzone occurs at low-mid elevations in northwestern Montana, in the Bitterroot National Forest, Missoula, and Kalispell regions, north to the Canadian border. It is a southern equivalent of the IDFdm2 in British Columbia (MacKillop et al. 2018).

Douglas-fir is the climax species of zonal forests (Table 12). Lodgepole pine and western larch are the main seral tree species. Ponderosa pine can also occur, especially on dry sites or near boundaries with the IDFdh_MT. The shrub cover is typically common snowberry, saskatoon, birch-leaved spirea, and mallow ninebark (*Physocarpus malvaceus*). Pinegrass dominates the understorey. Other common understorey plants are the dwarf shrubs kinnikinnick and twinflower (*Linnaea borealis*), as well as elk sedge (*Carex geyeri*), and heart-leaved arnica.

This subzone mostly occurs at elevations between the IDFdh_MT and either the ICHdw_ID or ICHdh_ID. It the north, it can abut the IDFdm2 (MacKillop et al. 2018) near the border with British Columbia. In its extreme southern range, it adjoins various subzones, including the MSmm_ID and MSdh_MT.

Zonal Habitat types: PSME/CARU-CARU, PSME/CARU-ARUV (Pfister et al. 1978).

IDFdm_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [Fd]		102		Py-Pseuspi, Py-Festida, PyFd-Purstri, PyFd-Ceanvel
2		FdPy [Lw]		103		FdPy-Arctuva, FdPy-Caregey
3				101		PSME/PHMA5-CARU, PSME/SYAL-CARU, PSME/PHMA5-PHMA5
4		FdLwPI [Py]				PSME/CARU-CARU, FdPy-Spirbet, PSME/CARU-ARUV
5	110	Fd[BgSePILw] (PyAtBl)		FdLw[SeBgEpAt]	112	Fd-Linnbor, FdLw-Clinuni, Fd-Phillew
6	111	Se[Fd](Bl)		Se[FdLwBg AtAct](Cw)	113	SeFd-Ribelac, SeDm-Cornsto, Act-Poa pra
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 68. IDFdm_MT tree species suitability and plant associations displayed on edatopic grid.

3.3.12 IDFd_k_MT – Dry Cool Montana IDF

This subzone occurs at mid elevations in northwestern Montana where it is found on the east slopes of the Rocky Mountains from Canada south to about highway MT200, and then south to Butte, and west into the mountain valleys, as far as the Bitterroot National Forest.

Douglas-fir is the climax species of zonal forests (Table 12). Lodgepole pine and trembling aspen are the main seral tree species. The most frequent shrubs are common snowberry, saskatoon, birch-leaved spirea, and prairie rose (*Rosa woodsii*). Pinegrass dominates the understorey. Other common understorey plants are elk sedge (*Carex geyeri*), northern bedstraw (*Galium boreale*), heart-leaved arnica, wild strawberry (*Fragaria virginiana*), and sticky purple geranium (*Geranium viscosissimum*).

In the northern part of its range, the IDFd_k_MT occurs at elevations between the FGff and MSdw_{MT} or MSdh_{MT}. In the southern areas, it is mostly between the IDFd_x_MT and MSdh_{MT}. It abuts the IDFd_{kx}_MT along its southern boundaries.

Zonal Habitat types: PSME/CARU-CARU, PSME/CARU, PSME/SYAL-CARU (Pfister et al. 1978).

IDFd _k _MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		[PfJr] (Py)		102		Jr-Artetri-Festida , Pf-Junicom-Pseuspi, PSME/FEID, PSME/JUCO6
2		PyFd [Pf] (Jr)		103		PyFd-Pseuspi,
3				101		PSME/CARU-CARU, PSME/CARU, PSME/SYAL-CARU
4			Fd [PIAt](Jr)			Fd-Sympalb-Calarub-Caregey, PI-Calarub
5	110	PI [Fd](At)		At [Fd]		112 At-Rosaaci, At-Rosawoo, PSME/SYAL-SYAL
6	111	Se [Bl]		Se (Act)		113 Se-Ribelac-Maiaste
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 69. IDFd_k_MT tree species suitability and plant associations displayed on edatopic grid.

3.3.13 IDFDx_MT – Dry Very Hot Montana IDF

This subzone occurs at low elevations in southwestern Montana and east central Idaho.

Douglas-fir is the primary species of zonal forests (Table 12). Ponderosa pine or trembling aspen are sometimes present. The most frequent shrubs are common snowberry, prairie rose (*Rosa acicularis*), common juniper (*Juniperus communis*), and birch-leaved spirea. Bunchgrasses, including bluebunch wheatgrass, Idaho fescue, and rough fescue (*Festuca campestris*) dominate the understory, with some pinegrass.

The subzone generally occurs at elevations below the IDFDx_MT. In much of the northeast part of its range, it occurs at elevations between the PPxw_MT and IDFDx_MT. In the southwestern part of its range, it occurs at elevations above the BGmk_MT although the biogeoclimatic sequence can be complicated in this area.

Zonal Habitat types: PSME/AGSP; PSME/FEID; PSME/FESC; PSME/SYOR (Pfister et al. 1978).

IDFDx_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		grassland		Gg		Festida, Pseuspi
2		PfJr [Py]		102		Pf-Junior-Pseuspi, Junisco-Pseuspi-Pascsmi, PIFL2/PSSPS
3				101		PSME/PSSPS, PIPO/PSSPS
4			[PyFdAt] (Jr)			PSME/AGSP; PSME/FEID; PSME/FESC; PSME/SYOR
5	110	Fd [Py] (At)		ActAt [FdPy]		112 PSME/SYAL-SYAL, PSME/SYAL,
6	111	Se [FdPI] (At)		Act [SeFdAt]		113
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 70. IDFDx_MT tree species suitability and plant associations displayed on edatopic grid.

3.3.14 IDFdKx_MT – Dry Cool-Mild Montana IDF

This subzone occurs at low to mid elevations in southwestern Montana, east central Idaho, and into Wyoming.

Douglas-fir is the climax species of zonal forests (Table 12). Lodgepole pine and trembling aspen are the main seral tree species, although lodgepole pine is not consistently present across the subzone. Rocky Mountain juniper is often present. The most frequent shrubs are common snowberry, prairie rose (*Rosa acicularis*), common juniper (*Juniperus communis*), and birch-leaved spirea. Bunchgrasses, including bluebunch wheatgrass, Idaho fescue, and rough fescue (*Festuca campestris*) dominate over pinegrass in the understory.

Throughout most of the range of the IDFdKx_MT, it occurs at elevations above the IDFdX_MT and below the MSdh_WY.

Zonal Habitat types: PSME/CARU-AGSP (Pfister et al. 1978; Steele et al. 1983, 1981).

IDFdKx_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		[PfJr] (Py)		102		Jr-Artetri-Festida , Pf-Junicom-Pseuspi, PSME/FEID, PSME/JUCO6
2		Fd [Pf] (JrPy)		103		PyFd-Pseuspi,
3				101		PSME/CARU, PSME/SYAL-CARU, PSME/AGSP,
4			Fd [PIAt](Jr)			PSME/CARU-AGSP
5	110	PI [Fd](At)		At [Fd]		112 At-Rosaaci, At-Rosawoo, PSME/SYAL-SYAL
6	111	Se [Bl]		Se (ActMt)		113 Se-Ribelac-Maiaste
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 71. IDFdKx MT tree species suitability and plant associations displayed on edatopic grid.

3.3.15 IDFdxx_WY – Dry Very Hot Wyoming IDF

This subzone occurs at low to mid elevations in south central Montana, and central Wyoming.

Douglas-fir is the climax species of zonal forests (Table 12). Limber pine and Rocky Mountain juniper often occur. Lodgepole pine, trembling aspen, and ponderosa pine occur infrequently on these sites. Common juniper is the most frequent shrub, often with common snowberry. Idaho fescue and bluebunch wheatgrass are the main understorey.

Throughout much of the range of the IDFdxx_WY, it occurs at elevations between the PPxw_MT and the MSdh_WY. Sometimes it abuts the IDFdxx_MT at higher elevations.

Zonal Habitat types: PSME/JUCO6, PSME/MARE11-JUCO6 (Pfister et al. 1978; Steele et al. 1983).

IDFdxx_WY						Habitat Types/Associations
	A	B	C	D	E	
0						
1	(JrJu)	grassland		Gg		Festida, Pseuspi, Junihor, ARTR2/FEID, JUSC2/ARTR2
2		Pf [Jr] (Fd)		102		PIFL2/PSSPS, PIFL2/FEID, PSME/FEID
3				101		PIFL2/JUCO6
4		Fd [Pf] (PyAtJr)				PSME/JUCO6, PSME/MARE11-JUCO6
5	110	Fd [Py] (At)		At [FdPy]	112	PSME/SYAL, PSME/PHMO4,
6	111	PIFd (At)		ActAt[PIFd](Se)	113	PICE/PHMA5, PSME/PHMA5-PHMA5
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 72. IDFdxx_WY tree species suitability and plant associations displayed on edatopic grid.

3.3.16 IDFXm_CO – Very Dry Mild Colorado IDF

This subzone occurs at mid elevations in western Colorado.

Douglas-fir is the climax species of zonal forests (Table 12). Ponderosa pine and trembling aspen are the main seral tree species. Gambel oak or Rocky Mountain juniper are often present, depending upon the area. The most frequent shrubs are common juniper (*Juniperus communis*) and mountain snowberry (*Symphoricarpos oreophilus*). Kinnikinnick and elk sedge (*Carex geyeri*) characterize the herb layer.

This subzone occurs at elevations below the MSxm_CO. The subzone at elevations below the IDFXm_CO varies. To the east, it is often the SGPdm_CO or the PPxh_CO. To the west, it is often the PPJWmw_UT, and, in the south it is IWFdm_CO.

Zonal Habitat types: PSME/JUCO6, PIPO-PSME/MUMO, PSME/QUGA, PSME/FEAR2 (Marr 1961; Alexander 1988)

IDFXm_CO						Habitat Types/Associations
	A	B	C	D	E	
0						
1	(Jr)	grassland		Gg		
2	Jr [PePfPyQa] (Fd)			102		PSME/ARUV-JUCO6, PIPO/CEMO2
3				101		PSME/JUCO6
4		PyFd [AtQa]				PIPO-PSME/MUMO, PSME/QUGA, PSME/FEAR2
5	110	PyFd [AtPl]		FdAt [PIPy]	112	POTR5/SYOR2, PSME/SYOR2
6	111	Se[PIPyFdSp] (BcAt)		SeAt [BcPyFdAa](Pl)	113	POTR/AMAL2-PRVIV
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 73. IDFXm_CO tree species suitability and plant associations displayed on edatopic grid.

3.3.17 IDFd_h_UT – Dry Hot Utah IDF

This subzone occurs at low elevations in Utah, in western Colorado, and eastern Nevada.

Douglas-fir is the climax species of zonal forests (Table 12). Gambel oak is often present. The most frequent shrub is mountain snowberry (*Symphoricarpos oreophilus*). Various grasses characterize the herb layer.

Throughout most of the range of the IDFd_h_UT, it occurs at elevations between the PPJWdw_UT or PPJWmw_UT and the MSdh_UT.

Zonal Habitat types: PSME/QUGA (Banner 1992).

IDFd _h _UT						Habitat Types/Associations
	A	B	C	D	E	
0						
1	(JrJuPe) grassland					Mountain Big Sagebrush Alliance
2	PeJu [Jr] (PfFd)			102		PIED/QUGA, PIED-JUOS/ARTR2, PIED-JUOS/AMUT-CEMO2; PIED/QUGA
3				101		PIPO/QUGA
4		Fd [PyAtQa] (JrBc)				PSME/QUGA; PSME/CEMO2; PSME/CELE3
5	110	Fd [PyQaAt](Bc)		Fd [AtPyQa]	112	QUGA/SYOR2, PSME/SYOR2; QUGA/AMAL2
6	111	Se[FdBc] (BIAt)		At [SeFdAaMt]	113	ABCO/MARE11/SYOR2; POTR5/SYOR2; Populus angustifolia / Cornus sericea
7						

Tree species codes are presented in Appendix 1 with many codes in Table 12; Habitat type / association codes are in Appendix 2.

Figure 74. IDFd_h_UT tree species suitability and plant associations displayed on edatopic grid.

3.4 INTERIOR GRAND FIR [IGF]

The Interior Grand Fir (IGF) Zone occurs at mid-elevations in dry to mesic, continental, temperate climates on the lee side of the Cascade Mountains and in the highlands of the intermountain basin of Washington, Oregon, and central Idaho. Grand fir (*Abies grandis*) is the key climax species of this zone (Franklin and Dyrness 1988; Clausnitzer 1993; Topik 1989). Stands are dominated by grand fir, Douglas-fir (*Pseudotsuga menziesii*) (Table 9), and/or ponderosa pine (*Pinus ponderosa*). Western larch (*Larix occidentalis*) and lodgepole pine (*Pinus contorta*) also occur. Western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*) are absent from circum-mesic sites in the zone.

The understorey varies considerably from the areas in the Coast transition along the East Cascades across the interior to Idaho. Shrub cover is generally light and characterized by birch-leaved spirea (*Spiraea betulifolia* ssp. *lucida*), common snowberry (*Symphoricarpos albus*), and saskatoon (*Amelanchier alnifolia*). Frequent herbs include pinegrass (*Calamagrostis rubescens*), elk sedge (*Carex geyeri*), prince's pine (*Chimaphila umbellata*), and heart-leaved arnica (*Arnica cordifolia*). In the Coast Transition, the understorey includes a greater variety of species.

The IGF usually occurs at elevations above the Interior Douglas-fir (IDF) or Ponderosa Pine (PP) zones. It generally occurs below the Montane Spruce (MS) Zone.

USNVC: Zonal forests are included in Macrogroup M500: Central Rocky Mountain Mesic Lower Montane Forest [*Tsuga heterophylla* – *Abies grandis* – *Larix occidentalis* Lower Montane Forest], specifically, G211: Central Rocky Mountain Mesic Grand Fir – Douglas-fir Forest & G212: East Cascades Mesic Grand Fir – Douglas-fir Forest groups.

3.4.1 IGF Subzones

Five subzones (Table 13) are recognized in a series of climate moisture and temperature gradients, from sub-continental to continental, longitude, and elevation.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 13. IGF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	IGFdk_WA	IGFdw_OR	IGFmh_OR	IGFmm_OR	IGFxm_OR	Common Name	BC Tree Code
<i>Pseudotsuga menziesii</i>	C*	C	C	C	C	Douglas-fir	Fd
<i>Abies grandis</i>	C	C	C	C	c	grand fir	Bg
<i>Pinus ponderosa</i>	S	S	S	S	S	ponderosa pine	Py
<i>Larix occidentalis</i>	s	s	s	s		western larch	Lw
<i>Pinus contorta</i>			s	s		lodgepole pine	Pl

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.4.2 IGFdk_WA – Dry Cool Washington IGF

This subzone occurs at mid elevations, along the east slope of the Cascade Mountains in mid to northern Washington State. Zonal forest stands are dominated by grand fir and Douglas-fir, although western larch, lodgepole pine, or ponderosa pine are often stand components (Table 13). In this area, a minor amount of western hemlock or western redcedar can occur, especially along the western boundary of the subzone. Although falsebox (*Paxistima myrsinites*), birch-leaved spirea, and saskatoon are common shrubs, some shrubs indicating a transitional subarctic/subcontinental climate also can occur, including dull Oregon-grape (*Mahonia nervosa*), oceanspray (*Holodiscus discolor*), and baldhip rose (*Rosa gymnocarpa*). The herb layer is mostly pinegrass and elk sedge, but can also include some ‘coastal’ species, such as vanilla-leaf (*Achlys triphylla*).

This subzone occurs at elevations above the IDFxh_WA, or in some places, the IDFx_WA. It occurs below the ESSFmw_WA, and sometimes the ESSFdh_WA. On the west, this subzone abuts the subarctic climates along the Cascades where it often meets the CWHms_WA.

Zonal Habitat types: ABGR/ARCO, ABGR/ACCI, ABGR/ACCI-CHUM, ABGR/BENE, ABGR/SPBEL/PTAQ (Lillybridge et al. 1995).

IGFdk_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		PyFd		102		PSME/PUTR/AGSP, PSME/PUTR, PIPO/CARU/AGSP, PSME/AGSP, PSME/CARU-AGSP
2		FdPy [Bg]		103		ABGR/CARU, PSME/CARU, ABGR/ARNE, ABGR/BENE/CARU, ABGR/CARU-LUPIN, PSME/SPBEL/CARU, PSME/CAGE, ABGR/HODI/CARU, PSME/PAMY
3				101		ABGR/ARCO, ABGR/ACCI, ABGR/ACCI-CHUM
4			FdBg [LwPy]			ABGR/BENE, ABGR/SPBEL/PTAQ
5	110	BgFd [CwLwPl] (SeHw)		BgFd [CwLw](SeAct)	112	ABGR/ACTR, TSHE/ACTR, ABGR/ACCI, POTR/SYAL
6	111	BgPl [FdSe] (HwBl)		Bg [ActFdCw PwSe](LwMb)	113	POTR/COST, ALIN/ATFI, ALIN/LYAM, THPL/OPHO,
7						

Tree species codes are presented in Appendix 1 with many codes in Table 13; Habitat type / association codes are in Appendix 2.

Figure 75. IGFdk_WA tree species suitability and plant associations displayed on edatopic grid.

3.4.3 IGFdw_OR – Dry Warm Oregon IGF

This subzone occurs at mid elevations, along the east slope of the Cascade Mountains in northern Oregon and southern Washington State.

Zonal forest stands are dominated by grand fir and Douglas-fir, although western larch or ponderosa pine are often stand components (Table 13). Along the western boundary of the subzone, a minor amount of western hemlock can occur. Garry oak is present on dry sites.

Although falsebox (*Paxistima myrsinites*), birch-leaved spirea, common snowberry, and saskatoon are common shrubs, some shrubs indicating a transitional subarctic/subcontinental climate also can occur, including dull Oregon-grape (*Mahonia nervosa*), oceanspray (*Holodiscus discolor*), baldhip rose (*Rosa gymnocarpa*), and vine maple (*Acer circinatum*). The herb layer is lightly developed, with some elk sedge, prince's pine, star-flowered false Solomon's-seal (*Maianthemum stellatum*), broad-leaved starflower (*Trientalis borealis* ssp. *latifolia*), and vanilla-leaf (*Achlys triphylla*).

This subzone occurs west of, and at elevations above, the IDFxx_WA. To the west, it abuts subzones with a subarctic climate, mostly CWHms_OR. To the south, it abuts the IWFdw_OR.

Zonal Habitat types: ABGR/HODI, PSME/SYAL, ABGR/TRLA2, ABGR/LIBO3, ABGR/CHUM (Simpson 2007; Topik 1989)

IGFdw_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1		Py [FdQg](Bg)		102		PIPO-QUGA/PUTR, PIPO-QUGA/BASA, PSME/FEOC; PIPO/CARU-PSSP
2		FdPyBg		103		PSME/CAGE, ABGR/CARU, ABGR/CAGE, PSME/HODI/CAGE2
3				101		
4		FdBg [Py](LwOy)				ABGR/HODI, PSME/SYAL, ABGR/TRLA2, ABGR/LIBO3, ABGR/CHUM
5	110	FdBg(PyLwHw)		FdBg(CwLwBp)	112	ABGR/SYMO/ACTR, ABGR/ACCI/ACTR, ABGR/ACTR,
6	111	Fd[SeBg](PIHw)		Bg[FdPwCw] (SeMbDrAct)	113	THPL-ABGR/ACTR
7						

Tree species codes are presented in Appendix 1 with many codes in Table 13; Habitat type / association codes are in Appendix 2.

Figure 76. IGFdw_OR tree species suitability and plant associations displayed on edatopic grid.

3.4.4 IGFmh_OR – Moist Hot Oregon IGF

This subzone occurs at mid to high elevations, on the Columbia Plateau of northeastern Oregon.

Zonal forest stands are dominated by grand fir, ponderosa pine, and Douglas-fir, although western larch or lodgepole pine are often stand components (Table 13). The shrub cover is light and is comprised mostly of falsebox (*Paxistima myrsinites*), birch-leaved spirea, common snowberry, and creeping Oregon-grape (*Mahonia repens*). The herb layer is dominated by pinegrass and elk sedge.

The subzone occurs at elevations above the PPxm_OR and below the MSxh_OR.

Zonal Habitat types: ABGR/CARU, ABGR/CAGE (Johnson and Simon 1987; Johnson and Clausnitzer 1992).

IGFmh_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1		PyJw [Om]		102		PIPO/PSSPS, JUOC/CERCO, JUOC/ARTRV
2		Py [Fd] (BgOm)		103		PSME/PHMA5, ABGR/SPBE, PSME/SYAL,
3				101		PICO(ABGR)/LIBO2, ABGR/ACGL/PHMA, ABGR/ACGL
4		BgFdPy [PILw]				ABGR/CARU, ABGR/CAGE, PSME/CAGE, PIPO/CARU, PIPO/CAGE, PSME/CARU
5	110	FdBg [PyPl] (SeLw)		FdBg [LwAt](Py)	112	PICO/VASC ABGR/CLUN, ABGR/TABR/CLUN, ABGR/VASC, ABGR/VASC/LIBO
6	111	Bg [FdSe](Lw)		Bg [ActFdLwSe]	113	ABGR/ATFI, PIEN/SETR, ALIN/ATFI, POTR/SYAL, POTR/ALIN-COST, PIEN/CADI
7						

Tree species codes are presented in Appendix 1 with many codes in Table 13; Habitat type / association codes are in Appendix 2.

Figure 77. IGFmh_OR tree species suitability and plant associations displayed on edatopic grid.

3.4.5 IGFxm_OR – Very Dry Mild Oregon IGF

This subzone occurs at low to mid elevations, in northeastern Oregon, southeastern Washington, and central Idaho. Zonal forests are mostly dominated by Douglas-fir and ponderosa pine, with a component of grand fir, particularly in the regeneration (Table 13). The understorey is mostly shrubs and grasses, including common snowberry, birch-leaved spirea, saskatoon, mock-orange (*Philadelphus lewisii*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), Sandberg's bluegrass (*Poa secunda* ssp. *secunda*), and yarrow (*Achillea millefolium*).

The IGFxm_OR occurs at elevations below the IGFmm_OR, and above BGwm_WA in the north, and above BGdh_OR in the south. To the east it abuts the IDFdh_ID.

Zonal Habitat types: PSME/PHMA, PSME/SYAL, PSME/HODI, ABGR/SPBE2 (Johnson and Simon 1987).

IGFxm_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1		Grassland		Gg			FEID-KOCR, FEID-PSSPS-BASA, AGSP-POSA
2		Py [Fd] (Bg)		102			PIPO/PSSPS, PIPO/FEID
3				101			PSME/CARU, PIPO/CARU
4		PyFd [Bg]					PSME/PHMA, PSME/SYAL, PSME/HODI, ABGR/SPBE2
5	110	FdBg[Py](LwSe)		FdBg[Py](SeAt)		112	ABGR/LIBO3, ABGR/CLUN2, PSME/ACGL-PHMA, PSME/ACGL
6	111	Bg[FdSe]		Bg[ActFd] (SeDw)		113	PICO/VAME, ABGR/GYDR, ABGR/POMU, ALIN/COST, POTR2/ALIN-COST

Tree species codes are presented in Appendix 1 with many codes in Table 13; Habitat type / association codes are in Appendix 2.

Figure 78. IGFxm_OR tree species suitability and plant associations displayed on edatopic grid.

3.4.6 IGFmm_OR – Moist Mild Oregon IGF

This subzone occurs at mid elevations, in northeastern Oregon, southeastern Washington, and central Idaho.

Zonal forests are dominated by Douglas-fir, grand fir, and ponderosa pine (Table 13). Western larch and lodgepole pine are additional seral tree species. The main understorey shrubs are black huckleberry (*Vaccinium membranaceum*), common snowberry, birch-leaved spirea, and baldhip rose (*Rosa gymnocarpa*). Key herbs are pinegrass, elk sedge, twinflower (*Linnaea borealis*), yarrow (*Achillea millefolium*), parsnip-flowered buckwheat (*Eriogonum heracleoides*), and heart-leaved arnica.

This subzone occurs at elevations above the IGFxm_OR and below MS: the MSxh_OR in western portions, and MSmm_ID in eastern portions.

Zonal Habitat types: ABGR/PHMA-PHMA, ABGR/VAME, ABGR/SPBE2, ABGR/LIBO (Johnson and Simon 1987).

IGFmm_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1		Py		102			PIPO/FEID, PIPO/PSSPS
2		Py [Fd] (Bg)		103			PSME/PHMA, PSME/CARU, ABGR/CARU,
3				101			ABGR/PHMA-PHMA,
4		BgFd [PIPyLw]					ABGR/VAME, ABGR/SPBE2, ABGR/LIBO, PSME/SYAL
5	110	FdBgPI [PySe](Lw)		FdBg [SeLwPI](PyAt)		112	ABGR/ACGL, ABGR/CLUN2
6	111	Bg[SeBl](Fd)		Bg[ActSeFdLw]		113	POTR5/ALIN-COST, POTR/CACA, PIEN/EQAR, PIEN/ATFI
7							

Tree species codes are presented in Appendix 1 with many codes in Table 13; Habitat type / association codes are in Appendix 2.

Figure 79. IGFmm_OR tree species suitability and plant associations displayed on edatopic grid.

3.5 INTERIOR WHITE FIR [IWF]

The Interior White Fir (IWF) Zone occurs at mid to high elevations in dry to mesic, continental, temperate climates across the western States of southern Oregon, northern California, Nevada, Utah, and Colorado. White fir (*Abies concolor*) is the key climax species of this zone (Volland 1985; Simpson 2007). Stands are dominated by white fir, Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) or aspen (*Populus tremuloides*) (Table 9). In the west, some species of subarctic climates occur, like Jeffrey pine (*Pinus jeffreyi*), sugar pine (*Pinus lambertiana*), or incense-cedar (*Calocedrus decurrens*). The understory varies considerably across the zone and reflects that this zone occurs in transition from hot, dry climates (Ponderosa Pine [PP] or Pinyon Pine – Juniper Woodland [PPJW] zones) to montane forests (Montane Spruce [MS] or Mountain Hemlock – Red Fir [MHRF] zones).

USNVC: Zonal forests are included in Macrogroup M022: Southern Rocky Mountain Lower Montane Forest [*Abies concolor* – *Pseudotsuga menziesii* – *Picea pungens* Forest], specifically, G226: Southern Rocky Mountain White Fir – Douglas-fir Dry Forest Group.

3.5.1 IWF Subzones

Four subzones (Table 14) are recognized, characterizing primarily sub-continental to continental temperature and longitudinal climatic moisture gradients.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 14. IWF Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	IWFdm_CO	IWFdw_OR	IWFxk_NV	IWFxm_CA	Common Name	BC Tree Code
<i>Abies concolor</i>	C*	C	C	C	white fir	Bc
<i>Calocedrus decurrens</i>		c		c	incense-cedar	Oa
<i>Pinus flexilis</i>			c		limber pine	Pf
<i>Pinus monophylla</i>			c		singleleaf pinyon	Pn
<i>Quercus gambelii</i>	s				Gambel oak	Qa
<i>Pseudotsuga menziesii</i>	S			s	Douglas-fir	Fd
<i>Pinus ponderosa</i>	S	S		s	ponderosa pine	Py
<i>Populus tremuloides</i>	s		S		trembling aspen	At
<i>Pinus jeffreyi</i>		s		S	Jeffrey pine	Pz
<i>Pinus lambertiana</i>		s		s	sugar pine	Ps
<i>Pinus contorta</i>		S			lodgepole pine	Pl
<i>Cercocarpus ledifolius</i>			s		curl-leaf mountain mahogany	Om

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.5.2 IWFdw_OR – Dry Warm Oregon IWF

This subzone occurs at mid to high elevations along the east slope of the Cascade Mountains from southern Oregon into northern California. Zonal forest stands are characterized by white fir (Table 14). Stands can be dominated by white fir or Douglas-fir. Common seral trees are lodgepole pine and ponderosa pine. Other trees include giant chinquapin (*Chrysolepis chrysophylla*), incense-cedar, sugar pine, and western white pine (*Pinus monticola*). Shrubs are of low cover and can include saskatoon (*Amelanchier alnifolia*), common snowberry (*Symphoricarpos albus*), baldhip rose (*Rosa gymnocarpa*), or falsebox (*Paxistima myrsinites*). Common herbs are squirreltail grass (*Elymus elymoides*), prince's pine (*Chimaphila umbellata*), stiff needlegrass (*Achnatherum occidentale*), wild strawberry (*Fragaria virginiana*), and Ross' sedge (*Carex rossii*).

To the west of this subzone, at higher elevations, is the MHRFds_CA. To the east is either the PPxk_OR or the PPxm_OR.

Zonal Habitat types: ABCO/CEVE-CHCHC4, ABCO/SYAL/FRVI, ABCO/SYMO (Simpson 2007; Volland 1985; Hopkins 1979).

IWFdw_OR						
	A	B	C	D	E	Habitat Types/Associations
0						
1		PyJw (PIBc)		102		PIPO/PUTR2-CEVE/CAINI3
2		PyBc [Jw](PI)		103		ABCO/CEVE-ARPA6, ABCO/CEVE-ARPA/CAPE-PEEU, ABCO-PSME/CEVE-CACH/CARU
3				101		
4		Bc [PyPIPzPzOa]				ABCO/CEVE-CHCHC4, ABCO/SYAL/FRVI, ABCO/SYMO
5	110	Bc [PIPzFd](Ps)	FdBc [Py]		112	ABCO/CHCHC4-PAMY/CHUM, ABCO-CADE27/TRLA6
6	111	Bc [PIFd]	Bc [FdAt]		113	PICO/SPDO/CAAN15, PICO/CAAN15, PICO/VAUL/CAAN15
7						

Tree species codes are presented in Appendix 1 with many codes in Table 14; Habitat type / association codes are in Appendix 2.

Figure 80. IWFdw_OR tree species suitability and plant associations displayed on edatopic grid.

3.5.3 IWFxm_CA – Very Dry Mild California IWF

This subzone occurs on the east slopes of the Sierra Nevada Mountains, centred around Lake Tahoe. It extends from Lassen and Plumas National forests in the north to about Inyo National Forest in the south.

Zonal forest stands are characterized by white fir. Curl-leaf mountain mahogany is often present. Seral species include lodgepole pine, Douglas-fir, Jeffrey pine, and ponderosa pine (Table 14). California red fir (*Abies magnifica*) can occur at higher elevations and on the western edge of the subzone. Some understorey species are pinemat manzanita (*Arctostaphylos nevadensis*), squirreltail grass (*Elymus elymoides*), and sulphur buckwheat (*Eriogonum umbellatum*).

This subzone abuts the CWFds_CA to the west, and the PPJWxw_NV to the east.

Zonal Habitat types: not available.

IWFxm_CA						
	A	B	C	D	E	
0						
1	PyJw			102		
2	Py [JwBcOmPz](Bm)			103		
3		BcPz		101		
4		[PyFdOaOm](PsBm)				
5		BcPz [FdOa] (PIPs)			110	
6	111	Pz[PIBc]		Bc[PzAt]		113
7						

Tree species codes are presented in Appendix 1 with many codes in Table 14.

Figure 81. IWFxm_CA tree species suitability displayed on edatopic grid.

3.5.4 IWFxk_NV – Very Dry Cool Nevada IWF

This subzone occurs on and near the top of a series of ridges in northeastern Nevada. Zonal forests are characterized by white fir and can have a high aspen component (Table 14). Curl-leaf mountain mahogany often occurs. Limber pine occurs on dry sites. The understorey is characterized by mountain snowberry (*Symphoricarpos oreophilus*), green rabbit-brush (*Chrysothamnus viscidiflorus*), and grasses, such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*).

This subzone occurs at elevations above the PPJWxw_NV and below the MSxx_NV.

Zonal Habitat types: ABCO/CELE3, ABCO/MARE11 (Youngblood and Mauk 1985).

IWFxk_NV						Habitat Types/Associations
	A	B	C	D	E	
0						
1	[JuPgPnPf](Jr)			102		PIMO-JUOS, PIMO-JUOS/ARNO4/PSSP6, PIFL2-PILO, ARTRV/SYOR2/PSSPS
2	Om [JuJrPnPfPg](At)			103		POTR5-PIFL2, PIMO-CELE3/ARTR2, CELE3/ARTR2/FEID
3				101		POTR5/SYOR2
4		AtBc [Om] (PyFd)				ABCO/MARE11, ABCO/CELE3
5		AtBc [Om] (Fd)		110		POTR5/AMAL/2FORB, POTR5-ABCO/SYOR2&POTR5
6		[SeBlBcAt](Af)		111		POTR5-ABLA/THFE, POTR5-ABLA/SYOR2/2FORB
7						

Tree species codes are presented in Appendix 1 with many codes in Table 14; Habitat type / association codes are in Appendix 2.

Figure 82. IWFxk_NV tree species and plant associations suitability displayed on edatopic grid.

3.5.5 IWFdm_CO – Dry Mild Colorado IWF

This subzone occurs at mid elevations in south central and southwestern Colorado.

Stands are characterized by white fir, Douglas-fir, and ponderosa pine (Table 14). Trembling aspen can also occur. The understorey is uncertain due to few plots in mature forests but may include prairie rose (*Rosa woodsii*) and introduced grasses.

The subzone occurs at elevations above the PPxh_CO and below the MSdk_CO.

Zonal Habitat types: ABCO-PSME/QUGA, ABCO-PSME/SYOR2 (Alexander 1988)

IWF dm_CO							Habitat Types/Associations
	A	B	C	D	E		
0							
1	(JrPe)	grassland		Gg			PIED/BOGR2
2	JrPeQa	[PfPyBc]		102			PIPO/BOGR2, PIPO/FEAR2, PIPO/PIED-QUGA
3				101			ABCO-PSME/QUGA
4		BcPyFd	[QaAt]				ABCO-PSME/SYOR2, POTR5/SYOR2
5		BcPyFdAt	(Qa)		110		ABCO-PSME/ACGL
6	111	Sp [PyBcSe FdAt](Bl)		AtAaBc [Fd](Se)	113		POAN3
7							

Tree species codes are presented in Appendix 1 with many codes in Table 14; Habitat type / association codes are in Appendix 2.

Figure 83. IWF dm_CO tree species suitability and plant associations displayed on edatopic grid.

3.6 MONTANE SPRUCE [MS]

The Montane Spruce (MS) Zone is a montane, forested zone of temperate, continental climates of the mountains of the western cordillera. It ranges from southern British Columbia and Alberta, as far south as New Mexico in the Rocky Mountains (Meidinger and Pojar 1991; Pfister et al. 1978; Cooper, Neiman, and Roberts 1991; Lillybridge et al. 1995).

Mature forests are characterized by Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) (Table 9); however, due to fire history, many forests are younger and dominated by lodgepole pine (*Pinus contorta*), with spruce and fir regeneration. Douglas-fir (*Pseudotsuga menziesii*) is usually present, as it is a long-lived seral species. Aspen (*Populus tremuloides*) and western larch (*Larix occidentalis*) are other common seral tree species. In some regions, grand fir (*Abies grandis*) or white fir (*A. concolor*) occur in the MS—especially when the IGF or IWF occurs at elevations below. Whitebark pine (*Pinus albicaulis*) can also occur, especially in the southeastern part of the zone.

Common understorey shrubs are black huckleberry (*Vaccinium membranaceum*), falsebox (*Paxistima myrsinites*), birch-leaved spirea (*Spiraea betulifolia* ssp. *lucida*), snowberries (*Symphoricarpos albus*, *S. oreophilus*), and common juniper (*Juniperus communis*). Pinegrass (*Calamagrostis rubescens*) and grouseberry (*Vaccinium scoparium*) are the most common and abundant understorey plants. Other frequent forbs/grasses are elk sedge (*Carex geyeri*), yarrow (*Achillea millefolium*), heart-leaved arnica (*Arnica cordifolia*), and western meadowrue (*Thalictrum occidentale*). Beargrass (*Xerophyllum tenax*) is abundant in some areas.

The Interior Douglas-fir (IDF) Zone generally occurs at elevations below the MS, although sometimes the Interior Grand Fir (IGF) or Interior White Fir (IWF) zones are found. The Englemann Spruce – Subalpine Fir (ESSF) Zone occurs above the MS zone. The MS zone is somewhat of a transitional zone between the IDF and ESSF.

USNVC: Zonal forests are included in Macrogroup M020: Rocky Mountain Subalpine-High Montane Forest [*Abies lasiocarpa* – *Picea engelmannii* – *Pinus albicaulis* Rocky Mountain Forest]

3.6.1 MS Subzones

Eleven subzones (Table 15) are recognized across the range of the MS, reflecting temperature, climatic moisture, and species distribution gradients

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 15. MS Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	MSxk_ WA	MSdm_ WA	MSxh_ OR	MSmm_ ID	MSdw_ MT	MSdh_ MT	MSdh_ WY	MSdh_ UT	MSxm_ CO	MSdk_ CO	MSxx_ NV	Common Name	BC Tree Code
<i>Picea engelmannii</i>	C*	C	C	c	C	c	C	c	C	C	C	Engelmann spruce	Se
<i>Abies lasiocarpa</i>	C	C	C	C	C	C	C	C	C	c	c	subalpine fir	Bl
<i>Abies grandis</i>			C	c								grand fir	Bg
<i>Abies concolor</i>								C		c	c	white fir	Bc
<i>Abies lasiocarpa</i> var. <i>arizonica</i>										C		corkbark fir	Bla
<i>Pseudotsuga menziesii</i>	S	S	S	S	S	S	S	S	s	s	s	Douglas-fir	Fd
<i>Pinus contorta</i>	S	S	S	S	S	s	S	s	S			lodgepole pine	Pl
<i>Larix occidentalis</i>		S	S		S							western larch	Lw
<i>Populus tremuloides</i>	s	s				S	s	S	S	S	S	trembling aspen	At
<i>Pinus ponderosa</i>	s	s										ponderosa pine	Py
<i>Pinus albicaulis</i>							s					whitebark pine	Pa
<i>Quercus gambelii</i>								s				Gambel oak	Qa
<i>Pinus flexilis</i>						s					S	limber pine	Pf
<i>Pinus longaeva</i>											s	Great Basin bristlecone pine	Pg

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.6.2 MSxk_WA – Very Dry Cool Washington MS

This subzone occurs at mid to high elevations in northwest Washington, between the Okanogan River valley and the Lake Chelan/Ross Lake National Recreation Areas—in a rainshadow area from the Cascade Mountains. On its northern boundary, it abuts the MSxk1 in British Columbia (Lloyd et al. 1990; Ryan et al. 2022).

Zonal forests of this subzone are generally dominated by lodgepole pine, with some Engelmann spruce and subalpine fir, especially in the regeneration (Table 15). Douglas-fir can be a significant component of some stands—particularly those on warm aspects or at low elevation. Pinegrass dominates the understorey. Other common plants are falsebox, grouseberry, heart-leaved arnica, and twinflower (*Linnaea borealis*).

This subzone occurs at elevations above the IDFdk_WA and below the ESSFxc_WA. It abuts the MSdm_WA in the northwest (although MSdm_WA is most extensive east of the Okanogan River valley).

Zonal Habitat types: ABLA2/CARU, ABLA2/LIBOL, ABLA2/PAMY, ABLA2/VASC, ABLA2/VASC/CARU (Lillybridge et al. 1995; Williams and Lillybridge 1983).

MSxk_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	FdPy [PI] (Pa)			102		PSME/ARUV/CARU, PSME/CARU-AGSP, PSME/PUTR/AGSP, PIPO-PSME/AGSP
2	FdPIPy (Lw)			103		PSME/CARU, PSME/ARUV, PSME/PAMY/CARU, PSME/SPBEL/CARU, PSME/VAMY/CARU, PSME/VAMY
3				101		ABLA2/COCA, ABLA2/CARU, ABLA2/LIBOL, POTR/CARU
4		FdPI [SeBI](Lw)				ABLA2/VASC, ABLA2/PAMY, ABLA2/VASC/CARU
5	110	PISe[BI] (FdLwAt)	PISe [FdAtBI](Lw)		112	ABLA2/GYDR, ABLA2/STAMC, ABLA2/LEGL-VASC, PIEN/COCA
6	111	SeBI[PI] (AtFd)	PI[SeBIAct] (FdAt)		113	PIEN/CASC2, PIEN/EQUIS, ABLA2/ATFI, ALIN/EQUIS, ALIN/ATFI
7						

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 84. MSxk_WA tree species suitability and plant associations displayed on edatopic grid.

3.6.3 MSdm_WA – Dry Mild Washington MS

This subzone occurs at mid to high elevations, mostly in the western portion of Colville National Forest in northern Washington State, but also a small area occurs west of the Okanogan River near British Columbia.

Zonal forests of this subzone are dominated by mixed stands of subalpine fir, lodgepole pine, and Engelmann spruce (Table 15). Western larch is a common seral species in the Colville National Forest (larch is not in the northwestern range of the subzone). Falsebox, black huckleberry, and Sitka alder (*Alnus alnobetula* ssp. *sinuata*) are common shrubs. Pinegrass dominates the understorey. Other common plants of the herb layer are grouseberry, low bilberry (*Vaccinium myrtillus*), kinnikinnick (*Arctostaphylos uva-ursi*), silky lupine (*Lupinus sericeus*), twinflower (*Linnaea borealis*), and heart-leaved arnica.

This subzone occurs at elevations above the IDFdm_WA and below ESSFxh_WA. In the western part of its range, it abuts the MSdm2 (Lloyd et al. 1990; Ryan et al. 2022) from British Columbia, which also occurs a bit in the U.S., near the border.

Zonal Habitat types: ABLA2/LIBOL, ABLA2/VAME, ABLA2/PAMY, ABLA2/VASC (Williams et al. 1995).

MSdm_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1	FdPy [Lw] (PI)			102		PSME/ARUV/CARU, PSME/VAMY/CARU, PSME/ARUV, PSME/SYAL/AGSP
2	Fd [LwPyPI]			103		PSME/PHMA, PSME/CARU, PSME/SYAL, PSME/SYOR, PSME/PAMY/CARU
3				101		ABLA2/COCA, ABLA2/CARU, PSME/PAMY, ABLA2/CLUN
4		FdSePI [BlLw] (At)				ABLA2/LIBOL, ABLA2/VAME, ABLA2/PAMY, ABLA2/VASC
5	110	PISeBI (FdLwAt)	PISe [FdLwAtBl]		112	ABLA2/TRCA3, ABLA2/GYDR, ABLA2/STAMC, POTR/CACA
6	111	Se[BlAt] (ActFdPI)	Se[PIBlAct At](Fd)		113	PIEN/CASCP2, PIEN/EQUIS, ABLA2/ATFI, ABLA2/TRLA4, ALIN/ATFI
7						

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 85. MSdm_WA tree species suitability and plant associations displayed on edatopic grid.

3.6.4 MSxh_OR – Very Dry Hot Oregon MS

This subzone occurs at mid to high elevations in northeastern Oregon, extending slightly into southeast Washington.

Zonal forests of this subzone are dominated by Engelmann spruce, subalpine fir, and lodgepole pine (Table 15). Grand fir and Douglas-fir often occur, especially at lower elevations. Black huckleberry is the main understorey shrub. Pinegrass, elk sedge, and grouseberry are the main plants in the herb layer. Heart-leaved arnica is common.

This subzone occurs at elevations above the IGFmh_OR or the western range of the IGFmm_OR, and below the ESSfxw_OR. The MS subzone to the east is the MSmm_ID, which occurs east of the Snake River.

Zonal Habitat types: ABLA2/PIEN/ARCO, ABLA2-PIEN/LIBO2, ABLA2/VAME, ABLA/VASC (Johnson and Simon 1987; Powell et al. 2007).

MSxh_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Fd [Py] (PIBgLwPf)			102			PIFL/JUCOM2, PSME/CARU; PIPO-PSME/CAGE2
2	PIFdLw [BgPySe](BIAt)			103			ABLA2/VASC, ABLA2/ARCO, PSME/CAGE2, ABGR/CAGE2
3		SePILw		101			ABGR/VAME, ABGR/LIBO2, ABGR/VASC, ABLA2/CLUN, PICO/VASC
4		[FdBgBl] (At)					ABLA2/PIEN/ARCO, ABLA2-PIEN/LIBO2, ABLA2/VAME, ABLA/VASC
5	110	SeBI [BgLwPl] (At)		SeBIbg [Lw] (FdPIAt)	112		ABLA2-PIEN/SETR, ABGR/TRCA, ABLA/TRCA,
6	111	SeBI [Bg] (LwPl)		SeBIbg (Lw)	113		
7							

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 86. MSxh_OR tree species suitability and plant associations displayed on edatopic grid.

3.6.5 MSmm_ID – Moist Mild Idaho MS

This subzone occurs at mid to high elevations in the mountains of central Idaho. It extends somewhat into the Bitterroot Mountains of western Montana.

Zonal forests of this subzone are dominated by Engelmann spruce, subalpine fir, and lodgepole pine (Table 15). Grand fir and Douglas-fir often occur, especially at lower elevations. Black huckleberry is the main understorey shrub. Birch-leaved spirea and false azalea (*Menziesia ferruginea*) are often present. Beargrass, pinegrass, elk sedge, and grouseberry are the main plants in the herb layer.

This subzone mostly occurs at elevations between the IGFmm_OR and ESSFdm_ID. In a small portion of the northern part of its range, it occurs above the ICHdh_ID. The MS to the east is mostly the MSdh_WY, although in the northeast it is the MSdh_MT and MSdw_MT.

Zonal Habitat types: ABLA/XETE-VAME, ABLA/VASC, ABLA/VAME, ABLA/SPBE2, ABLA/CARU (Steele et al. 1981).

MSmm_ID							Habitat Types/Associations
	A	B	C	D	E		
0							
1	FdPy (PIPa)			102			FdPy/Junicom-Physmal
2	FdPI (PyBISeBgLw)			103			FdPI/Calarub-Caregey-Xeroten
3		PIFdSe		101			ABLA/XETE-VAME
4		[BgBI] (At)					ABLA/VASC, ABLA/VAME, ABLA/SPBE2, ABLA/CARU,
5	110	SeBIPI [Fd](Bg)		SeBI[FdPI] (BgAt)		112	SeBI/Ledugla/Xeroten, SeBI/Ribelac
6	111	SeBI [PI]		SeBI (PIAt)		113	Se/Calacan, SeBI/Athyfil-Equiarv-Tiartri
7							

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 87. MSmm_ID tree species suitability and plant associations displayed on edatopic grid.

3.6.6 MSdw_MT – Dry Warm Montana MS

This subzone occurs at mid to high elevations in the mountains of western Montana. It is a southern version of the MSdw in British Columbia (MacKillop et al. 2018).

Zonal forests of this subzone are dominated by lodgepole pine, western larch, subalpine fir, and Engelmann spruce (Table 15). Douglas-fir often occurs, especially at lower elevations. The shrub understorey is moderately developed with a variety of shrubs, including birch-leaved spirea, saskatoon (*Amelanchier alnifolia*), common snowberry, black huckleberry, thimbleberry (*Rubus parviflorus*), and Douglas maple (*Acer glabrum*). Pinegrass and beargrass are key understorey species, occurring along with elk sedge, grouseberry, heart-leaved arnica, and queen's cup (*Clintonia uniflora*).

Over much of its range, the MSdw_MT occurs at elevations below the ESSFk_MT. In the northern part, it can occur below the ESSFdk_MT. It usually occurs at elevations above the IDF—the IDFdm_MT in the west, and the IDFdk_MT in the east. Sometimes, in the north, it occurs above the ICHmh_MT. Along the Canadian border, it abuts the MSdw from British Columbia. To the south, it abuts the MSdh_MT.

Zonal Habitat types: ABLA/LIBO3-VASC, ABLA/CLUN2, ABLA/XETE-VAME, ABLA/CLUN2-CLUN2, ABLA/CLUN2-MEFE, ABLA/XETE (Pfister et al. 1978).

MSdw_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1	Fd [PI] (PaPf)			102		PI/Junicom, FdPf/Juni, AtFd/Arctuva, Fd/Festida, Fd/Juni
2	FdPI [Lw] (SeBIPy)			103		FdPI/Spirbet/Calarub, PI/Vaccuae, FdLw/Sympalb/Calarub
3		FdLwSePI		101		ABLA/LIBO3-VASC, ABLA/CLUN2, ABLA/XETE-VAME
4		[BIAt] (Bg)				ABLA/CLUN2-CLUN2, ABLA/CLUN2-MEFE, ABLA/XETE
5	110	SeBI[LwPIFd] (AtAct)	Se[LwPIBIAt] (FdActEpPw)		112	SeBI/Streamp, FdSe/Cornsto, SeBI/Calacan, Act/Cornsto
6	111	Se [BIP]	Se[BIAct](Ep)		113	SeBI/Oplohor, Se/Equiarv, Se/Cornsto
7						

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 88. MSdw_MT tree species suitability and plant associations displayed on edatopic grid.

3.6.7 MSdh_MT – Dry Hot Montana MS

This subzone occurs at mid to high elevations in the mountains of southwestern Montana and slightly into adjacent Idaho.

Zonal forests of this subzone are dominated by lodgepole pine, along with some subalpine fir and Engelmann spruce (Table 15). Douglas-fir occurs frequently, especially at lower elevations. The shrub understorey is lightly developed with black huckleberry and some common juniper (*Juniperus communis*). Pinegrass and grouseberry dominate the understorey, occurring along with beargrass, and some elk sedge and heart-leaved arnica.

The subzone occurs at elevations below the ESSFkx_MT. At lower elevations, it mostly occurs above the IDfDk_MT. To the north, it abuts the MSdw_MT. To the south, it abuts the MSdh_WY, which lacks beargrass.

Zonal Habitat types: ABLA/VASC-CARU, ABLA/VASC-VASC, ABLA/XETE-VASC, ABLA/XETE-VAME, ABLA/VAME, ABLA/MEFE (Pfister et al. 1978)

MSdh_MT							Habitat Types/Associations
	A	B	C	D	E		
0							
1	FdPI (PaPfJr)			102			PSME/JUCO6, PIFL2, PSME/CARU, PIFL2/JUCO6, PSME/FEID
2	FdPI[Pa](SeBl)			103			PSME/CARU, ABLA/XETE-VASC, ABLA/JUCO6, PSME/CAGE2
3		PISe		101			ABLA/VASC-CARU, ABLA/VASC-VASC
4		[FdBlAt] (LwPa)					ABLA/XETE-VASC, ABLA/XETE-VAME, ABLA/VAME, ABLA/MEFE
5	110	SeBIPI [Fd]		SePI[FdBlAt]	112		Se-Ribelac-Equiarv; BISE-Calacan;
6	111	SeBIPI		Se[ActBIPI]	113		ABLA/ALVIS, ABLA/SYAL, ABLA/ACGL
7							

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 89. MSdh_MT tree species suitability and plant associations displayed on edatopic grid.

3.6.8 MSdh_WY – Dry Hot Wyoming MS

This subzone occurs at mid to high elevations in the mountains of Wyoming, southwest Montana, and east central Idaho.

Zonal forests of this subzone are dominated by lodgepole pine, along with some subalpine fir and Engelmann spruce (Table 15). Douglas-fir occurs often, especially at lower elevations. The shrub understorey is lightly developed with snowberries and common juniper (*Juniperus communis*). Pinegrass and grouseberry dominate the understorey, occurring along with elk sedge and heart-leaved arnica.

This subzone occurs at elevations below the ESSF_{xk}_WY. To the north, it abuts the MHD_h_MT, and to the south it abuts the MS_{xm}_CO and MS_{dh}_UT. At lower elevations, it mostly occurs above the ID_{Fdk}_MT, but portions of the SW have ID_{Fdx}_MT and in the southeast, ID_{Fdx}_WY occurs below.

Zonal Habitat types: ABLA/VASC, ABLA/CARU, ABLA/CAGE2, ABLA-PIEN/VASC (Pfister et al. 1978; Steele et al. 1983).

MSdh_WY						Habitat Types/Associations
	A	B	C	D	E	
0						
1	FdPI(PaPf)			102		PSME/JUCO6, PIFL2, PSME/CARU, PIFL2/JUCO6, PSME/FEID
2	FdPI[Pa](SeBI)			103		PSME/CARU, ABLA/JUCO6, PSME/CAGE2
3				101		
4		PISe [FdBIAt] (Pa)				ABLA/VASC, ABLA/CARU, ABLA/CAGE2, ABLA-PIEN/VASC
5	110	SeBIPI [Fd]		SePI[FdBIAt]	112	Se-Ribelac-Equiarv; BISE-Calacan;
6	111	SeBIPI		Se[ActBIPI]	113	ABLA/ALVIS, ABLA/SYAL, ABLA/ACGL
7						

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 90. MSdh_WY tree species suitability and plant associations displayed on edatopic grid.

3.6.9 MSdh_UT – Dry Hot Utah MS

This subzone occurs at mid to high elevations in the mountains of Utah, western Colorado, eastern Nevada, and southern Idaho.

Zonal forests of this subzone are dominated by subalpine fir, Douglas-fir, and aspen (Table 15). Some Engelmann spruce is present. The shrub understorey is mostly mountain snowberry (*Symphoricarpos oreophilus*). The herb layer is poorly characterized due to limited data but appears to be mostly grasses, including bluegrasses (*Poa* spp.), smooth brome (*Bromus inermis*), blue wildrye (*Elymus glaucus*), and others.

This subzone typically occurs at elevations between the ESSF_{xk}_UT and the IDF_{dh}_UT.

Zonal Habitat types: ABCO/SYOR2, ABLA/MARE11, PSME/SYOR2 (Youngblood and Mauk 1985).

MSdh_UT						Habitat Types/Associations
	A	B	C	D	E	
0						
1	Jr [PfPe]			102		
2	Jr [PfAt] (OmPyFd)			103		PIPO/CELE3, PIPO/QUGA,
3		AtFd		101		POTR5/SYOR2, ABCO/CELE3, PSME/CELE3, PSME/QUGA
4		[BcBlOmPyQa](Se)				ABCO/SYOR2, ABLA/MARE11, PSME/SYOR2
5		AtFd[BcBlPlSe]		110		POTR5/2FORB, POTR5/AMAL2-SYOR2
6		AtBl[BcMtSpSe](Pl)		111		
7						

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 91. MSdh_UT tree species suitability and plant associations displayed on edatopic grid.

3.6.10 MSxm_CO – Very Dry Mild Colorado MS

This subzone occurs at mid to high elevations in the mountains of Colorado, Utah, and southern Wyoming.

Zonal forests of this subzone are dominated by aspen, subalpine fir, Engelmann spruce, and lodgepole pine (Table 15). At lower elevations, Douglas-fir is common. Mountain snowberry (*Symphoricarpos oreophilus*) and common juniper (*Juniperus communis*) are frequent shrubs. Grouseberry, elk sedge, and heart-leaved arnica characterize the ground layer.

This subzone typically occurs at elevations between the IDfxm_CO and the ESSFxc_CO. It can also occur above the IDFdh_UT.

Zonal Habitat types: PIEN/JUCO6, ABLA-PIEN/JUCO6, ABLA-PIEN/VASC, ABLA-PIEN/CAGE2, ABLA/CAGE2 (Alexander 1988)

MSxm_CO							Habitat Types/Associations
	A	B	C	D	E		
0							
1	[Pf](JrPy)			102			
2	Fd [PfPy](QaAt)			103			
3		PIFdAt		101			PIEN/JUCO6, ABLA-PIEN/JUCO6
4		[BISe](Qa)					ABLA-PIEN/VASC, ABLA-PIEN/CAGE2, ABLA/CAGE2
5	110	BIPiSe [Fd](BcAt)		PISeAt[BIFd]		112	POTR5/SYOR2
6	111	BIPiSe [Sp](BcAt)		At[SePIBI]		113	
7							

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 92. MSxm_CO tree species suitability and plant associations displayed on edatopic grid.

3.6.11 MSdk_CO – Dry Cool Colorado MS

This subzone occurs at mid to high elevations in the mountains of southern Colorado.

Zonal forests of this subzone are dominated by aspen, subalpine fir, corkbark fir, and Engelmann spruce (Table 15), usually with lodgepole pine, and at lower elevations, Douglas-fir and white fir. Common shrubs are low bilberry (*Vaccinium myrtillus*) and mountain snowberry (*Symphoricarpos oreophilus*). Grouseberry, elk sedge, and heart-leaved arnica characterize the ground layer.

This subzone typically occurs at elevations between the IWFdm_CO and the ESSFxc_CO.

Zonal Habitat types: ABLA-PIEN/CAGE2, ABLA/VASC, ABLA-PIEN/VASC, ABLA-PIEN/VAMY2, ABLA-PIEN/ARCO9 (Alexander 1988)

MSdk_CO							Habitat Types/Associations
	A	B	C	D	E		
0							
1	Jr [PfQa] (Py)			102			
2	Fd [PfQaPy] (JrAt)			103			PIEN-PSME/JUCO6
3		FdSeAt		101			ABLA-PIEN/CAGE2, ABLA/VASC
4		[BcBlBla]					ABLA-PIEN/VASC, ABLA-PIEN/VAMY2, ABLA-PIEN/ARCO9
5	110	Se[FdSp BcBlAt]		At[SeSpFd] (BcBl)		112	
6	111	Se[SpBc BlAt](Pl)		At[AaSeSp] (BcBl)		113	
7							

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 93. MSdk_CO tree species suitability and plant associations displayed on edatopic grid.

3.6.12 MSxx_NV – Very Dry Very Hot Nevada MS

This subzone occurs at high elevations in the mountains of central Nevada.

Zonal forests of this subzone are characterized by subalpine fir, Engelmann spruce, aspen, and limber pine (Table 15). White fir and Douglas-fir occur at lower elevations. Understorey data is limited. The most prominent shrub is mountain snowberry (*Symphoricarpos oreophilus*).

This subzone typically occurs at elevations above the IWFxk_NV but also occurs above the MMMdk_NV in the southern part of the MSxx_NV range.

Zonal Habitat types: ABLA/CAR05 (Youngblood and Mauk 1985); limited data.

MSxx_NV							Associations
	A	B	C	D	E		
0							Habitat Types/Associations
1	Pf [Pg]			102			
2	PfPg (Om)			103			PIFL2-PILO
3				101			
4		[BcFd] (AtOmSe)					ABLA/CAR05
5		At [BcSe] (FdBl)			110		
6		Se [BlBcAt]			111		
7							

Tree species codes are presented in Appendix 1 with many codes in Table 15; Habitat type / association codes are in Appendix 2.

Figure 94. MSxx_NV tree species suitability displayed on edatopic grid.

3.7 PONDEROSA PINE [PP]

The Ponderosa Pine (PP) Zone occurs at low elevations in dry, continental, temperate climates of the intermountain plateaus and interior mountain valleys and slopes of Washington (Lillybridge et al. 1995; Williams et al. 1995), Oregon (Franklin and Dyrness 1988), Idaho (Steele et al. 1981, 1983), Montana (Pfister et al. 1978), Wyoming (Hoffman and Alexander 1987; Steele et al. 1983), and southern British Columbia (Meidinger and Pojar 1991).

Ponderosa pine (*Pinus ponderosa*) is the key climax species of this zone (Table 9). Douglas-fir (*Pseudotsuga menziesii*) is frequent in moister regions or on moister sites, and, due to fire suppression, is increasing in some parts of the PP zone. Rocky Mountain juniper (*Juniperus scopulorum*) or western juniper (*Juniperus occidentalis*) are frequent in some areas.

The understory is characterized by bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*).

The Interior Douglas-fir (IDF) zone usually occurs at elevations above the PP. In some areas, the Interior Grand Fir (IGF) or Interior White Fir (IWF) zones occur at higher elevations. At lower elevations, grassland zones are most common, including Bunchgrass (BG) or Mixed-grass Prairie (MGP). Western Juniper – Pine (WJP) occurs at lower elevations in parts of the western PP.

USNVC: Zonal forests are included in Macrogroup M501: Central Rocky Mountain Dry Lower Montane-Foothill Forest [*Pinus ponderosa* var. *ponderosa* – *Pseudotsuga menziesii* – *Pinus flexilis* Central Rocky Mountain Dry Forest], specifically G213: Central Rocky Mountain Ponderosa Pine Open Woodland.

3.7.1 PP Subzones

Eight subzones (Table 16) are recognized across the range of the PP zone, characterizing regional climates and floristics due to a wide latitudinal and longitudinal range.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 16. PP Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	PPxh_WA	PPxx_OR	PPxm_OR	PPxk_OR	PPxw_MT	PPxw_WY	PPmx_WY	PPxh_CO	Common Name	BC Tree Code
<i>Pinus ponderosa</i>	C	C	C	C	C*	C	C	C	ponderosa pine	Py
<i>Juniperus scopulorum</i>					C	c	c	c	Rocky Mountain juniper	Jr
<i>Quercus macrocarpa</i>							C		bur oak	Qm
<i>Quercus gambelii</i>								C	Gambel oak	Qa
<i>Pinus edulis</i>								c	twoneedle pinyon	Pe
<i>Pseudotsuga menziesii</i>	c	c							Douglas-fir	Fd
<i>Quercus garryana</i>		C							Garry oak	Qg
<i>Juniperus occidentalis</i>			C						western juniper	Jw
<i>Cercocarpus montanus</i>								c	alderleaf mountain mahogany	
<i>Cercocarpus ledifolius</i>			c			c			curl-leaf mountain mahogany	Om
<i>Pinus contorta</i>				C					lodgepole pine	Pl
<i>Populus tremuloides</i>						s	s		trembling aspen	At
<i>Betula papyrifera</i>							s		paper birch	Ep

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

3.7.2 PPxh_WA – Very Dry Hot Washington PP

This subzone occurs at low elevations, in northeastern Washington State, south to northwestern Idaho and bordering Oregon. It is a southern variation of the PPxh1 in British Columbia (Lloyd et al. 1990; Ryan et al. 2022).

Zonal forest stands are dominated by ponderosa pine, with some Douglas-fir (Table 16). The understorey is characterized by bluebunch wheatgrass and Idaho fescue, with some arrowleaf balsamroot (*Balsamorhiza sagittata*).

In the northern part of its range, the PPxh_WA occurs at elevations above the BGdw_WA, and below either the IDfxh_WA (west of Okanogan R.) or the IDfdh_WA (east of Okanogan R.). In its southern range, the PPxh_WA is found at elevations between the BGdh_OR and IDfxh_ID. It abuts the PPxh1 (from B.C.) across the Okanogan valley into Canada. To the south, at similar elevations, is the PPxx_OR.

Zonal Habitat types: PIPO-PSME/AGSP, PSME/CARU-AGSP, PIPO/AGSP (Williams et al. 1995; Cooper, Neiman, and Roberts 1991; Lillybridge et al. 1995; Williams and Lillybridge 1983).

PP xh_WA						Habitat Types/Associations
	A	B	C	D	E	
0						
1		grassland		Gg		non-treed?
2		[Py]		102		PIPO/PUTR/AGSP, PIPO/PUTR
3				101		
4		Py (Fd)				PIPO-PSME/AGSP, PSME/CARU-AGSP, PIPO/AGSP
5		FdPy			110	PSME/SPBEL/CARU, PSME/SYAL, PSME/SPBEL
6	111	Fd[At](Py)		Fd [AtAct](Dw)		113 COST-SYAL
7						

Tree species codes are presented in Appendix 1 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 95. PPxh_WA tree species suitability and plant associations displayed on edatopic grid.

3.7.3 PPxx_OR – Very Dry Very Hot Oregon PP

This subzone occurs at low elevations on the east side of the Cascade Mountains from southern Washington into northern Oregon.

Zonal forest stands are characterized by ponderosa pine and Garry oak (*Quercus garryana*), along with some Douglas-fir (Table 16). The understorey is characterized by bluebunch wheatgrass, Idaho fescue, and Sandberg's bluegrass (*Poa secunda*).

This subzone occurs at elevations between the BGxh_WA and IDfxx_WA. To the south, it abuts the PPxm_OR. The PP subzone to the north is the PPxh_WA

Zonal Habitat types: QUGA4/PSSPS, PIPO/PSSPS (Simpson 2007; Lillybridge et al. 1995; Topik, Halverson, and High 1988).

PP xx_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1	NA	grassland		Gg			
2		PyQg (Jw)		102			PIPO-QUGA4/PUTR, PIPO/QUGA4/BASA3; QUGA4/PSSPS
3				101			PIPO/PUTR2/PSSPS
4		PyQg					QUGA4/PSSPS, QUGA4-QUKE, PIPO/PSSPS, PIPO/PUTR
5		FdPyQg [Bg](DwVb)			110		ABGR/ARNE, ABGR/SYMPH, PIPO/PSME/SYMPH; PSME/ARUV
6	111	Py[Fd](Qg)		[FdActPy QgBg] (Dw)		113	PSME/CAGE2, PSME/CARU, PSME/SYAL
7							

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 96. PPxx_OR tree species suitability and plant associations displayed on edatopic grid.

3.7.4 PPxm_OR – Very Dry Mild Oregon PP

This subzone occurs at low elevations over central Oregon, and along the east slope of the Cascade Mountains of Oregon and northern California.

Zonal forest stands are characterized by ponderosa pine (Table 16). Western juniper and curl-leaf mountain mahogany sometimes occur. Grand fir or white fir occur on some moister sites or at higher elevations. Antelope-brush (*Purshia tridentata*) is a common shrub. The main understorey species are Idaho fescue, elk sedge (*Carex geyeri*), squirreltail grass (*Elymus elymoides*), and Sandberg's bluegrass (*Poa secunda*).

This subzone occurs at elevations above the WJPxm_OR. In the western part of the range of this subzone, where it is along the east slope of the Cascade Mountains, it occurs at elevations below the IWFdw_OR. To the east, it occurs below the IGFmh_OR. It abuts the PPxk_OR in the Pumice Region along the East Cascades. The PP subzone to the north is the PPxx_OR.

Zonal Habitat types: PIPO/CAGE2, PIPO/CELE, PIPO/FEID, PIPO/PUTR/FEID, PIPO/PSSPS (Johnson and Clausnitzer 1992; Simpson 2007).

PP xm_OR						Habitat Types/Associations
	A	B	C	D	E	
0						
1		grasslands		Gg		FEID-KOCR, AGSP-POSA3-PHCO2, ACSP-SPCR-ARLO3,
2		[Jw]				AGSP-POSA3-OPPO, AGSP-POSA3, JUOC/FEID-PSSPS
3				101		PIPO/CAGE2, PIPO/CELE, PIPO/ARPA
4		Py [Om] (Jw)				PIPO/FEID, PIPO/PUTR/FEID, PIPO/PSSPS
5	110	Py [Fd] (BgBcOm)		Py[BgBcFd] (Om)	112	PIPO/SYOR, PSME/SYAL, PIPO/SYAL, PSME/CARU
6	111	Fd[BgBcPy] (At)		BgBc[FdAct]	113	POTR/POPR, POTR/MESIC FORB, POTR/CALA3, ALIN-RIBES/MESIC F
7						

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 97. PPxm_OR tree species suitability and plant associations displayed on edatopic grid.

3.7.5 PPxk_OR – Very Dry Cool Oregon PP

This subzone occurs at low elevations along the east slope of the Cascade Mountains in the “pumice region”.

Zonal forest stands are characterized by ponderosa and lodgepole pines (Table 16). Antelope-brush (*Purshia tridentata*) and greenleaf manzanita (*Arctostaphylos patula*) are common shrubs. The understorey is graminoid dominated with Ross' sedge (*Carex rossii*), Idaho fescue, squirreltail grass (*Elymus elymoides*), and stiff needlegrass (*Achnatherum occidentale*).

This subzone occurs at elevations below the IWFdw_OR. The PPxk_OR also abuts the PPxm_OR.

Zonal Habitat types: PIPO/PUTR2/ACOCO, PICO/PUTR/FEID, PIPO/PUTR/FEID-AGSP, PICO/PUTR/STOC, PIPO/PUTR/STOC, PIPO/PUTR/FEID (Volland 1985; Hopkins 1979).

PP xk_OR							Habitat Types/Associations
	A	B	C	D	E		
0							
1		grasslands		Gg			non-treed?
2		Py (Jw)		102			PIPO/PUTR2-CEVE/ACOCO, PIPO/PUTR-ARPA/FEID, PIPO/PUTR-ARPA/STOC
3				101			PIPO/PUTR2/ACOCO, PICO/PUTR/FEID, PIPO/PUTR/FEID-AGSP
4			Py [Pl] (Ps)				PICO/PUTR/STOC, PIPO/PUTR/STOC, PIPO/PUTR/FEID
5			Pl [Py]		110		PICO/ARUV
6	111	Pl (FdBc)		Bc		113	PICO/CAAN15, PICO/SPDO/CAAN15, PICO/VAUL/CAAN15
7							

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 98. PPxk_OR tree species suitability and plant associations displayed on edatopic grid.

3.7.6 PPxw_MT – Very Dry Warm Montana PP

This subzone occurs at low to mid elevations in central and southeastern Montana, and into northeastern Wyoming. Zonal forest stands are characterized by ponderosa pine (Table 16), usually with Rocky Mountain juniper. Bluebunch wheatgrass is the main understorey species. Western wheatgrass (*Pascopyrum smithii*) and Idaho fescue can also occur.

This subzone mostly occurs at elevations above the MGPmw_MT and below the IDfdx_MT or IDfdxx_WY. It abuts the PPxw_WY in the southeast part of its range and the Ppmx_WY in the Black Hills region.

Zonal Habitat types: PIPO/JUSC2, PIPO/PSSPS, PIPO/FEID, PIPO/JUHO2 (Pfister et al. 1978).

PP xw_MT						Habitat Types/Associations
	A	B	C	D	E	
0						
1	NA	grassland		Gg		FEID
2		PyJr		102		JUSC2/ARTR2, JUSC2/PSSPS
3				101		
4			Py [Jr]			PIPO/JUSC2, PIPO/PSSPS, PIPO/FEID, PIPO/JUHO2
5			Py [Jr](Fd)		110	PIPO/SYAL, PIPO/PRVI, PSME/JUSC2, PSME/ACGL
6	111	Py (Fd)		[Aa](Py)		113 PLWR2, PODE3/FRPE, PODE3/JUSC2, POTR5
7						

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 99. PPxw_MT tree species suitability and plant associations displayed on edatopic grid.

3.7.7 PPxw_WY – Very Dry Warm Wyoming PP

This subzone occurs at low to mid elevations in central and southeastern Wyoming. Zonal forest stands are characterized by ponderosa pine (Table 16), often with Rocky Mountain juniper and/or curl-leaf mountain-mahogany. Bluebunch wheatgrass, Idaho fescue, and elk sedge are the main graminoids.

This subzone occurs at elevations above the BGmm_MT or the MGpmw_MT and mostly below the IDFdx_WY or IDFdx_MT. It abuts the PPxw_MT to the north (although there is also some confusion in the mapping in this area between the two units).

Zonal Habitat types: PIPO/JUSC2/PSSPS, PIPO/CAGE2 (Johnston 1987).

PP xw_WY						Habitat Types/Associations
	A	B	C	D	E	
0						
1	NA	grassland		Gg		FEID
2		Py [JrPf]		102		PIPO/PUTR2, PIFL2/JUCO6, PIPO/FEID-ARTR2, PIPO/CARO5
3				101		PIPO/JUSC2/PSSPS
4			Py [Jr]			PIPO/CAGE2
5			Py [Jr]		110	PSME/PHMA
6	111	Py		At[Aa](Py)		113
7						

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 100. PPxw_WY tree species suitability and plant associations displayed on edatopic grid.

3.7.8 PPmx_WY – Moist Very Hot Wyoming PP

This subzone occurs at low to mid elevations in northeastern Wyoming. Zonal forest stands are characterized by ponderosa pine and bur oak (Table 16), often with Rocky Mountain juniper. Common understorey plants include creeping Oregon-grape (*Mahonia repens*), common snowberry (*Symphoricarpos albus*), western mugwort (*Artemisia ludoviciana*), junegrass (*Koeleria macrantha*), and yarrow (*Achillea millefolium*).

This subzone occurs at elevations above the MGPmw_MT. It abuts the PPxw_MT to the west.

Zonal Habitat types: PIPO/JUSC2, PIPO/QUMA2; PIPO/MARE11, PIPO/JUCO6-SYAL (Hoffman and Alexander 1987).

PP mx_WY							Habitat Types/Associations
	A	B	C	D	E		
0							
1		grasslands		Gg			
2		Py [Jr] (Qm)		102			PIPO/SCSC
3				101			PIPO/JUSC2
4		Py [Qm] (JrEp)					PIPO/QUMA2; PIPO/MARE11, PIPO/JUCO6-SYAL
5	110	AtPyQm		PyQmAt [Ep]		112	PIPO/SYAL
6	111	AtPy [Qm]		QmOpAt [EpPy]		113	POTR5/COCO6-COCO6
7							

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 101. PPmx_WY tree species suitability and plant associations displayed on edatopic grid.

3.7.9 PPxh_CO – Very Dry Hot Colorado PP

This subzone occurs at low to mid elevations in central and southern Colorado. Zonal forest stands are characterized by ponderosa pine with Gambel oak (Table 16). Mountain snowberry (*Symphoricarpos oreophilus*) is a common shrub; elk sedge is a common graminoid.

This subzone mostly occurs at elevations between the PPJWwm_CO and IWFdm_CO. In the northern part of its range, it occurs between the MGPmw_MT and the IDfxm_CO.

Zonal Habitat types: PIPO/QUGA, PIPO/BOGR2, PIPO/QUGA/FEAR2 (Johnston 1987; Alexander 1988).

PP xh_CO							Habitat Types/Associations
	A	B	C	D	E		
0							
1		grasslands		Gg			
2	Pe [JrPfPy] (Qa)			102			PIPO/PIED-QUGA, PIED/QUGA
3				101			
4		Py [QaJr]					PIPO/QUGA, PIPO/BOGR2, PIPO/QUGA/FEAR2
5	110	PyFdQa (At)		PyFdQa [At]	112		PIPO/QUGA-SYOR2, PSME/QUGA, PSME/QUGA/FEAR2
6	111	Fd[AtPyQa] (Bc)		AtFd[AaPyQa] (Bc)	113		PIPO-PSME/MUMO; PSME/QUGA; ABCO-PSME/QUGA
7							

Tree species codes are presented in Appendix 1 with many codes in Table 16; Habitat type / association codes are in Appendix 2.

Figure 102. PPxh_CO tree species suitability and plant associations displayed on edatopic grid.

3.8 SUB-BOREAL ASPEN PARKLAND [SBAP]

This zone is characterized by rolling to hilly terrain, with mountain rough fescue grasslands on southerly, warm-aspect slopes and aspen woodlands / willow shrublands in low-lying areas or cool aspect slopes (Natural Regions Committee 2006). Soils are typically Black Chernozems under grasslands or Dark Gray Chernozems under aspen or willow cover.

3.8.1 SPAPfp – Foothills Parkland SBAP

This subzone occurs in the foothills of Alberta in two areas—the southern section is contiguous with the subzone in Montana. Defining the zonal vegetation is challenged by the strong aspect difference (Natural Regions Committee 2006).

Grasslands are as in the FGff subzone—dominated by “mountain” rough fescue (*Festuca campestris*), along with western wheatgrass (*Pascopyrum smithii*), Idaho fescue (*Festuca idahoensis*), and Richardson’s needlegrass (*Eriocoma richardsonii*), with the moister southerly slopes having a greater herb component. As noted in the zone description, aspen is common on moderately well-drained cool aspects. Balsam poplar occurs on moist sites. White spruce and Douglas-fir are occasionally present. Plains cottonwood is mentioned in the Alberta portion of this subzone (Natural Regions Committee 2006), but it not evident in the data for Montana or on iNaturalist (<https://inaturalist.ca/observations>).

SBAPfp					
	A	B	C	D	E
0					
1		grasslands		d	
2	NA				
3				m	
4		At			
5		At [Acb] (Sxw Fdi)			h
6		At [Acb] (Sxw Fdi)			h
7					

Tree species codes are presented in Appendix 1.

Figure 103. SBAPfp tree species suitability.

4 JUNIPER, OAK, AND MOUNTAIN MAHOGANY DOMINATED ZONES

4.1 PINYON PINE – JUNIPER WOODLAND [PPJW]

The Pinyon Pine – Juniper Woodland (PPJW) Zone is a woodland zone of the arid, interior plateaus and mountains of the western United States (West, Tausch, and Tueller 1998).

Mature vegetation is characterized by open to closed stands of intermediate height pines, usually accompanied by moderately tall junipers. The pines are mostly “pinyon” pines (Table 17): twoneedle pinyon (*Pinus edulis*) or singleleaf pinyon (*P. monophylla*) – twoneedle mostly in the western range, and singleleaf in the east. The widest ranging juniper is Utah juniper (*Juniperus osteosperma*). In the western range, California juniper (*J. californica*) occurs, and in the south, mostly in Colorado, oneseed juniper dominates (*J. monosperma*). Rocky Mountain juniper (*J. scopulorum*) occurs commonly in the east and south. Mountain mahogany is a common associate, including both curl-leaf (*Cercocarpus ledifolius*) and alderleaf mountain mahogany (*C. montanus*).

Common shrubs are big sagebrush (*Artemisia tridentata*, including ssp. *wyomingensis*, ssp. *vaseyana*), little sagebrush (*Artemisia arbuscula*), black sagebrush (*Artemisia nova*), and antelope-brush (*Purshia tridentata*). Grasses dominate the understory with cover depending upon the density of the canopy. Common species are blue grama (*Bouteloua gracilis*), Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and Sandberg's bluegrass (*Poa secunda*).

The PPJW zone occurs at elevations above various grassland or shrub-steppe zones, including Bunchgrass (BG), Great Basin Desert (GBD), California Valley Grasslands (CVG), Shortgrass Prairie (SGP), and Mixed-grass Prairie (MGP) zones.

USNVC: Zonal forests are included in two Macrogroups: M896 Intermountain Pinyon – Juniper Woodland [*Pinus monophylla* – *Juniperus osteosperma* – *Juniperus occidentalis* Intermountain Woodland] and M897 Southern Rocky Mountain Two-needle Pinyon – Juniper Woodland [*Pinus edulis* – *Juniperus monosperma* Southern Rocky Mountain Woodland]

Table 17. Tall Shrub and Tree species of juniper, oak and mountain mahogany dominated Biogeoclimatic Zones

Scientific Name	WJP*	PPJW	OW	MMM	Common Name
<i>Juniperus occidentalis</i>	C**				western juniper
<i>Pinus ponderosa</i>	c		c		Ponderosa pine
<i>Pinus monophylla</i>		C			singleleaf pinyon
<i>Pinus edulis</i>		C			twoneedle pinyon
<i>Juniperus osteosperma</i>		C			Utah juniper
<i>Quercus gambelii</i>		s			Gambel oak
<i>Populus tremuloides</i>				s	trembling aspen
<i>Quercus garryana</i>			C		Garry oak
<i>Quercus kelloggii</i>			C		black oak
<i>Quercus wislizeni</i>			C		interior live oak
<i>Quercus douglasii</i>			C		blue oak
<i>Quercus lobata</i>			C		valley oak
<i>Pinus sabiniana</i>			c		California foothill pine
<i>Cercocarpus ledifolius</i>				C	curl-leaf mountain mahogany
<i>Aesculus californica</i>			c		California buckeye

* Zone names: WJP: Western Juniper – Pine; PPJW: Pinyon Pine – Juniper Woodland; OW: Oak Woodland; MMM: Montane Mountain Mahogany ** **C** – major climax species; c – minor climax species

4.1.1 PPJW Subzones

Six subzones (Table 18) are recognized across the range of the PPJW.

Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

Table 18. PPJW Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	PPJWxh_CA	PPJWxw_NV	PPJWdw_UT	PPJWmw_UT	PPJWwm_CO	PPJWdm_WY	Common Name	BC Tree Code
<i>Pinus monophylla</i>	C*	C					singleleaf pinyon	Pn
<i>Pinus edulis</i>			C	C	C	c	twoneedle pinyon	Pe
<i>Pinus sabiniana</i>	c						California foothill pine	Pc
<i>Juniperus californica</i>	c						California juniper	Jc
<i>Juniperus osteosperma</i>		C	C	c		C	Utah juniper	Ju
<i>Juniperus scopulorum</i>				c	c	C	Rocky Mountain juniper	Jr
<i>Juniperus monosperma</i>					C		oneseed juniper	Jo
<i>Quercus chrysolepis</i>	C						canyon live oak	Qc
<i>Quercus wislizeni</i>	c						interior live oak	Qz
<i>Cercocarpus ledifolius</i>		c		c		c	curl-leaf mountain mahogany	Om
<i>Cercocarpus montanus</i>			c	C	c	c	alderleaf mountain mahogany	
<i>Quercus gambelii</i>			c	C	c		Gambel oak	Qa

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

4.1.2 PPJWxh_CA – Very Dry Hot California PPJW

This subzone occurs at low elevations, in southern California.

Zonal vegetation is dominated by California juniper and California foothill pine (Table 18). Canyon live oak, interior live oak, singleleaf pinyon, and birchleaf mountain mahogany (*Cercocarpus montanus* var. *glaber*) are also frequent. Understorey species include bigberry manzanita (*Arctostaphylos glauca*), chamise (*Adenostoma fasciculatum*), and various introduced grasses such as soft brome (*Bromus hordeaceus*), rattail fescue (*Vulpia myuros*), and red brome (*Bromus rubens*). Frequent fires can result in conversion of this pinyon-juniper woodland to open chaparral or sagebrush vegetation.

This subzone mostly occurs between the CVGdm_CA and the CCHun_CA. In the southeast part of its range, it occurs next to the MSSDun_NV

Zonal Habitat types: unknown due to limited data (Horton 1960).

PPJWxh_CA					
	A	B	C	D	E
0					
1		NA		Gg	
2		QcQz[Jc](Qd)		103	
3				101	
4		JcPn [QcQzQd]			
5	110	Pc [Qc](QzQd)			
6	111	PcPz (QzQd)			
7					

Tree species codes are presented in Appendix 1 with many codes in Table 18.

Figure 104. PPJWxh_CA tree species suitability displayed on edatopic grid.

4.1.3 PPJW_{xw}_NV – Very Dry Warm Nevada PPJW

This subzone occurs at low to moderate elevations throughout Nevada and into western Utah, southern Idaho, southern Oregon, and eastern California.

Mature vegetation is characterized by Utah juniper and singleleaf pinyon (Table 18). Curl-leaf mountain mahogany commonly occurs. The understorey is characterized by big sagebrush (including *ssp. wyomingensis*, *ssp. vaseyana*), as well as black sagebrush and antelope-brush.

This subzone mostly occurs at elevations above the GBD_{xh}_NV, but also, in its northern range, above the BG_{dh}_OR. It mostly occurs below the IWF_{xk}_NV or the MMM_{mk}_NV. The PPJW subzone to the east is the PPJW_{dw}_UT.

Zonal Habitat types: PIMO-JUOS/ARTR2, PIMO-JUOS/ARNO4, PIMO-JUOS/ARTRV (West, Tausch, and Tueller 1998).

PPJW _{xw} _NV							Habitat Types/Associations
	A	B	C	D	E		
0							
1		NA		Gg			ARNO/FEID, ARTR/FEID, ARTRV/FEID
2		Om (JuPn)		103			CELE3/PSSPS, CELE3/ARTR2/FEID, CERCO, CELE3/SYOR2
3				101			JUOS, JUOS/ARTRT/PSSP6, JUOS-PIMO/CORA, PIED, PIMO/ARTR2
4		JuPn (Om)					PIMO-JUOS/ARTR2, PIMO-JUOS/ARNO4, PIMO-JUOS/ARTRV
5	110	Ju[Pn](Qa)					ABCO/CELE3, PIJE/ARPA6-CEVE, PIPO/ARPA6, PIPO/QUGA
6	111	(PyJuPn QaBc)		(QaMt AtBcAf)		113	Populus freemontii Alliance, POTR5/SYOR2
7							

Tree species codes are presented in Appendix 1 with many codes in Table 18; Habitat type / association codes are in Appendix 2.

Figure 105. PPJW_{xw}_NV tree species suitability and plant associations displayed on edatopic grid.

4.1.4 PPJWdw_UT – Dry Warm Utah PPJW

This subzone occurs at moderate elevations in Utah and western Colorado.

Mature vegetation is characterized by twoneedle pinyon and Utah juniper (Table 18). Alderleaf mountain mahogany often occurs. The main shrubs are big sagebrush, Wyoming big sagebrush, black sagebrush, shadscale saltbush (*Atriplex confertifolia*), and broom snakeweed (*Gutierrezia sarothrae*).

This subzone mostly occurs at elevations above the GBDdw_UT or GBDxx_UT, and below the PPJWmw_UT (sometime below the IDFdh_UT). The PPJWxw_NV is the equivalent subzone to the west.

Zonal Habitat types: PIED, JUOS, PIED-JUOS/AMUT-CEMO2, PIED-JUOS/ARTR2, PIED/JUOS/CEMO2 (West, Tausch, and Tueller 1998; Youngblood and Mauk 1985).

PPJWdw_UT						Habitat Types/Associations
	A	B	C	D	E	
0						
1		NA		Gg		ARNO4/FEID, ARTR2/PSSPS, ARTRS, ARNO4/PSSPS
2	Pe [Ju] (Jr)			103		CERCO, PIFL2-PILO, PIMO-CELE3/ARTR2, JUOS/ARTR2, JUOS-PIED/PSSPS
3				101		JUOS/ACHY, JUOS/ARTR2, PIED, PIED/QUGA, JUOS
4		JuPe (Qa)				PIED-JUOS/AMUT-CEMO2, PIED-JUOS/ARTR2, PIED-JUOS/CEMO2
5	110	Pe [JuQa]				PIPO/ARPA6, PIPO/PUTR2, PIPO/QUGA, PSME/ARPA6, PSME/CEMO
6	111	Fd [Py](Mt)		Aa (Mt)	113	PSME/QUGA, PSME/ACGL, PSME/CEMO2, PSME/SYOR2, Populus angustifolia w/ Alnus incana or Betula occidentalis, Salix exigua
7						

Tree species codes are presented in Appendix 1 with many codes in Table 18; Habitat type / association codes are in Appendix 2.

Figure 106. PPJWdw_UT tree species suitability and plant associations displayed on edatopic grid.

4.1.5 PPJWmw_UT – Moist Warm Utah PPJW

This subzone occurs at moderate elevations in Utah and western Colorado, at elevations above the PPJWdw_UT.

Mature vegetation is characterized by twoneedle pinyon, usually with Utah juniper and gamble oak (Table 18). Alderleaf mountain mahogany often occurs. The main shrubs are big sagebrush, mountain snowberry (*Symphoricarpos oreophilus*), and Utah serviceberry (*Amelanchier utahensis*).

This subzone mostly occurs at elevations above the PPJWdw_UT, and below the IDFdh_UT or IDFxm_CO.

Zonal Habitat types: PIED-JUOS/AMUT-CEMO2, PIED-JUOS/ARTR2, PIED/JUOS/CEMO2-QUGA (West, Tausch, and Tueller 1998; Youngblood and Mauk 1985).

PPJWmw_UT						Habitat Types/Associations
	A	B	C	D	E	
0						
1	Om [Ju]			102		CELE3/PSSPS, JUOS
2	Ju [OmPe]			103		JUOS/CEMO2-PERA4-CEMO2, JUOS/ARTR2, PIED-JUOS/PUTR2
3				101		PIED/QUGA, PIED-JUOS/AMUT-CEMO2-AMUT, PIED
4		Pe (JuQa) (Jr)				PIED-JUOS/AMUT-CEMO2, PIED-JUOS/ARTR2, PIED/JUOS/CEMO2-QUGA
5		Qa (JrPe)		110		QUGA/SYOR2, QUGA/AMAL2, QUGA
6		[FdAtAaQa] (PyBc)		111		PSME/QUGA, PSME/ACGL, PSME/CEMO2, PIPO/QUGA, ABCO/QUGA, Populus angustifolia / Cornus sericea, POTR5/AMAL2-SYOR2
7						

Tree species codes are presented in Appendix 1 with many codes in Table 18; Habitat type / association codes are in Appendix 2.

Figure 107. PPJWmw_UT tree species suitability and plant associations displayed on edatopic grid.

4.1.6 PPJWwm_CO – Wet Mild Colorado PPJW

This subzone occurs at mid elevations along the east slopes of the Rocky Mountains of Colorado.

Mature vegetation is characterized by twoneedle pinyon and oneseed juniper, sometimes with Rocky Mountain juniper, gambel oak, or alderleaf mountain mahogany (Table 18). Blue grama is most common in the understory.

This subzone occurs at elevations above the SGPdm_CO or MGPMw_CO, and below the PPxh_CO or IDfxm_CO. The PPJWdw_UT occurs in western Colorado.

Zonal Habitat types: PIED/BOGR2, PIED-JUMO/CEMO2, PIED/QUGA (West, Tausch, and Tueller 1998; Marr 1961).

PPJWwm_CO							Habitat Types/Associations
	A	B	C	D	E		
0							
1		(JoJrPe)		Gg			Bouteloua gracilis Alliance
2		Jo [JrPe]		103			JOMU/BOGR2, PIED/BOGR2; PIED-JUMO/CEMO2
3				101			
4		JoPe (Jr)					JUMO/BOCU, PIED-JUMO/ACNEN2, JUMO/BOGR2, PIED/BOGR2
5	110	Jo [PeQa] (Jr)					
6	111	[Qa](Pe)		Ad [Qa]		113	
7							

Tree species codes are presented in Appendix 1 with many codes in Table 18; Habitat type / association codes are in Appendix 2.

Figure 108. PPJWwm_CO tree species suitability displayed on edatopic grid.

4.1.7 PPJWdm_WY – Dry Mild Wyoming PPJW

This subzone occurs at low to moderate elevations in central and southwestern Wyoming.

Mature vegetation is characterized by Utah juniper along with some Rocky Mountain juniper (Table 18). Twoneedle pinyon and limber pine are often present. Big sagebrush is a common shrub (includes ssp. *wyomingensis*). Other common species are bluebunch wheatgrass and Idaho fescue.

This subzone mostly occurs at elevations above the BGxx_WY or BGmm_MT. The PPJWmk_WY occurs above.

Zonal Habitat types: JUOS/ARTR2 (West, Tausch, and Tueller 1998; Johnston 1987).

PPJWdm_WY							Habitat Types/Associations
	A	B	C	D	E		
0							
1				Gg			ARTR4/FEID, PIFL2/FEID, PIFL2/JUCO6
2		(JuPfOm)					
3				101			CELE3/PSSPS, JUOS-PIED/PSSPS, PIFL2/PSSPS
4		JuJr [PfPe](Om)					JUOS, JUOS/ARTR2, JUSC2/ARTR2, PIED,
5	110	Ju[PeJr](Om)					
6	111	[Fd](AtPy)	Aa		113		PSME/PSSPS, PSME/FEID, PIPO/FEID
7							

Tree species codes are presented in Appendix 1 with many codes in Table 18; Habitat type / association codes are in Appendix 2.

Figure 109. PPJWdm_WY tree species suitability and plant associations displayed on edatopic grid.

4.2 WESTERN JUNIPER – PINE [WJP]

The Western Juniper – Pine (WJP) Zone is a woodland zone of the arid Columbia Plateau, centred in Oregon and extending into northeastern California, northwestern Nevada, and southwestern Idaho (Franklin and Dyrness 1988).

Mature vegetation is characterized by open stands of western juniper (*Juniperus occidentalis*) (Table 17). It is generally the only conifer, although some ponderosa pine (*Pinus ponderosa*) may occur at upper elevations of the zone. Big sagebrush (*Artemisia tridentata*) is the dominant shrub. Other key understory species are bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), and Sandberg's bluegrass (*Poa secunda*).

The WJP zone occurs at elevations between the Bunchgrass (BG) and Ponderosa Pine (PP) zones.

USNVC: Zonal forests are included in Macrogroup: M896 Intermountain Pinyon – Juniper Woodland [*Pinus monophylla* – *Juniperus osteosperma* – *Juniperus occidentalis* Intermountain Woodland], specifically G248 Columbia Plateau Western Juniper Open Woodland Group.

4.2.1 WJP Subzones

Only one subzone is recognized at present. Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types used for the data summaries are listed.

4.2.2 WJPxm_OR – Very Dry Mild Oregon WJP

This subzone occurs at low to moderate elevations in central and eastern Oregon, northeastern California, northeastern Nevada, and southwestern Idaho.

Mature vegetation is characterized by western juniper. The understorey is characterized by big sagebrush, bluebunch wheatgrass, Idaho fescue, and Sandberg’s bluegrass.

This subzone mostly occurs at elevations above the BGdh_OR; however on its northern edge, it is above the BGxh_WA. The PPxm_OR generally occurs above. The PPJWxw_NV occurs at similar elevations to the southeast.

Zonal Habitat types: JUOC/ARTR2, JUOC/ARTRT/PSSPS-FEID, JUOC/ARTRV, JUOC/FEID-PSSPS, JUOC/PUTR2/FEID-PSSPS (Volland 1985; Franklin and Dyrness 1988).

WJP xm_OR						Habitat Types/Associations
A	B	C	D	E		
0						
1		NA		Gg		PSSPS, PSSPS-ERHE2, PSSPS-POSE, ARTRV/FEID, FEID-PSSPS
2		Jw		103		JUOC/ARAR8, JUOC/ARAR8/FEID
3				101		JUOC/ARTR2, JUOC/ARTRT/PSSPS-FEID, JUOC/ARTRV,
4			Jw (Om)			JUOC/FEID-PSSPS, JUOC/PUTR2/FEID-PSSPS
5	110	Jw (Py)				PIPO/FEID, PIPO/PSSPS, PIPO/PUTR/FEID, PIPO/SYAL
6		[PyJw] (ActFd)			111	
7						

Tree species codes are presented in Appendix 1; Habitat type / association codes are in Appendix 2.

Figure 110. WJPxm_OR tree species suitability and plant associations displayed on edatopic grid.

4.3 OAK WOODLAND [OW]

The Oak Woodland (OW) Zone is a low elevation woodland zone (Griffin 1977) that occurs in California and SW Oregon. Blue oak (*Quercus douglasii*) and interior live oak (*Quercus wislizeni*) are the main oak species in California (Table 17), whereas Garry oak (*Q. garryana*) and black oak (*Quercus kelloggii*) are the main oaks in Oregon. Associated trees include valley oak (*Quercus lobata*), California foothill pine (*Pinus sabiniana*), and California buckeye (*Aesculus californica*).

In California, this zone occurs above the California Valley Grassland (CVG) zone and below the Coastal Mixed Evergreen (CMX) zone, often in association with the California Chaparral (CCH) zone. In Oregon, it occurs at elevations below the CDF zone.

USNVC: Zonal forests in California are included in Macrogroup M009: Californian Forest & Woodland [*Quercus agrifolia* – *Umbellularia californica* – *Hesperocyparis* spp. Forest & Woodland], specifically G195: Californian Broadleaf Forest & Woodland. In Oregon, zonal forests are included in Macrogroup M886: Southern Vancouverian Dry Foothill Forest & Woodland, in G206: Cascadian Oregon White Oak – Conifer Forest & Woodland.

Four subzones are recognized currently (Table 19). It is possible that another subzone occurs in the Willamette Valley (see, e.g., Alaica et al. 2022), or that the OWwm_OR extends into that valley, but data to confirm mapping is currently limited. Vegetation descriptions in this section are for zonal (or “average”) sites.

Table 19. OW Subzones – Climax and Seral Trees of Upland Sites

Scientific Name	OWwm_OR	OWmm_OR	OWdm_CA	OWxm_CA	Common Name	BC Tree Code
<i>Quercus garryana</i>	C	C	c		Garry oak	Qg
<i>Quercus kelloggii</i>	C	C	c		black oak	Qb
<i>Quercus douglasii</i>			C	C	blue oak	Qd
<i>Quercus wislizeni</i>			C	c	interior live oak	Qz
<i>Jumiperus occidentalis</i>		c			western juniper	Jw
<i>Arbutus menziesii</i>	c				arbutus	Ra
<i>Pinus sabiniana</i>			c		California foothill pine	Pc
<i>Quercus lobata</i>			c		valley oak	Ql
<i>Quercus chrysolepis</i>			c		canyon live oak	Qc
<i>Umbellularia californica</i>			c		California laurel	Ol
<i>Quercus agrifolia</i>				C	California live oak	Qx
<i>Quercus engelmannii</i>				C	Engelmann oak	Qn
<i>Aesculus californica</i>			S	s	California buckeye	On

* **C** – major climax species; c – minor climax species; **S** – major seral species; s – minor seral species

4.3.1 OWdm_CA – Dry Maritime California OW

This subzone occurs in the interior of California, associated with the Central Valley, to the southern limit of California foothill pine.

Blue oak and interior live oak are the main oak species (Table 19). Associated trees include California black oak, valley oak, canyon live oak, California foothill pine, and California buckeye. Poison oak (*Toxicodendron diversilobum*) and toyon (*Heteromeles arbutifolia*) are common shrubs in the understory. Introduced grasses are also common, including soft brome (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), hedgehog dogtail (*Cynosurus echinatus*), and silver hairgrass (*Aira caryophyllea*). Spreading hedge-parsley (*Torilis arvensis*) is also common.

The OWdm_CA occurs at elevations above the CVGdm_CA and below the CMXxm_CA. It often occurs in association with the CCHun_CA. The CDFxm_CA occurs on the northern edge of the OWdm_CA. OWxm_CA occurs to the south.

Zonal association: *Quercus douglasii* – *Quercus wislizeni* – *Pinus sabiniana* / *Toxicodendron diversilobum*
Woodland is the most common association.

OWdm_CA						
	A	B	C	D	E	
0						
1	QdQzPc (Qc)			102		
2	QdQzPc[Qc](QbOn)			103		
3		QbQdQcQz		101		
4		Pc [On] (Q!)				
5		QdQcQzQ!Pc[QbOgOnAfDw](Py)				110
6		QdQcQ! [PcQbQzOgAfDw](On)				111
7						

Tree species codes are presented in Appendix 1 with many codes in Table 19.

Figure 111. OWdm_CA tree species suitability displayed on edatopic grid.

4.3.2 OWxm_CA – Very Dry Maritime California OW

This subzone occurs in the interior of California, associated with the Central Valley, south of about 37 degrees N latitude (south of the distribution of California foothill pine).

Blue oak, Engelmann oak, California live oak, and interior live oak are the main oak species (Table 19). Associated trees include valley oak, canyon live oak, California foothill pine, and California buckeye. Scrub oak (*Quercus berberidifolia*) and poison oak (*Toxicodendron diversilobum*) are often dominant in the undertorey. Other understorey plants are bigberry manzanita (*Arctostaphylos glauca*), California buckwheat (*Eriogonum fasciculatum*), and various bromes (compact brome, riggut brome, soft brome).

The OWxm_CA occurs at elevations above the CVGdm_CA and below the CMXxm_CA. It often occurs in association with the CCHun_CA. The OWdm_CA abuts this subzone in the north.

Zonal association: *Quercus (douglasii, agrifolia, engelmannii) / Toxicodendron diversilobum / Bromus* Woodland is the most common association.

OWxm_CA						
	A	B	C	D	E	
0						
1	Qd			102		
2	Qd [QxQzQn]			103		
3				101		
4		QdQxQn[Qz] (On)				
5		QxQn [QdQzAf] (On)			110	
6		QxQn [QdQzAf] (On)			111	
7						

Tree species codes are presented in Appendix 1 with many codes in Table 19.

Figure 112. OWxm_CA tree species suitability displayed on edatopic grid.

4.3.3 OWmm_OR – Moist Maritime Oregon OW

This subzone occurs in SW Oregon and northern California, associated with the Umpqua River Valley near Roseburg, OR, and the Hat Creek valley and Crystal Lake area of California.

Garry oak and black oak characterize the oak forests and woodlands on most sites. Western juniper occurs in the eastern range of the subzone. Some California foothill pine occurs in the southern range of subzone in California.

The OWmm_OR occurs at elevations below the CDFxm_CA.

OWmm_OR						
	A	B	C	D	E	
0						
1	QgQb (Jw)			102		
2	QgQb (Jw)			103		
3				101		
4		QgQb				
5		QgQb [Py](Pc)			110	
6		Qb [QgPyFdAct](PzPsPcOh)				111
7						

Tree species codes are presented in Appendix 1 with many codes in Table 19.

Figure 113. OWmm_OR tree species suitability displayed on edatopic grid.

4.3.4 OWwm_OR – Wet Maritime Oregon OW

The OWwm_OR occurs in SW Oregon, associated with the Rogue River Valley near Medford.

Garry oak and black oak characterize the oak forests and woodlands on most sites.

The OWwm_OR occurs at elevations below the CDFmm_OR.

OWwm_OR						
	A	B	C	D	E	
0						
1	QgQb			102		
2	QgQb			103		
3				101		
4		QgQb [Ra]				
5		QgQb [RaPy]			110	
6		QgQbFd [Py]			111	
7						

Tree species codes are presented in Appendix 1 with many codes in Table 19.

Figure 114. OWwm_OR tree species suitability displayed on edatopic grid.

4.4 MONTANE MOUNTAIN MAHOGANY [MMM]

The MMM occurs at montane elevations in southern Nevada. Also described as the Mountain Shrub zone¹, it is an elevation band that is below the drought tolerance for high-elevation conifers (such as limber pine [*Pinus flexilis*] or bristlecone pine [*P. longaeva*]) but too cold for the Pinyon Pine – Juniper Woodland zone.

Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) characterizes the zone (Table 17). Other species include big sagebrush (ssp. *vasayana*), mountain snowberry (*Symphoricarpos oreophilus*), little sagebrush (*Artemisia arbuscula*) and some trembling aspen (*Populus tremuloides*). The herb understorey is usually sparse with the main species being bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*).

The zone occurs between the Pinyon Pine – Juniper Woodland (PPJW) and the Montane Spruce (MS) zones.

USNVC: Zonal vegetation is included in Macrogroup M896 Intermountain Pinyon – Juniper Woodland [*Pinus monophylla* – *Juniperus osteosperma* – *Juniperus occidentalis* Intermountain Woodland], specifically part of G249 Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub. Note: USNVC² suggests that this Group could be moved to M049 Southern Rocky Mountain Montane Shrubland.

Only one subzone is recognized at present.

¹ <https://www.onlinenevada.org/articles/nevada-vegetation-overview>

² [Explore The Classification « The U.S. National Vegetation Classification \(usnvc.org\)](#)

4.4.1 MMMdk_NV – Dry Cool Nevada MMM

The subzone occurs in montane elevations in central and south-central Nevada. See zone description.

The subzone occurs at elevations above the PPJWxw_NV and below the MSxx_NV. At similar elevations to the north, IWfXk_NV occurs.

MMM dk_NV							Habitat Types/Associations
	A	B	C	D	E		
0							
1	[OmPf](PnJu)			102			PIMO/ARTR2, PIMO-JUOS/ARTR2, ARAR8/POSE
2		Om		103			CELE3/ARTR2/ELCA11, CELE3/ARTR2/FEID
3				101			
4		Om [At]					CELE3/SYOR2, CELE3/SYOR2/BASA3
5		AtOm			110		POTR5/SYOR2
6		[AtAfOm]			111		POTR5/SYOR2/2FORB
7							

Tree species codes are presented in Appendix 1.

Figure 115. MMMdk_NV tree species suitability and plant associations displayed on edatopic grid.

5 GRASSLAND ZONES

5.1 BUNCHGRASS [BG]

The Bunchgrass (BG) Zone is a shrub-steppe zone of the arid, interior plateaus and mountains of the western United States (Franklin and Dyrness 1988; Brown and Makings 2010) and southern British Columbia (Meidinger and Pojar 1991). It occurs mostly in Washington, Oregon, Idaho, western Wyoming and Montana, and northern Nevada.

Mature vegetation is characterized by open to closed stands of big sagebrush (*Artemisia tridentata* ssp. *tridentata* & *wyomingensis*) (Table 20). Antelope-brush (*Purshia tridentata*) often occurs with big sagebrush. Other accompanying species are bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), junegrass (*Koeleria macrantha*), and Sandberg's bluegrass (*Poa secunda*).

The BG zone occurs at elevations below various arid climate forest and woodland zones, including Ponderosa Pine (PP), Interior Grand Fir (IGF), Interior Douglas-fir (IDF), Interior White Fir (IWF), Pinyon Pine – Juniper Woodland (PPJW), and Western Juniper – Pine (WJP). It abuts the Great Basin Desert (GBD) zone to the south and Mixed-grass Prairie (MGP) zone to the east.

USNVC: Zonal vegetation is included in Macrogroup M169 Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland [*Artemisia tridentata* – *Artemisia tripartita* ssp. *tripartita* – *Purshia tridentata* Steppe & Shrubland].

5.1.1 BG Subzones

Twelve subzones are recognized across the range of the BG zone. Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal habitat types are listed, if known.

Table 20. Key species of Grassland Zones

Scientific Name	BG*	GBD	SGP	MGP	FG	Common Name
<i>Purshia tridentata</i>	a**					antelope-brush
<i>Artemisia tridentata</i>	C	c		C		big sagebrush
<i>Poa secunda</i>	C					Sandberg's bluegrass
<i>Pseudoroegneria spicata</i>	C					bluebunch wheatgrass
<i>Chrysothamnus viscidiflorus</i>	C	C				green rabbit-brush
<i>Atriplex confertifolia</i>		C				shadscale saltbush
<i>Pleuraphis jamesii</i>		C				James' galleta
<i>Achnatherum hymenoides</i>		C				Indian ricegrass
<i>Bouteloua gracilis</i>			C	a		blue grama
<i>Bouteloua dactyloides</i>			C			buffalograss
<i>Cylindropuntia imbricata</i> var. <i>imbricata</i>			C			tree cholla
<i>Sporobolus cryptandrus</i>			C	a		sand dropseed
<i>Yucca glauca</i>			C			soapweed yucca
<i>Gutierrezia sarothrae</i>			C			broom snakeweed
<i>Aristida purpurea</i>			C			red three-awn
<i>Pascopyrum smithii</i>			C	C	a	western wheatgrass
<i>Artemisia frigida</i>			C	C		prairie sagewort
<i>Opuntia polyacantha</i>			C	C		plains prickly-pear cactus
<i>Hesperostipa comata</i>				C		needle-and-thread grass
<i>Tradescantia occidentalis</i>				C		prairie spiderwort
<i>Festuca idahoensis</i>	a				C	Idaho fescue
<i>Festuca campestris</i>					C	rough fescue
<i>Eriocoma richarsonii</i>					C	Richardson's needlegrass
<i>Danthonia parryi</i>					C	Parry's oatgrass

* Zone names: BG: Bunchgrass; GBD: Great Basin Desert; SGP: Short Grass Prairie; MGP: Mid Grass Prairie; FG: Fescue Grassland

** C – characteristic species; a – accompanying species

5.1.2 BGxh_WA Very Dry Hot Washington BG

This subzone occurs at low elevations in central Washington to north central Oregon, at elevations below the BGdw_WA in the north, below the BGmw_WA in SW Washington, or below various PP subzones in the west.

It is characterized by big sagebrush along with bluebunch wheatgrass and Idaho fescue.

Zonal habitat types: ARTR4/FEID-PSSPS, ARTR4/PSSPS-FEID (Franklin and Dyrness 1988).

Tree species codes on grid are presented in Appendix 1.

BGxh_WA					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4			(Jw)		
5		[Py] (Qg)			110
6		Act (Dw)			111
7					

Figure 116. BGxh_WA tree species suitability displayed on edatopic grid.

5.1.3 BGdw_WA – Dry Warm Washington BG

This subzone occurs at low to moderate elevations in north central to northwest Washington, at elevations above the BGxh_WA.

It is characterized by threetip sagebrush (*Artemisia tripartita*) along with bluebunch wheatgrass and Idaho fescue. Arrowleaf balsamroot (*Balsamorhiza sagittata*) is common.

Zonal habitat types: ARTR4/FEID-PSSPS, ARTR4/PSSPS-FEID (Franklin and Dyrness 1988).

Tree species codes on grid are presented in Appendix 1.

BGdw_WA					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		Py [Fd]			110
6		Act [At]			111
7					

Figure 117. BGdw_WA tree species suitability displayed on edatopic grid.

5.1.4 BGmw_WA – Moist Warm Washington BG

This subzone occurs at low elevations in southeastern Washington, into western Idaho and northeast Oregon, east of the BGxh_WA.

It is characterized by bluebunch wheatgrass and Idaho fescue, i.e., it lacks big sagebrush.

Zonal habitat types: FEID-PSSPS, PSSPS, PSSPS-FEID (Franklin and Dyrness 1988)

Tree species codes on grid are presented in Appendix 1.

BGmw_WA					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		Py [Fd]			110
6		Act			111
7					

Figure 118. BGmw_WA tree species suitability displayed on edatopic grid.

5.1.5 BGwm_WA – Wet Mild Washington BG

This subzone occurs at low to mid elevations in southeastern Washington, into western Idaho, north and east of the BGmw_WA.

It is characterized by common snowberry (*Symphoricarpos albus*), mallow ninebark (*Physocarpus malvaceus*), bluebunch wheatgrass, and Idaho fescue. The subzone lacks big sagebrush.

Zonal habitat types: SYAL/FEID-PSSPS, SYAL/PSSPS-FEID (Franklin and Dyrness 1988).

Tree species codes on grid are presented in Appendix 1.

BGwm_WA					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		PyFd (Bg)			110
6		Act [PyAt]			111
7					

Figure 119. BGwm_WA tree species suitability displayed on edatopic grid.

5.1.6 BGdh_OR – Dry Hot Oregon BG

This wide-ranging subzone occurs at low to moderate elevations in southeast Oregon, southern Idaho, and northern Nevada.

It is characterized by big sagebrush (mostly *ssp. wyomingensis*) along with green rabbit-brush, common rabbit-brush (*Ericameria nauseosa*), black sagebrush (*Artemisia nova*), bluebunch wheatgrass, and Sandberg's bluegrass.

Zonal vegetation: Wyoming Big Sagebrush Shrubland Alliance (Franklin and Dyrness 1988; Hironaka, Fosberg, and Winward 1983).

Tree species codes on grid are presented in Appendix 1.

BGdh_OR					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4			(Ju Jw)		
5		Ju (JwPn)			110
6		Aa (Py)			111
7					

Figure 120. BGdh_OR tree species suitability displayed on edatopic grid.

5.1.7 BGdw_OR – Dry Warm Oregon BG

This subzone occurs at low to moderate elevations in northeast Oregon.

It is characterized by big sagebrush (mostly *ssp. wyomingensis*) and bluebunch wheatgrass. At higher elevations to the east is the BGMw_OR.

Zonal vegetation: Wyoming Big Sagebrush Shrubland Alliance (Franklin and Dyrness 1988).

Tree species codes on grid are presented in Appendix 1.

BGdw_OR					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		Py [Fd] (Bg)			110
6		Act (At)			111
7					

Figure 121. BGdw_OR tree species suitability displayed on edatopic grid.

5.1.8 BGmw_OR – Moist Warm Oregon BG

This subzone occurs at moderate elevations in northeast Oregon.

The zonal vegetation is represented by Idaho fescue and bluebunch wheatgrass. Associated species are Sandberg’s bluegrass, yarrow (*Achillea millefolium* var. *lanulosa*) and junegrass (*Koeleria macrantha*) (Endress et al. 2020). At lower elevations, to the west, is the BGdw_OR.

Zonal habitat types: FEID-PSSPS, PSSPS-FEID (Franklin and Dyrness 1988).

Tree species codes on grid are presented in Appendix 1.

BGmw_OR					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		[PyFd]			110
6		Act			111
7					

Figure 122. BGdw_OR tree species suitability displayed on edatopic grid.

5.1.9 BGmk_NV – Moist Cool Nevada BG

This subzone occurs at moderate elevations in northern Nevada, extreme southeast Oregon, southern Idaho, and into northwestern Colorado. It generally occurs at elevations above the BGdh_OR.

It is characterized by mountain big sagebrush (ssp. *vaseyana*), Idaho fescue, and bluebunch wheatgrass.

Zonal vegetation: ARTRV/FEID, ARTRV/PSSPS, ARTR2/FEID, CELE3/ARTR2/FEID (Hironaka, Fosberg, and Winward 1983)

Tree species codes on grid are presented in Appendix 1.

BGmk_NV					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4		(Om)			
5		[AtOm] (Jr)			110
6		At (AfAct Aa)			111
7					

Figure 123. BGmk_NV tree species suitability displayed on edatopic grid.

5.1.10 BGmk_MT – Moist Cool Montana BG

This subzone occurs at low to moderate elevations southwestern Montana and adjacent Idaho.

It is characterized by big sagebrush (including ssp. *wyomingensis*, *vaseyana*), Idaho fescue, and bluebunch wheatgrass. Rocky Mountain juniper (*Juniperus scopulorum*) is often present.

Zonal vegetation: ARTR2/FEID, ARTR2/PSSPS (Hironaka, Fosberg, and Winward 1983).

Tree species codes on grid are presented in Appendix 1.

BGmk_MT					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4		(JrPf)			
5		At (JrOm)			110
6		Act [At]			111
7					

Figure 124. BGmk_MT tree species suitability displayed on edatopic grid.

5.1.11 BGmm_MT – Moist Mild Montana BG

This subzone occurs at moderate elevations mostly in Wyoming, but also into southern Montana.

It is characterized by big sagebrush, Idaho fescue, and bluebunch wheatgrass. Rocky Mountain juniper (*Juniperus scopulorum*) is commonly present.

Zonal vegetation: big sagebrush steppe

Tree species codes on grid are presented in Appendix 1.

BGmm_MT					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4		(Jr)			
5		Py [Jr]			110
6		Ad [At]			111
7					

Figure 125. BGmm_MT tree species suitability displayed on edatopic grid.

5.1.12 BGxx_WY – Very Dry Very Hot Wyoming BG

This subzone occurs at moderate elevations in southwest Wyoming.

It is characterized by big sagebrush (including *wyomingensis*, *vasayana*), rabbit-brush (*Chrysothamnus* sp. & *Ericameria nauseosa*), greasewood (*Sarcobatus vermiculatusis*), and various grasses.

Zonal vegetation: big sagebrush steppe

Tree species codes on grid are presented in Appendix 1.

BGxx_WY					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4					
5		[Ju] (Pe)			110
6		Aa			111
7					

Figure 126. BGxx_WY tree species suitability displayed on edatopic grid.

5.1.13 BGxxx_WY – Very Dry Very Very Hot Wyoming BG

This subzone occurs at moderate elevations in west central Wyoming.

It is characterized by big sagebrush (including *wyomingensis*) and some higher elevation grasses including Idaho fescue and bluebunch wheatgrass.

Zonal vegetation: big sagebrush steppe

Tree species codes on grid are presented in Appendix 1.

BGxxx_WY					
	A	B	C	D	E
0					
1		grasslands		Gg1	
2	NA				
3		grasslands		Gg2	
4					
5		[Ju] (JrOmPf)			110
6		AaAd [At](Af)			111
7					

Figure 127. BGxxx_WY tree species suitability displayed on edatopic grid.

5.2 GREAT BASIN DESERT [GBD]

The Great Basin Desert (GBD) Zone is a shrub-steppe / salt desert shrub zone of low elevation, arid climates centred on the Great Basin. It occurs mostly in Nevada and Utah, in the hydrological Great Basin, although the zone extends somewhat into the Colorado Plateau and Snake River Plain. The northern part of the Great Basin is included in the Bunchgrass zone.

The vegetation of the GBD, as characterized here, mostly lacks big sagebrush, although some Wyoming big sagebrush can occur (Table 20). In the Great Basin area, big sagebrush areas with bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), junegrass (*Koeleria macrantha*), and Sandberg's bluegrass (*Poa secunda*) are included in the Bunchgrass (BG) zone. Desert shrub / salt desert shrub communities are common in the GBD. Plants in this zone include shadscale saltbush (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), winterfat (*Krascheninnikovia lanata*), broom snakeweed (*Gutierrezia sarothrae*), mormon tea (*Ephedra viridis*), green rabbit-brush (*Chrysothamnus viscidiflorus*), blackbrush (*Coleogyne ramosissima*), Bailey's greasewood (*Sarcobatus baileyi*), and Nevada jointfir (*Ephedra nevadensis*). Common grasses include Indian ricegrass (*Achnatherum hymenoides*) and James' galleta (*Pleuraphis jamesii*). Historically, needle-and-thread grass (*Hesperostipa comata*), and sand dropseed (*Sporobolus cryptandrus*) would have been more frequent than they are now.

The GBD zone mostly occurs at elevations below the Pinyon Pine – Juniper Woodland (PPJW) zone.

USNVC: Zonal vegetation is included in Macrogroup M171 Great Basin-Intermountain Dry Shrubland & Grassland [*Chrysothamnus viscidiflorus* – *Coleogyne ramosissima* / *Achnatherum hymenoides* Dry Shrubland & Grassland], both G312 Colorado Plateau Blackbrush – Mormon-tea Shrubland Group, and G310 Intermountain Semi-Desert Steppe & Shrubland Group. The zone includes large areas of Macrogroup M093 Great Basin Saltbush Scrub [*Atriplex confertifolia* – *Atriplex canescens* – *Atriplex corrugata* Great Basin Scrub], mostly G300 Intermountain Shadscale – Saltbush Scrub Group.

5.2.1 GBD Subzones

Three subzones are recognized across the range of the GBD zone. Vegetation descriptions in this section are for zonal (or “average”) sites. The zonal vegetation is listed, to the level known.

5.2.2 GBDxh_NV – Very Dry Hot Nevada GBD

This subzone mostly occurs at low elevations in Nevada, and into northeastern California. It also potentially occurs in southern Oregon and Idaho. It is characterized by dry shrubland and salt desert scrub comprised of Wyoming big sagebrush, shadscale saltbush, green rabbitbrush, bud sagebrush, Bailey's greasewood, greasewood, Nevada jointfir, and Indian ricegrass.

Zonal vegetation: *Artemisia tridentata* ssp. *wyomingensis*, *Sarcobatus baileyi*, *Sarcobatus vermiculatus*, *Atriplex confertifolia*, and *Chrysothamnus viscidiflorus* Shrubland Alliances; *Artemisia nova* Dwarf-shrub Alliance.

Tree species codes on grid are presented in Appendix 1.

GBDxh_NV					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gs	
4		NA			
5		Ju[PePn]			110
6		Af (AaAdm)			111
7					

Figure 128. GBDxh_NV tree species suitability displayed on edatopic grid.

5.2.3 GBDdw_UT – Dry Warm Utah GBD

This subzone occurs primarily at low elevations in Utah, extending slightly into eastern Nevada and western. The main species of this subzone are shadscale saltbush, greasewood, winterfat, Indian ricegrass, James' galleta, saltlover (*Halogeton glomeratus*), and green molly (*Bassia americana*).

Zonal vegetation: Shadscale Shrubland Alliance, Black Greasewood Shrubland Alliance

Tree species codes on grid are presented in Appendix 1.

GBDdw_UT					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		Ju			110
6		Af (AaAdm)			111
7					

Figure 129. GBDdw_UT tree species suitability displayed on edatopic grid.

5.2.4 GBDxx_UT – Very Dry Very Hot Utah GBD

The GBDxx_UT occurs in southeast Utah, extending slightly into Colorado. It is characterized by blackbrush rangelands, with blackbrush, mormon tea, broom snakeweed, Torrey's jointfir (*Ephedra torreyana*), shadscale saltbush, Indian ricegrass, and James' galleta.

Zonal vegetation: Blackbrush Shrubland Alliance

Tree species codes on grid are presented in Appendix 1.

GBDxx_UT					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gs	
4		NA			
5		Ju [Pe]			110
6		Af (Aa)			111
7					

Figure 130. GBDxx_UT tree species suitability displayed on edatopic grid.

5.3 MIXED-GRASS PRAIRIE [MGP]

The MGP zone is a subdivision of Plains Grassland (Brown and Makings 2010) that includes elements of short-grass and tall-grass prairies. It extends from the south of Canada’s prairie provinces through eastern Montana, and western North and South Dakota, south to Texas.

This vegetation is characterized by medium-tall grasses, including needle-and-thread grass (*Hesperostipa comata*), and western wheatgrass (*Pascopyrum smithii*) (Table 20). Other common species are sideoats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), buffalograss (*Bouteloua dactyloides*), thread-leaf sedge (*Carex filifolia*), thickspike wheatgrass (*Elymus lanceolatus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and little bluestem (*Schizachyrium scoparium*).

USNVC: Zonal vegetation is included in Macrogroup M051: Great Plains Mixedgrass & Fescue Prairie Grassland [*Hesperostipa comata* – *Pascopyrum smithii* – *Festuca hallii* Grassland]

Only one subzone is recognized in the mapped area.

5.3.1 MGPmw_MT – Moist Warm Montana MGP

As presently mapped, this subzone occurs in eastern Montana and eastern Wyoming, and into Colorado. See zone description for vegetation of this subzone.

MGPmw_MT					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		PyJr (Fd)			110
6		AdmOp [Jr]			111
7					

Tree species codes are presented in Appendix 1

Figure 131. MGPmw_MT tree species suitability displayed on edatopic grid.

5.4 SHORT GRASS PRAIRIE [SGP]

The SGP zone is a subdivision of Plains Grassland (Brown and Makings 2010) that includes elements of short-grass and tall-grass prairies. The SGP zone is mapped in eastern Colorado and north into southeastern Wyoming. The zone extends outside our map area into western Nebraska, and south to northern Texas and eastern New Mexico.

The vegetation is characterized by short grasses, mainly blue grama (*Bouteloua gracilis*) and buffalograss (*Bouteloua dactyloides*) (Table 20). Other common species are three awns (*Aristida* spp.), broom snakeweed (*Gutierrezia sarothrae*), plains prickly-pear cactus (*Opuntia polyacantha*), tree cholla (*Cylindropuntia imbricata* var. *imbricata*), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), and prairie sagewort (*Artemisia frigida*) (Brown and Makings 2010).

USNVC: Zonal vegetation is included in Macrogroup M053: Western Great Plains Shortgrass Prairie [*Bouteloua gracilis* – *Bouteloua dactyloides* Shortgrass Prairie]

Only one subzone is recognized in the mapped area.

5.4.1 SGPdm_CO – Dry Mild Colorado SGP

See zone description for vegetation of this subzone.

SGP dm_CO					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		JoPe (JrQa)			110
6		Adm [Aa]			111
7					

Tree species codes are presented in Appendix 1

Figure 132. SGPdm_CO tree species suitability displayed on edatopic grid.

5.5 FESCUE GRASSLAND [FG]

The Fescue Grassland zone occurs in northwestern Montana, north into southwestern Alberta.

The vegetation is dominated by “mountain” rough fescue (*Festuca campestris*), along with the western wheatgrass (*Pascopyrum smithii*), Idaho fescue (*Festuca idahoensis*), Parry’s oatgrass (*Danthonia parryi*), and Richardson’s needlegrass (*Eriocoma richardsonii*) (Table 20). Common forbs are silvery lupine (*Lupinus argenteus*), sticky purple geranium (*Geranium viscosissimum*), old-man’s whiskers (*Geum triflorum*), pasture sagewort (*Artemisia frigida*), and prairie golden bean (*Thermopsis rhombifolia*) (Natural Regions Committee 2006).

To the north, in Alberta, away from the foothills, plains rough fescue (*Festuca hallii*) is the dominant grass.

Only one subzone is recognized in the USA mapped area.

5.5.1 FGff – Foothills Fescue FG

Subzone is dominated by mountain rough fescue—see zone description. No tree species recommendations. Soils are Black Chernozems. The winter climate is moderated by chinook winds (Adams et al. 2003).

Plains cottonwood is mentioned in the Alberta portion of this subzone (Natural Regions Committee 2006), but it not evident in the data for Montana or on iNaturalist (<https://inaturalist.ca/observations>).

FGff					
	A	B	C	D	E
0					
1		grasslands			
2	NA				
3		grasslands			
4		NA			
5		[At Acb]			112
6		At [Acb]			113
7					

Tree species codes are presented in Appendix 1

Figure 133. FGff tree species suitability displayed on edatopic grid.

5.6 CENTRAL VALLEY GRASSLAND [CVG]

This zone characterizes the historic vegetation of the lower elevations of the Central Valley of California (Brown and Makings 2010). Most of this area has been converted into farms, pasture, or cities. The valley once supported communities dominated by perennial bunchgrasses as well as oak-grass savannas, and desert grasslands. Purple needlegrass (*Nasella pulchra*) and foothill needlegrass (*N. lepida*) were key species. Other grasses included spidergrass (*Aristida ternipes*), squirreltail (*Elymus elymoides*), blue wildrye (*Elymus glaucus*), Idaho fescue (*Festuca idahoensis*), junegrass (*Koeleria macrantha*), beardless wildrye (*Leymus triticoides*), California melicgrass (*Melica californica*), smallflower melicgrass (*M. imperfecta*), and Sandberg bluegrass (*Poa secunda*). Various trees occurred along river floodplains and creeks including white alder (*Alnus rhombifolia*) and Fremont poplar (*Populus fremontii*).

USNVC: Zonal vegetation is included in Macrogroup M045: Californian Annual & Perennial Grassland (Californian *Nassella pulchra* – *Brodiaea elegans* – *Plagiobothrys nothofulvus* Grassland Macrogroup).

Only one subzone is recognized, at present.

5.6.1 CVGdm_CA – Dry Maritime CVG

This subzone is described in the zone description.

CVGdm_CA					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		QI [QdQzPc]			110
6		Af [MeOgDw]			111
7					

Tree species codes are presented in Appendix 1

Figure 134. CVGdm_CA tree species suitability displayed on edatopic grid.

6 MOJAVE AND CHAPARRAL ZONES

6.1 MOJAVE – SONORAN SEMI-DESERT [MSSD]

This zone is a low elevation, warm temperate climate zone of semi-desert climates in the southwest U.S. and into adjacent Mexico. It includes the Mojave and Sonoran deserts.

USNVC: Zonal vegetation is included in Macrogroup M088: Mojave-Sonoran Semi-Desert Scrub [*Carnegiea gigantea* – *Stenocereus thurberi* – *Ambrosia dumosa* Mojave-Sonoran Semi-Desert Scrub].

Only one subzone, which characterizes the Mojave Desert, is recognized in the map area. Vegetation descriptions in this section are for zonal (or “average”) sites.

6.1.1 MSSDun_NV – Nevada MSSD

This subzone occurs in southern California, southern Nevada, and adjacent Arizona. Cacti occur along with agaves and other drought-tolerant species. Creosote bush (*Larrea tridentata*) is usually present, along with burrobush (*Ambrosia dumosa*), Nevada jointfir (*Ephedra nevadensis*), Mojave yucca (*Yucca schidigera*), and Joshua tree (*Yucca brevifolia*).

MSSDun_NV					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		Ou			
5		Ou [JuPn]			110
6		Af			111
7					

Tree species codes are presented in Appendix 1

Figure 135. MSSDun_NV tree species suitability displayed on edatopic grid.

6.2 CALIFORNIA CHAPARRAL [CCH]

This zone characterizes California chaparral—the sclerophyllous shrublands comprised of unique shrub species that thrive in the Mediterranean climate (Cooper 1922). Chaparral vegetation is wider ranging than zonal chaparral—the latter is mostly restricted to far southern California and into Baja California, Mexico. Chaparral vegetation is common in southern “coastal” California, often on steep topography with shallow soils.

Common shrub species of the shrub chaparral are chamise (*Adenostoma fasciculatum*), toyon (*Heteromeles arbutifolia*), scrub oak (*Quercus berberidifolia*), bigpod ceanothus (*Ceanothus megacarpus*), redheart (*Ceanothus spinosus*), lemonade sumac (*Rhus integrifolia*), sugar sumac (*Rhus ovata*), coastal sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), among others. Trees are infrequent in the climax chaparral region, confined mostly to California live oak (*Quercus agrifolia*), although some other small tree species can occur.

Western sycamore (*Platanus racemosa*), white alder (*Alnus rhombifolia*), and Fremont poplar (*Populus fremontii*) occur along floodplains and creeks, sometimes with minor bigleaf maple (*Acer macrophyllum*) or California laurel (*Umbellularia californica*).

USNVC: Zonal vegetation is included in Macrogroup M043: Californian Chaparral [Californian *Adenostoma fasciculatum* – *Arctostaphylos manzanita* Chaparral Macrogroup].

Only one subzone is recognized, at present.

6.2.1 CCHun_CA – California CCH

This subzone is described in the zone description. It is presently mapped along much of coastal southern California. The distribution of zonal CCH should be more restricted to the southern distribution.

CCHun_CA					
	A	B	C	D	E
0					
1		shrublands		Gs	
2	NA				
3				101	
4		Qx			
5		AfDwOz (Pc)			110
6		AfDwOz (Mb)			111
7					

Tree species codes are presented in Appendix 1

Figure 136. CCHun_CA tree species suitability displayed on edatopic grid.

6.3 MADREAN CHAPARRAL [MDCH]

This zone characterizes “interior” chaparral, occurring mostly in Arizona but also occurs in the desert mountains above the Mojave and Sonoran deserts into California and Nevada. Some key species are Sonoran scrub oak (*Quercus turbinella*), desert ceanothus (*Ceanothus greggii*), pointleaf manzanita (*Arctostaphylos pungens*), greenleaf manzanita (*Arctostaphylos patula*), alderleaf mountain mahogany (*Cercocarpus montanus*), narrowleaf yerba santa (*Eriodictyon angustifolium*), and ashy silktassel (*Garrya flavescens*).

USNVC: Zonal vegetation is included in Macrogroup M091: Warm Interior Chaparral [*Quercus turbinella* – *Arctostaphylos pungens* – *Ceanothus greggii* Warm Interior Chaparral].

Only one subzone is recognized, at present.

6.3.1 MDCHun_NV – Nevada MDCH

This subzone is mapped in southern California and Nevada but would extend into Arizona. The vegetation is as described for the zone. Data is limited in the area of mapping.

MDCHun_NV					
	A	B	C	D	E
0					
1		grasslands		Gg	
2	NA				
3		grasslands		Gg	
4		NA			
5		JuPn (Qa)			110
6		Af (Mt)			111
7					

Tree species codes are presented in Appendix 1

Figure 137. MDCHun_NV tree species suitability displayed on edatopic grid.

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APPENDIX 1: TREE SPECIES CODES USED IN EDATOPIC GRIDS

Tree species are presented on the edatopic grid, within site series (ecosystems), using three formats:

1. Bold type: primary species
2. In square brackets: secondary species
3. In round brackets: tertiary species

TreeCode	Scientific Name	English Name	US code
Aa	<i>Populus angustifolia</i>	narrowleaf cottonwood	POAN3
Acb	<i>Populus balsamifera</i>	balsam poplar	POBA2
Act	<i>Populus trichocarpa</i>	black cottonwood	POBAT
Ad	<i>Populus deltoides</i>	eastern cottonwood	PODE3
Add	<i>Populus deltoides ssp. deltoides</i>	eastern cottonwood	PODED
Adm	<i>Populus deltoides ssp. monilifera</i>	plains cottonwood	PODEM
Af	<i>Populus fremontii</i>	Fremont cottonwood	POFR2
At	<i>Populus tremuloides</i>	trembling aspen	POTR5
Ax	<i>Populus sp. x Populus sp.</i>	poplar hybrid	
Ba	<i>Abies amabilis</i>	amabilis fir	ABAM
Bb	<i>Abies balsamea</i>	balsam fir	ABBA
Bc	<i>Abies concolor</i>	white fir	ABCO
Bg	<i>Abies grandis</i>	grand fir	ABGR
Bl	<i>Abies lasiocarpa</i>	subalpine fir	ABLA
Bla	<i>Abies lasiocarpa var. arizonica</i>	corkbark fir	ABLAA
Bm	<i>Abies magnifica var. shastensis</i>	Shasta red fir	ABSH
Bp	<i>Abies procera</i>	noble fir	ABPR
Cw	<i>Thuja plicata</i>	western redcedar	THPL
Dr	<i>Alnus rubra</i>	red alder	ALRU2
Dw	<i>Alnus rhombifolia</i>	white alder	ALRH2
Ea	<i>Betula neolaskana</i>	Alaska paper birch	BENE4
Ee	<i>Betula pendula</i>	European birch	BEPE3
Ep	<i>Betula papyrifera</i>	common paper birch	BEPA
Es	<i>Betula pubescens</i>	silver birch	BEPUS
Ew	<i>Betula occidentalis</i>	water birch	BEOC2
Exp	<i>Betula x winteri</i>	Alaska x paper birch hybrid	BEWI2
Ey	<i>Betula alleghaniensis</i>	yellow birch	BEAL2
Fd	<i>Pseudotsuga menziesii</i>	Douglas-fir	PSME
Fdc	<i>Pseudotsuga menziesii var. menziesii</i>	coast Douglas-fir	PSMEM
Fdi	<i>Pseudotsuga menziesii var. glauca</i>	Rocky Mountain Douglas-fir	PSMEG
Gp	<i>Cornus nuttallii</i>	western flowering dogwood	CONU4
Hm	<i>Tsuga mertensiana</i>	mountain hemlock	TSME
Hw	<i>Tsuga heterophylla</i>	western hemlock	TSHE
Hxm	<i>Tsuga heterophylla x mertensiana</i>	mountain x western hemlock hybrid	TSJE
Jc	<i>Juniperus californica</i>	California juniper	JUCA7
Jo	<i>Juniperus monosperma</i>	oneseed juniper	JUMO
Jr	<i>Juniperus scopulorum</i>	Rocky Mountain juniper	JUSC2
Js	<i>Juniperus maritima</i>	seaside juniper	JUMA10
Ju	<i>Juniperus osteosperma</i>	Utah juniper	JUOS
Jw	<i>Juniperus occidentalis</i>	western juniper	JUOC

TreeCode	Scientific Name	English Name	US code
Kc	<i>Frangula (Rhamnus) purshiana</i>	casacara	FRPU7
La	<i>Larix lyallii</i>	subalpine larch	LALY
Ld	<i>Larix gmelinii</i>	Dahurian larch	LAGM3
Ls	<i>Larix sibirica</i>	Siberian larch	LASI3
Lt	<i>Larix laricina</i>	tamarack	LALA
Lw	<i>Larix occidentalis</i>	western larch	LAOC
Mb	<i>Acer macrophyllum</i>	bigleaf maple	ACMA3
Me	<i>Acer negundo</i>	box-elder	ACNE2
Mn	<i>Acer platanoides</i>	Norway maple	ACPL
Ms	<i>Acer pseudoplatanus</i>	sycamore maple	ACPS
Mt	<i>Acer grandidentatum</i>	bigtooth maple	ACGR3
Mv	<i>Acer circinatum</i>	vine maple	ACCI
Oa	<i>Calocedrus (Libocedrus) decurrens</i>	incense-cedar	CADE27
Ob	<i>Sequoiadendron giganteum</i>	giant sequoia	SEGI2
Oc	<i>Sequoia sempervirens</i>	coast redwood	SESE3
Od	<i>Sorbus aucuparia</i>	European mountain-ash	SOAU
Oe	<i>Ulmus pumila</i>	Siberian elm	ULPU
Of	<i>Pyrus communis</i>	common pear	PYCO
Og	<i>Fraxinus latifolia</i>	Oregon ash	FRLA
Oh	<i>Fraxinus americana</i>	white ash	FRAM2
Oi	<i>Carya ovata</i>	shagbark hickory	CAOV2
Oj	<i>Ailanthus altissima</i>	tree-of-heaven	AIAL
Ok	<i>Juglans ailanthifolia</i>	Japanese walnut	JUAI2
Ol	<i>Umbellularia californica</i>	California laurel	UMCA
Om	<i>Cercocarpus ledifolius</i>	curl-leaf mountain mahogany	CELE3
On	<i>Aesculus californica</i>	California buckeye	AECA
Op	<i>Fraxinus pennsylvanica</i>	green ash	FRPE
Ot	<i>Notholithocarpus densiflorus</i>	tanoak	LIDE3/NODE3
Ou	<i>Yucca brevifolia</i>	Joshua tree	YUBR
Oy	<i>Chrysolepis chrysophylla</i>	giant chinkapin	CHCH7
Oz	<i>Platanus racemosa</i>	western sycamore	PLRA
Pa	<i>Pinus albicaulis</i>	whitebark pine	PIAL
Pb	<i>Pinus aristida</i>	bristlecone pine	PIAR
Pc	<i>Pinus sabiniana</i>	California foothill pine	PISA2
Pe	<i>Pinus edulis</i>	twoneedle pinyon	PIED
Pf	<i>Pinus flexilis</i>	limber pine	PIFL2
Pg	<i>Pinus longaeva</i>	Great Basin bristlecone pine	PILO
Pj	<i>Pinus banksiana</i>	jack pine	PIBA2
Pk	<i>Pinus attenuata</i>	knobcone pine	PIAT
Pl	<i>Pinus contorta</i>	lodgepole pine	PICO
Plc	<i>Pinus contorta var. contorta</i>	shore pine	PICOC
Pli	<i>Pinus contorta var. latifolia</i>	lodgepole pine	PICOL
Pm	<i>Pinus radiata</i>	Monterey pine	PIRA2
Pn	<i>Pinus monophylla</i>	singleleaf pinyon	PIMO
Pr	<i>Pinus resinosa</i>	red pine	PIRE
Ps	<i>Pinus lambertiana</i>	sugar pine	PILA
Pu	<i>Pinus muricata</i>	Bishop pine	PIMU
Pw	<i>Pinus monticola</i>	western white pine	PIMO3
Pxj	<i>Pinus x murraybanksiana</i>	lodgepole x jack pine hybrid	
Py	<i>Pinus ponderosa</i>	ponderosa pine	PIPO

TreeCode	Scientific Name	English Name	US code
Pz	<i>Pinus jeffreyi</i>	Jeffrey's pine	PIJE
Qa	<i>Quercus gambelii</i>	Gambel oak	QUGA
Qb	<i>Quercus kelloggii</i>	black oak	QUKE
Qc	<i>Quercus chrysolepis</i>	canyon live oak	QUCH2
Qd	<i>Quercus douglasii</i>	blue oak	QUDO
Qe	<i>Quercus robur</i>	English oak	QURO2
Qg	<i>Quercus garryana</i>	Garry oak	QUGA4
Ql	<i>Quercus lobata</i>	valley oak	QULO
Qm	<i>Quercus macrocarpa</i>	bur oak	QUMA2
Qn	<i>Quercus engelmannii</i>	Engelmann oak	QUEN
Qs	<i>Quercus sadleriana</i>	Sadler oak	QUSA2
Qv	<i>Quercus vaccinifolia</i>	huckleberry oak	QUVA
Qw	<i>Quercus alba</i>	white oak	QUAL
Qx	<i>Quercus agrifolia</i>	California live oak	QUAG
Qz	<i>Quercus wislizeni</i>	interior live oak	QUWI2
Ra	<i>Arbutus menziesii</i>	arbutus	ARME
Sb	<i>Picea mariana</i>	black spruce	PIMA
Se	<i>Picea engelmannii</i>	Engelmann spruce	PIEN
Sn	<i>Picea abies</i>	Norway spruce	PIAB
Sp	<i>Picea pungens</i>	blue spruce	PIPU
Sr	<i>Picea breweriana</i>	Brewer spruce	PIBR
Ss	<i>Picea sitchensis</i>	Sitka spruce	PISI
Sw	<i>Picea glauca</i>	white spruce	PIGL
Sx	<i>Picea engelmannii x glauca</i>	interior spruce	
Sxs	<i>Picea x lutzii</i>	hybrid Sitka spruce	
Tw	<i>Taxus brevifolia</i>	western yew	TABR2
Ua	<i>Malus pumila</i>	cultivated apple	MAPU
Up	<i>Malus fusca</i>	Pacific crab apple	MAFU
Vb	<i>Prunus emarginata</i>	bitter cherry	PREM
Vp	<i>Prunus pensylvanica</i>	pin cherry	PRPE2
Vs	<i>Prunus avium</i>	sweet cherry	PRAV
Vv	<i>Prunus virginiana</i>	choke cherry	PRVI
Wa	<i>Salix amygdaloides</i>	peach-leaf willow	SAAM2
Wb	<i>Salix bebbiana</i>	Bebb's willow	SABE2
Wd	<i>Salix discolor</i>	pussy willow	SADI
Wp	<i>Salix lasiandra</i>	Pacific willow	SALUL
Ws	<i>Salix scouleriana</i>	Scouler's willow	SASC
Wt	<i>Salix sitchensis</i>	Sitka willow	SASI2
Yc	<i>Chamaecyparis nootkatensis</i>	yellow-cedar	CHNO
Yp	<i>Chamaecyparis lawsoniana</i>	Port Orford-cedar	CHLA

APPENDIX 2: HABITAT TYPE / ASSOCIATION CODES

HABITAT TYPE / ASSOCIATION	COMMON NAME
ABAM/ACCI/TITR	Pacific silver fir/vine maple/oneleaf foamflower
ABAM/ACTR	Pacific silver fir/vanilla leaf
ABAM/ATFI	Pacific silver fir/lady fern
ABAM/BENE	Silver fir/dwarf Oregon-grape
ABAM/GASH	Pacific silver fir/salal
ABAM/GYDR	Pacific silver fir/oak fern
ABAM/LYAM	Pacific silver fir/American skunkcabbage
ABAM/MANE	Silver fir/dwarf Oregon-grape
ABAM/MEFE	Pacific silver fir/rusty menziesia
ABAM/OPHO	Pacific silver fir/devilsclub
ABAM/OPHO-VAAL	Pacific silver fir/devilsclub-Alaska huckleberry
ABAM/OXOR	Pacific silver fir/redwood-sorrel
ABAM/RHAL2-VAME	Pacific silver fir/Cascade azalea-thinleaf huckleberry
ABAM/RHAL-VAME	Pacific silver fir/Cascade azalea-thinleaf huckleberry
ABAM/RHLA2/CLUN2	Pacific silver fir/Cascade azalea/bride's bonnet
ABAM/RHMA3/XETE	Pacific silver fir/Pacific rhododendron/common beargrass
ABAM/RHMA3-MANE2	Pacific silver fir/Pacific rhododendron-Cascade barberry
ABAM/RHMA3-VAAL/COCA13	Pacific silver fir/Pacific rhododendron-Alaska huckleberry/bunchberry dogwood
ABAM/ROGY/ACTR	Pacific silver fir/baldhip rose/vanilla leaf
ABAM/RULA	Pacific silver fir/roughfruit berry
ABAM/RUSP-BLSP	Pacific silver fir/salmonberry-deer fern
ABAM/TITR	Pacific silver fir/coolwort foamflower
ABAM/TITRU	Pacific silver fir/oneleaf foamflower
ABAM/TIUN	Silver fir/oneleaf foamflower
ABAM/TIUN-STRO	Pacific silver fir/oneleaf foamflower-twistedstalk
ABAM/VAAL	Silver fir/Alaska huckleberry
ABAM/VAAL/COCA13	Silver fir/Alaska huckleberry/bunchberry
ABAM/VAAL-BENE	Pacific silver fir/Alaska huckleberry-Oregongrape
ABAM/VAAL-CLUN	Pacific silver fir/Alaska huckleberry/bride's bonnet
ABAM/VAAL-GASH	Pacific silver fir/Alaska huckleberry-salal
ABAM/VAAL-MADI2	Pacific silver fir/Alaska huckleberry/false lily of the valley
ABAM/VAAL-TIUN	Pacific silver fir/Alaska huckleberry/oneleaf foamflower
ABAM/VAME/CLUN	Silver fir/big huckleberry/beadily
ABAM/VAME/CLUN2	Pacific silver fir/blue huckleberry/queencup beadily
ABAM/VAME/RULA	Pacific silver fir/blue huckleberry/roughfruit berry
ABAM/VAME/VASI	Pacific silver fir/thinleaf huckleberry/Sitka valerian
ABAM/VAME/XETE	Silver fir/big huckleberry/beargrass
ABAM/VAME-ORSE	Pacific silver fir/thinleaf huckleberry-sidebells wintergreen
ABAM/VAME-PYSE	Pacific silver fir/thinleaf huckleberry/sidebells wintergreen

HABITAT TYPE / ASSOCIATION	COMMON NAME
ABAM/VAME-VASI	Pacific silver fir/thinleaf huckleberry/Sitka valerian
ABAM/XETE	Pacific silver fir/common beargrass
ABAM-TSHE/VAME/ACTR	Pacific silver fir-western hemlock/thinleaf huckleberry/sweet after death
ABCO-ABMAS/QUSA2	white fir-Shasta red fir/deer oak
ABCO-ABMAS/ACTR	white fir-Shasta red fir/vanilla leaf
ABCO/ARNE	white fir/pinemat manzanita
ABCO/BENE/ACTR	white fir/dwarf oregongrape/vanilla leaf
ABCO/BENE2	white fir/dwarf oregongrape
ABCO/BENE2/ACTR	white fir/dwarf oregongrape/vanilla leaf
ABCO/BENE2/LIBOL	white fir/dwarf oregongrape/western twinflower
ABCO/CELE3	white fir/curl-leaf mountain mahogany
ABCO/CEVE-ARPA/CAPE-PEEU	white fir/snowbrush ceanothus-greenleaf manzanita/long-stolon sedge-glaucus beardtongue
ABCO/CEVE-ARPA6	white fir/snowbrush ceanothus-greenleaf manzanita
ABCO/CEVE-CHCHC4	white fir/snowbrush ceanothus-giant chinquapin
ABCO/CHCHC4-PAMY/CHUM	white fir/giant chinquapin-Oregon boxleaf/pipissewa
ABCO/GASH-BENE2	white fir/salal-dwarf oregongrape
ABCO/MARE11	white fir/creeping barberry
ABCO/MARE11/SYOR2	white fir/creeping barberry/mountain snowberry
ABCO/QUGA	white fir/Gamble oak
ABCO/QUVA	white fir/huckleberry oak
ABCO/RHMA3-BENE2	white fir/Pacific rhododendron-dwarf oregon-grape
ABCO/RHMA3-QUSA2	white fir/Pacific rhododendron-deer oak
ABCO/SYAL/FRVI	white fir/common snowberry/Virginia strawberry
ABCO/SYMO	white fir/creeping snowberry
ABCO/SYOR2	white fir/mountain snowberry
ABCO/XETE	white fir/common beargrass
ABCO-ABMAS/ACTR	white fir-shasta red fir/vanillaleaf
ABCO-ABMAS/CHUM-ANDE3	white fir-shasta red fir/common prince's-pine-threeleaf anemone
ABCO-ABMAS/QUSA2	white fir-shasta red fir/Sadler oak
ABCO-CACH6/PAMY/CHUM	white fir-giant chinquapin/Oregon boxleaf/pipsissewa
ABCO-CADE27/TRLA6	white fir-incense cedar/western starflower
ABCO-LIDE3/CHUM	white fir-tanoak/pipsissewa
ABCO-PSME/ACGL	white fir-Douglas-fir/Rocky Mountain maple
ABCO-PSME/CEVE-CACH/CARU	white fir-Douglas-fir/snowbrush ceanothus-giant chinquapin/pinegrass
ABCO-PSME/QUGA	white fir-Douglas-fir/Gambel oak
ABCO-PSME/ROGY	white fir-Douglas-fir/dwarf rose
ABCO-PSME/SYOR2	white fir-Douglas-fir/mountain snowberry
ABGR/ACCI	grand fir/vine maple
ABGR/ACCI/ACTR	grand fir/vine maple/sweet after death
ABGR/ACCI-CHUM	grand fir/vine maple-pipissewa
ABGR/ACGL	grand fir/Rocky Mountain maple
ABGR/ACGL/PHMA	grand fir/Rocky Mountain maple-mallow ninebark

HABITAT TYPE / ASSOCIATION	COMMON NAME
ABGR/ACGLD/CLUN	grand fir/Douglas maple/bride's bonnet
ABGR/ACTR	grand fir/sweet after death
ABGR/ARCO	grand fir/heartleaf arnica
ABGR/ARNE	grand fir/pinemat manzanita
ABGR/ARUV	grand fir/kinnikinnick
ABGR/ASCA	grand fir/British Columbia wildginger
ABGR/ASCA2	grand fir/British Columbia wildginger
ABGR/ATFI	grand fir/common ladyfern
ABGR/BENE	Grand fir/dwarf Oregon grape
ABGR/BENE/CARU	grand fir/Cascade barberry/pinegrass
ABGR/CAGE	grand fir/Geyer's sedge
ABGR/CAGE2	grand fir/Geyer's sedge
ABGR/CARU	grand fir/pinegrass
ABGR/CARU-LUPIN	grand fir/pinegrass-lupine
ABGR/CHUM	grand fir/pipsissewa
ABGR/CLUN	grand fir/bride's bonnet
ABGR/CLUN2	grand fir/bride's bonnet
ABGR/CLUN2-CLUN2	grand fir/bride's bonnet-bride's bonnet
ABGR/CLUN2-MEFE	grand fir/bride's bonnet-rusty menziesia
ABGR/CLUN2-PHMA5	grand fir/bride's bonnet-mallow ninebark
ABGR/COCO6/VAHE	grand fir/California hazel/inside out flower
ABGR/GYDR	grand fir/western oakfern
ABGR/HODI	grand fir/oceanspray
ABGR/HODI/CARU	grand fir/oceanspray/pinegrass
ABGR/HODI/POMU	Grand fir/oceanspray/swordfern
ABGR/LIBO	grand fir/twinflower
ABGR/LIBO2	grand fir/twinflower
ABGR/LIBO3	grand fir/twinflower
ABGR/MANE2	grand fir/Cascade barberry
ABGR/MANE2-GASH	Grand fir/dwarf Oregon grape-salal
ABGR/PHMA	grand fir/mallow ninebark
ABGR/PHMA5	grand fir/mallow ninebark
ABGR/PHMA5-PHMA5	grand fir/mallow ninebark-mallow ninebark
ABGR/PHMA-PHMA	grand fir/mallow ninebark-mallow ninebark
ABGR/POMU	grand fir/western swordfern
ABGR/SETR	grand fir/arrowleaf ragwort
ABGR/SPBE	grand fir/white spirea
ABGR/SPBE2	grand fir/white spirea
ABGR/SPBEL/PTAQ	grand fir/shinyleaf spirea/western brackenfern
ABGR/SYMO/ACTR	grand fir/creeping snowberry/sweet after death
ABGR/SYMPH	grand fir/snowberry
ABGR/TABR/CLUN	grand fir/Pacific yew/bride's bonnet

HABITAT TYPE / ASSOCIATION	COMMON NAME
ABGR/TODI	grand fir/poison oak
ABGR/TRCA	grand fir/Carolina bugbane
ABGR/TRCA3	grand fir/Carolina bugbane
ABGR/TRLA2	grand fir/broadleaf starflower
ABGR/VAME	grand fir/thinleaf huckleberry
ABGR/VAME/CLUN	grand fir/thinleaf huckleberry/bride's bonnet
ABGR/VASC	grand fir/grouse huckleberry
ABGR/VASC/LIBO	grand fir/grouse huckleberry/twinflower
ABLA/ACGL	subalpine fir/Rocky Mountain maple
ABLA/ALVIS	subalpine fir/Sitka alder
ABLA/ARCO9	subalpine fir/heartleaf arnica
ABLA/CACA	subalpine fir/bluejoint
ABLA/CACA4	subalpine fir/bluejoint
ABLA/CACA4-LEGL	subalpine fir/bluejoint-western Labrador tea
ABLA/CACA-LEGL	subalpine fir/bluejoint-western Labrador tea
ABLA/CAGE	subalpine fir/Geyer's sedge
ABLA/CAGE2	subalpine fir/Geyer's sedge
ABLA/CARO5	subalpine fir/Ross' sedge
ABLA/CARU	subalpine fir/pinegrass
ABLA/CLUN2	subalpine fir/bride's bonnet
ABLA/CLUN2-CLUN2	subalpine fir/bride's bonnet-bride's bonnet
ABLA/CLUN2-MEFE	subalpine fir/bride's bonnet-rusty menziesia
ABLA/CLUN2-XETE	subalpine fir/bride's bonnet-common beargrass
ABLA/JUCO	subalpine fir/common juniper
ABLA/JUCO6	subalpine fir/common juniper
ABLA/LIBO3-VASC	subalpine fir/twinflower-grouse whortleberry
ABLA/LUGLH	subalpine fir/Hitchcock's smooth woodrush
ABLA/LUGLH-VASC	subalpine fir/Hitchcock's smooth woodrush-grouse whortleberry
ABLA/MARE11	subalpine fir/creeping barberry
ABLA/MEFE	subalpine fir/fools huckleberry
ABLA/Ribelac	subalpine fir/prickly currant
ABLA/RIMO2	subalpine fir/gooseberry currant
ABLA/Senetri	subalpine fir/arrowleaf ragwort
ABLA/SPBE2	subalpine fir/white spirea
ABLA/STAM	subalpine fir/claspleaf twistedstalk
ABLA/SYAL	subalpine fir/common snowberry
ABLA/THOC	subalpine fir/western meadow-rue
ABLA/TRCA	subalpine fir/Carolina bugbane
ABLA/VAME	subalpine fir/thinleaf huckleberry
ABLA/VASC	subalpine fir/grouse whortleberry
ABLA/VASC-CARU	subalpine fir/grouse whortleberry-pinegrass phase
ABLA/VASC-THOC	subalpine fir/grouse whortleberry-western meadow rue phase

HABITAT TYPE / ASSOCIATION	COMMON NAME
ABLA/VASC-VASC	subalpine fir/grouse whortleberry-grouse whortleberry phase
ABLA/XETE	subalpine fir/common beargrass
ABLA/XETE/VAME	subalpine fir/common beargrass/thinleaf huckleberry
ABLA/XETE/VASC	subalpine fir/common beargrass/grouse whortleberry
ABLA/XETE-LUHI	subalpine fir/common beargrass-Hitchcock's smooth woodrush
ABLA/XETE-VAGL	subalpine fir/common beargrass-thinleaf huckleberry
ABLA/XETE-VAME	subalpine fir/common beargrass-big huckleberry phase
ABLA/XETE-VASC	subalpine fir/common beargrass-grouse whortleberry phase
ABLA2/ARCO	subalpine fir/heartleaf arnica
ABLA2/ARLA-POPU	subalpine fir/broadleaf arnica-Jacob's-ladder
ABLA2/ATFI	subalpine fir/common ladyfern
ABLA2/CAGE	subalpine fir/Geyer's sedge
ABLA2/CARU	subalpine fir/pinegrass
ABLA2/CLUN	subalpine fir/bride's bonnet
ABLA2/COCA	subalpine fir/bunchberry dogwood
ABLA2/FEVI	subalpine fir/greenleaf fescue
ABLA2/GYDR	subalpine fir/oakfern
ABLA2/LEGL/CASC5	subalpine fir/western labrador tea-bluejoint
ABLA2/LEGL-VASC	subalpine fir/western labrador tea-grouse whortleberry
ABLA2/LIBOL	subalpine fir/twinflower
ABLA2/LUHI	subalpine fir/Hitchcock's smooth woodrush
ABLA2/OPHO	subalpine fir/devilsclub
ABLA2/PAMY	subalpine fir/Oregon boxleaf
ABLA2/PAMY/CARU	subalpine fir/Oregon boxleaf/pinegrass
ABLA2/PIEN/ARCO	subalpine fir-Engelmann spruce/heartleaf arnica
ABLA2/POPU	subalpine fir/Jacob's-ladder
ABLA2/RHAL	subalpine fir/Cascade azalea
ABLA2/RHAL/LUHI	subalpine fir/Cascade azalea/Hitchcock's smooth woodrush
ABLA2/RHAL/SETR	subalpine fir/Cascade azalea/arrowleaf ragwort
ABLA2/RHAL-XETE	subalpine fir/Cascade azalea-common beargrass
ABLA2/RULA	subalpine fir/roughfruit berry
ABLA2/SAAR4	subalpine fir/Arctic willow
ABLA2/STAM	subalpine fir/claspleaf twistedstalk
ABLA2/STAMC	subalpine fir/claspleaf twistedstalk
ABLA2/TRCA3	subalpine fir/Carolina bugbane
ABLA2/TRLA4	subalpine fir/broadleaf starflower
ABLA2/VADE	subalpine fir/Cascade bilberry
ABLA2/VAME	subalpine fir/thinleaf huckleberry
ABLA2/VASC	subalpine fir/grouse whortleberry
ABLA2/VASC/CARU	subalpine fir/grouse whortleberry/pinegrass
ABLA2/VASC/LUHI	subalpine fir/grouse whortleberry/Hitchcock's smooth woodrush
ABLA2/VASI	subalpine fir/Sitka valerian

HABITAT TYPE / ASSOCIATION	COMMON NAME
ABLA2/VAUL/CASC5	subalpine fir/bog blueberry/broom sedge
ABLA2/XETE	subalpine fir/common beargrass
ABLA2-PIAL/CAGE	subalpine fir-whitebark pine/Geyer's sedge
ABLA2-PIAL/VASC/ARCO	subalpine fir-whitebark pine/grouse whortleberry/heartleaf arnica
ABLA2-PIEN/ARCO	subalpine fir-Engelmann spruce/heartleaf arnica
ABLA2-PIEN/LEGL	subalpine fir-Engelmann spruce/western Labrador tea
ABLA2-PIEN/LIBO2	subalpine fir-Engelmann spruce/twinflower
ABLA2-PIEN/MEFE	subalpine fir-Engelmann spruce/rusty menziesia
ABLA2-PIEN/POPU	subalpine fir-Engelmann spruce/Jacob's-ladder
ABLA2-PIEN/SETR	subalpine fir-Engelmann spruce/arrowleaf ragwort
ABLA-PIAL/VASC	subalpine fir-whitebark pine/grouse whortleberry
ABLA-PIEN/ARCO9	subalpine fir-Engelmann spruce/heartleaf arnica
ABLA-PIEN/CAGE2	subalpine fir-Engelmann spruce/Geyer's sedge
ABLA-PIEN/JUCO6	subalpine fir-Engelmann spruce/common juniper
ABLA-PIEN/LIBO3/VASC	subalpine fir-Engelmann spruce/twinflower/grouse whortleberry
ABLA-PIEN/RIBES	subalpine fir-Engelmann spruce/currant
ABLA-PIEN/RUPA	subalpine fir-Engelmann spruce/thimbleberry
ABLA-PIEN/SETR	subalpine fir-Engelmann spruce/arrowleaf ragwort
ABLA-PIEN/VAMY2	subalpine fir-Engelmann spruce/whortleberry
ABLA-PIEN/VASC	subalpine fir-Engelmann spruce/grouse whortleberry
ABLE/PIEN/JUCO6	subalpine fir-Engelmann spruce/common juniper
ABMAS/ARNE	Shasta red fir/pinemat manzanita
ABMAS/CHUM	Shasta red fir/common prince's pine
ABMAS/OSCH	shasta red fir/mountain sweet-root
ABMAS/VAME/CHUM	shasta red fir/thin-leaved huckleberry/common prince's pine
ABMAS-ABCO/QUSA2/PYSE	shasta red fir-white fir/saddler oak/one-sided pyrola
ABMAS-ABCO/SYMO/CHUM	shasta red fir-white fir/creeping snowberry/commor prince's pine
ABMAS-PICO/ARNE/CHUM	shasta red fir-lodgepole pine/pinemat manzanita/common prince's pine
ABMAS-TSME/ARNE/CHUM	shasta red fir-mountain hemlock/pinemat manzanita/common prince's pine
ABSH/ARNE	Shasta red fir/pinemat manzanita
ABSH-TSME/ARNE/CAIN3	Shasta red fir-mountain hemlock/pinemat manzanita/long-stolon sedge
ACSP-SPCR-ARLO3	bluebunch wheatgrass-sand dropseed-Fendler threeawn
Act/Cornsto	black cottonwood/red-osier dogwood
Act-Acer gla-Corycor	black cottonwood/Douglas' maple-hazelnut
ActDm-Cornsto-Equiarv	black cottonwood-mountain alder/red-osier dogwood/field horsetail
Act-Poa pra	black cottonwood/kentucky bluegrass
AGSP-POSA	bluebunch wheatgrass/Sandberg bluegrass
AGSP-POSA3	bluebunch wheatgrass/Sandberg bluegrass
AGSP-POSA3-OPPO	bluebunch wheatgrass-Sandberg bluegrass-prickly pear
AGSP-POSA3-PHCO2	bluebunch wheatgrass-Sandberg bluegrass-Snake River phlox
ALBA/XETE-VASC	subalpine fir/common beargrass-grouse whortleberry
ALIN/ATFI	gray alder/common ladyfern

HABITAT TYPE / ASSOCIATION	COMMON NAME
ALIN/CACA	gray alder/bluejoint
ALIN/COST	gray alder/redosier dogwood
ALIN/EQUIS	gray alder/horsetail
ALIN/GLEL	gray alder/fowl mannagrass
ALIN/LYAM	gray alder/waterhorehound
ALIN-RIBES/MESIC	gray alder-currant/mesic forb
ALSI/GYDR	Sitka alder/oakfern
ALSI-OPHO	Sitka alder/devilsclub
ARAR	little sagebrush
ARAR8/POSE	little sagebrush/Sandburg bluegrass
ARNO/FEID	black sagebrush/Idaho fescue
ARNO4/FEID	black sagebrush/Idaho fescue
ARNO4/PSSPS	black sagebrush/bluebunch wheatgrass
ARTR	big sagebrush
ARTR/FEID	big sagebrush/Idaho fescue
ARTR/FEID-PSSP	big sagebrush/Idaho fescue-bluebunch wheatgrass
ARTR/PSSPS	big sagebrush/bluebunch wheatgrass
ARTR2/FEID	big sagebrush/Idaho fescue
ARTR2/PSSPS	big sagebrush/bluebunch wheatgrass
ARTR4/FEID	threetip sagebrush/Idaho fescue
ARTR4/FEID-PSSPS	threetip sagebrush/Idaho fescue-bluebunch wheatgrass
ARTR4/PSSPS-FEID	threetip sagebrush/bluebunch wheatgrass-Idaho fescue
ARTRS	big sagebrush series
ARTRV/FEID	mountain big sagebrush/Idaho fescue
ARTRV/PSSPS	mountain big sagebrush/bluebunch wheatgrass
ARTRV/SYOR2/PSSPS	mountain big sagebrush/mountain snowberry/bluebunch wheatgrass
ARTRW8	Wyoming big sagebrush
AtFd/Arctuva	aspen-Douglas fir/kinnikinnick
ATFI-GYDR	ladyfern-oakfern
At-Rosaaci	aspen/prickly rose
At-Rosawoo	aspen/wood's rose
Bc/Carex	white fir/sedge
Bc/Ceanco	white fir/trailing buckbrush
Bc/Ceanint	white fir/ceanothus
Bc/Ribes	white fir/gooseberry
Bc/Salix	white fir/willos
BcFd/Quervac	white fir-Douglas-fir/huckleberry oak
BcFd/Sympmol	white fir-Douglas-fir/mountain snowberry
BcQb/Arctnev-Quervac	white fir-black oak/pinemat manzanita-huckleberry oak
BEPA/COCO6	paper birch/beaked hazelnut
Bl-Alnuvir-Ribelac	subalpine fir/green alder-prickly currant
Bl-Heramax	subalpine fir/common cowparsnip

HABITAT TYPE / ASSOCIATION	COMMON NAME
Bl-Menzfer-Loniuta-Paximyr-Clinuni	subalpine fir/rusty menziesia-Utah honeysuckle-Oregon boxleaf/brides bonnet
Bl-Menzfer-Rhodalb-Gymndry-Athyfil	subalpine fir/rusty menziesia-Cascade azalea/oak fern-lady fern
Bl-Menzfer-Violgla	subalpine fir/rusty menziesia/pioneer violet
Bl-Oplohor	subalpine fir/devilsclub
BlPa alliance	subalpine fir-whitebark pine alliance
BlPa/Veravir	subalpine fir-whitebark pine/sitka valerian
Bl-Ribelac-Senetri	subalpine fir/prickly currant/arrowleaf ragwort
Bl-Rubupar	subalpine fir/thimbleberry
BlSe-Calacan	Engelmann spruce-subalpine fir/bluejoint reedgrass
Bl-Senetri-Valesit	subalpine fir/arrowleaf ragwort-Sitka valerian
BlSe-Streamp	subalpine fir-Engelmann spruce/clapleaf twistedstalk
BlSe-Vaccsco-Arnilat	subalpine fir-Engelmann spruce/grouse whortleberry-mountain arnica
CELE3/ARTR2/ELCA11	curl-leaf mountain mahogany/big sagebrush/bearded wheatgrass
CELE3/ARTR2/FEID	curl-leaf mountain mahogany/big sagebrush/Idaho fescue
CELE3/PSSPS	curl-leaf mountain mahogany/bluebunch wheatgrass
CELE3/SYOR	curl-leaf mountain mahogany/mountain snowberry
CELE3/SYOR2	curl-leaf mountain mahogany/mountain snowberry
CELE3/SYOR2/BASA3	curl-leaf mountain mahogany/mountain snowberry/arrowleaf balsamroot
CERCO	mountain mahogany series
CHLA/RHMA3/GASH	Port Orford cedar/Pacific rododendron-salal
CHLA/VAOV2	Port Orford cedar/Evergreen huckleberry
CHLA/VAOV2/POMUM	Port Orford cedar/California huckleberry/western swordfern
CHLA-ABCO/BENE2	port-orford cedar-white fir/dwarf oregongrape
CHLA-TSHE/POMU	Port Orford cedar-western hemlock/western swordfern
COST-SYAL	red-osier dogwood-common snowberry
CwBg/Polymun-Adiaale	western red cedar/sword fern/maidenhair fern
Fd/Festida	Douglas-fir/Idaho fescue (PSME/FEID)
Fd/Holodis	Douglas-fir/oceanspray (PSME/HODI)
Fd/Juni	Douglas-fir/juniper
Fd-Arctuva	Douglas-fir/kinnikinnick
FdBl - Junicom - Arctuva - Pseuspi	douglas-fir-subalpine fir/common juniper/kinnikinnick-bluebunch wheatgrass
FdEp/Acergla/Pseuspi	douglas-fir-paper birch/Rocky Mtn. maple/bluebunch wheatgrass
Fd-Linnbor	Douglas-fir/twinflower
FdLw/Spirbet/Calarub	douglas-fir-western larch/shinyleaf spirea/pinegrass
FdLw/Sympalb/Calarub	douglas-fir-western larch/common snowberry/pinegrass
FdLw/Sympalb/Caregey	douglas-fir-western larch/common snowberry/Geyer's sedge
FdLw-Clinuni	douglas-fir-western larch/bride's bonnet
FdPf/Juni	douglas-fir-limber pine/juniper
Fd-Phillew	Douglas-fir/mallow ninebark (PSME/PHMA5)
FdPl/Amelaln-Sympalb/Pseuspi	douglas-fir-lodgepole pine/saskatoon-snowberry/bluebunch wheatgrass
FdPl/Calarub	douglas-fir-lodgepole pine/pinegrass
FdPl/Calarub-Caregey-Xeroten	douglas-fir-lodgepole pine/pinegrass-Geyer's sedge-beargrass

HABITAT TYPE / ASSOCIATION	COMMON NAME
FdPV/Spirbet/Calarub	douglas-fir-lodgepole pine/shinyleaf spirea/pinegrass
FdPy/Junicom-Physmal	douglas-fir-ponderosa pine/common juniper-mallow ninebark
FdPy-Arctuva	douglas-fir-ponderosa pine/kinnikinnick
FdPy-Caregey	douglas-fir-ponderosa pine/Geyer's sedge
FdPy-Physmal-Pseuspi	douglas-fir-ponderosa pine/mallow ninebark/bluebunch wheatgrass
FdPy-Spirbet	douglas-fir-ponderosa pine/shinyleaf spirea
FdSe/Cornsto	douglas-fir-Engelmann spruce/red-osier dogwood
Fd-Spirbet	Douglas-fir/shinyleaf spirea (PSME/SPBE)
Fd-Spirbet-Xeroten	Douglas-fir/shinyleaf spirea/beargrass
Fd-Sympalb-Calarub-Caregey	Douglas-fir/common snowberry/pinegrass-Geyer's sedge
FEID	Idaho fescue series
FEID/AGSP-BASA	Idaho fescue-bluebunch wheatgrass-arrowleaf balsamroot
FEID-AGSP	Idaho fescue-bluebunch wheatgrass
FEID-AGSP-LUSE	Idaho fescue-bluebunch wheatgrass-silky lupine
FEID-KOCR	Idaho fescue-prairie Junegrass
FEID-PSSPS	Idaho fescue-bluebunch wheatgrass
FEID-PSSPS-BASA	Idaho fescue-bluebunch wheatgrass-arrowleaf balsamroot
Festida	Idaho fescue
Jr-Artetri-Festida	Rocky Mtn. juniper/Idaho fescue
JUMO	oneseed juniper series
JUMO/BOCU	oneseed juniper/sideoats grama
JUMU/BOGR2	oneseed juniper/sideoats grama
Junihor	creeping juniper
Junisco-Pseuspi-Pascsmi	Rocky Mtn. juniper/bluebunch wheatgrass-western wheatgrass
JUOC	western juniper series
JUOC/ARAR8	western juniper/little sagebrush
JUOC/ARAR8/FEID	western juniper/little sagebrush/Idaho fescue
JUOC/ARTR2	western juniper/big sagebrush
JUOC/ARTRT/PSSPS-FEID	western juniper/basin big sagebrush/bluebunch wheatgrass-Idaho fescue
JUOC/ARTRV	western juniper/mountain big sagebrush
JUOC/CERCO	western juniper/mountain mahogany
JUOC/FEID	western juniper/Idaho fescue
JUOC/FEID-PSSPS	western juniper/Idaho fescue-bluebunch wheatgrass
JUOC/PUTR2/FEID-PSSPS	western juniper/antelope bitterbrush/Idaho fescue-bluebunch wheatgrass
JUOS	Utah juniper series
JUOS/ACHY	Utah juniper/Indian ricegrass
JUOS/ARTR2	Utah juniper/big sagebrush
JUOS/ARTRT/PSSP6	Utah juniper/basin big sagebrush/bluebunch wheatgrass
JUOS/CEMO2-PERA4-CEMO2	Utah juniper/alderleaf mountain mahogany-squaw-apple-alderleaf mountain mahogany
JUOS-PIED/PSSPS	Utah juniper-twoneedle pinyon/beardless wheatgrass
JUOS-PIMO/CORA	Utah juniper-singleleaf pinyon/blackbrush
JUSC2/ARTR2	Rocky Mountain juniper/big sagebrush

HABITAT TYPE / ASSOCIATION	COMMON NAME
JUSC2/PSSPS	Rocky Mountain juniper/bluebunch wheatgrass
LALY/VASC/LUHI	subalpine larch/grouse whortleberry/Hitchcock's smooth woodrush
LIDE3/VAOV2-RHMA3-GASH	tanoak/California huckleberry/Pacific rhododendron-salal
LIDE3-ACMA3-QUCH2/POMU	tanoak-bigleaf maple-canyon live oak/western swordfern
LIDE3-CHLA/GASH	tanoak-Port Orford cedar/salal
LIDE3-PSME/GASH-BENE2	tanoak-douglas-fir/salal-dwarf oregongrape
LIDE3-PSME/GASH-RHMA3	tanoak-Douglas-fir/salal-Pacific rhododendron
LIDE3-PSME/GASH-VAOV2	tanoak-Douglas-fir/salal-California huckleberry
LIDE3-PSME-QUCH2/BENE2	tanoak-douglas-fir-canyon live oak/dwarf oregongrape
LIDE3-PSME-QUCH2/RHD16	tanoak-douglas-fir-canyon live oak/poison oak
LIDE3-TSHE/VAOV2/POMU	tanoak-western hemlock/California huckleberry/western swordfern
LIDE3-TSHE/VAOV2/POMU-RIP	tanoak-western hemlock/California huckleberry/western swordfern riparian
Pf-Junicom-Pseuspi	limber pine/common juniper/bluebunch wheatgrass
Pf-Junior-Pseuspi	limber pine/creeping juniper/bluebunch wheatgrass
PIAL/ABLA	whitebark pine/subalpine fir communities
PIAL/CAGE	whitebark pine/Geyer's sedge
PIAL/CARU	whitebark pine/pinegrass
PIAL/JUCO4	whitebark pine/common juniper
PIAL/RIMO/POPU	subalpine fir/gooseberry currant/Jacob's-ladder
PIAL/VASC	whitebark pine/grouse whortleberry
PIAL/VASC/LUHI	whitebark pine/grouse whortleberry/Hitchcock's smooth woodrush
PIAL-ABLA/FEID	whitebark pine-subalpine fir/Idaho fescue
PIAL-ABLA2/RHAL/XETE	whitebark pine-subalpine fir/Cascade azalea/common beargrass
PICE/PHMA5	spruce/mallow ninebark
PICEA/EQAR	spruce/horsetail
Piceeng-Athyfil	Engelmann spruce/lady fern
PICO alliance	lodgepole pine alliance
PICO(ABGR)/LIBO2	lodgepole pine-grand fir/twinflower
PICO(ABLA2)/VASC	lodgepole pine-subalpine fir/grouse whortleberry
PICO/ARUV	lodgepole pine/kinnikinnick
PICO/CAAN15	lodgepole pine/widefruit sedge
PICO/CACA	lodgepole pine/bluejoint
PICO/JUCO6	lodgepole pine/common juniper
PICO/PUTR/FEID	lodgepole pine/bitterbrush/Idaho fescue
PICO/PUTR/STOC	lodgepole pine/bitterbrush/western needlegrass
PICO/SPDO/CAAN15	lodgepole pine/rose spiraea/widefruit sedge
PICO/VAME	lodgepole pine/thinleaf huckleberry
PICO/VAME/XETE	lodgepole pine/thinleaf huckleberry/beargrass
PICO/VASC	lodgepole pine/grouse whortleberry
PICO/VAUL/CAAN15	lodgepole pine/bog blueberry/widefruit sedge
PICO/XETE	lodgepole pine/common beargrass
PICOC/ARCO3	shore pine/hairy manzanita

HABITAT TYPE / ASSOCIATION	COMMON NAME
PICOC/ARUV	Shore pine/Bearberry
PICOC/CYSC4/AMAR4	Shore pine/Scots broom/European beachgrass
PICOC-PISI/VAOV2	Shore pine-Sitka spruce/Evergreen huckleberry
PICO-PSME/MYCA-VAOV2	Shore pine-Douglas-fir/Wax myrtle-Evergreen huckleberry
PICO-TSME/DEP	lodgepole pine-mountain hemlock/depauperate
PICO-TSME/VAME/XETE	lodgepole pine-mountain hemlock/thinleaf huckleberry/beargrass
PIED	twoneedle pinyon series
PIED/BOGR2	twoneedle pinyon/blue grama
PIED/JUOS/CEMO2	twoneedle pinyon-Utah juniper/alderleaf mountain mahogany
PIED/JUOS/CEMO2-QUGA	twoneedle pinyon-Utah juniper/alderleaf mountain mahogany-Gambel oak
PIED/QUGA	twoneedle pinyon/Gambel oak
PIED-JUMO/ACNEN2	twoneedle pinyon-oneseed juniper/Columbia needlegrass
PIED-JUOS/AMUT-CEMO2	twoneedle pinyon-Utah juniper/Utah serviceberry-alderleaf mountain mahogany
PIED-JUOS/AMUT-CEMO2-AMUT	twoneedle pinyon-Utah juniper/Utah serviceberry-alderleaf mountain mahogany-Utah serviceberry
PIED-JUOS/ARTR2	twoneedle pinyon-Utah juniper/big sagebrush
PIED-JUOS/CEMO2	twoneedle pinyon-Utah juniper/alderleaf mountain mahogany
PIED-JUOS/PUTR2	twoneedle pinyon-Utah juniper/antelope bitterbrush
PIEN/ATFI	Engelmann spruce/common ladyfern
PIEN/CADI	Engelmann spruce/softleaf sedge
PIEN/CASCP2	Engelmann spruce/western singlespike sedge
PIEN/COCA	Engelmann spruce/bunchberry dogwood
PIEN/COST	Engelmann spruce/redosier dogwood
PIEN/EQAR	Engelmann spruce/field horsetail
PIEN/EQUIS	Engelmann spruce/horsetail
PIEN/JUCO6	Engelmann spruce/common juniper
PIEN/RIMO2	Engelmann spruce/gooseberry current
PIEN/SETR	Engelmann spruce/arrowleaf ragwort
PIEN/SYAL	Engelmann spruce/common snowberry
PIEN/VAMY2	Engelmann spruce/whortleberry
PIEN-PSME/JUCO6	Engelmann spruce-Douglas-fir/common juniper
PIFL/FEID	limber pine/Idaho fescue
PIFL/JUCO6	limber pine/common juniper
PIFL/JUCOM2	limber pine/common juniper
PIFL2	limber pine series
PIFL2/FEID	limber pine/Idaho fescue
PIFL2/JUCO6	limber pine/common juniper
PIFL2/LEKI2	limber pine/spike fescue
PIFL2/PSSPS	limber pine/bluebunch wheatgrass
PIFL2-PILO	limber pine series
PIJE/ARPA6-CEVE	Jeffrey pine/greenleaf manzanita-snowbrush ceonothus
PIJE-CADE27/ARV14	jeffrey pine-incense-cedar/whiteleaf manzanita
PIMO/ARTR2	singleleaf pinyon/big sagebrush

HABITAT TYPE / ASSOCIATION	COMMON NAME
PIMO-CELE3/ARTR2	singleleaf pinyon-curl-leaf mountain mahogany/big sagebrush
PIMO-JUOS	singleleaf pinyon-Utah juniper series
PIMO-JUOS/ARNO4	singleleaf pinyon-Utah juniper/black sagebrush
PIMO-JUOS/ARNO4/PSSP6	singleleaf pinyon-Utah juniper/black sagebrush/bluebunch wheatgrass
PIMO-JUOS/ARTR2	singleleaf pinyon-Utah juniper/big sagebrush
PIMO-JUOS/ARTRV	singleleaf pinyon-Utah juniper/mountain big sagebrush
PIPO alliance	ponderosa pine alliance
PIPO/AGSP	Ponderosa Pine/Bluebunch Wheatgrass
PIPO/ARPA	ponderosa pine/greenleaf manzanita
PIPO/ARPA6	ponderosa pine/greenleaf manzanita
PIPO/BOGR2	ponderosa pine/blue grama
PIPO/CAGE	ponderosa pine/Geyer's sedge
PIPO/CAGE2	ponderosa pine/Geyer's sedge
PIPO/CARO5	ponderosa pine/Ross' sedge
PIPO/CARU	ponderosa pine/pinegrass
PIPO/CARU/AGSP	ponderosa pine/pinegrass-bluebunch wheatgrass
PIPO/CARU-PSSP	ponderosa pine/pinegrass-bluebunch wheatgrass
PIPO/CAUT	ponderosa pine/Northwest Territory sedge
PIPO/CELE	ponderosa pine/curl-leaf mountain mahogany
PIPO/CELE3	ponderosa pine/curl-leaf mountain mahogany
PIPO/CEMO2	ponderosa pine/alderleaf mountain mahogany
PIPO/FEAR2	ponderosa pine/Arizona fescue
PIPO/FEID	ponderosa pine/Idaho fescue
PIPO/FEID-ARTR2	ponderosa pine/Idaho fescue-big sagebrush
PIPO/JUCO6-SYAL	ponderosa pine/common juniper-common snowberry
PIPO/JUHO2	ponderosa pine/creeping juniper
PIPO/JUSC2	ponderosa pine/Rocky Mountain juniper
PIPO/JUSC2/PSSPS	ponderosa pine-Rocky Mountain juniper/bluebunch wheatgrass
PIPO/MARE11	ponderosa pine/creeping barberry
PIPO/PIED-QUGA	ponderosa pine/twoneedle pinyon-Gambel oak
PIPO/PRVI	ponderosa pine/chokecherry
PIPO/PSME/SYMPH	ponderosa pine-Douglas-fir/snowberry
PIPO/PSSPS	ponderosa pine/bluebunch wheatgrass
PIPO/PUTR	ponderosa pine/bitterbrush
PIPO/PUTR/AGSP	ponderosa pine/antelope bitterbrush-bluebunch wheatgrass
PIPO/PUTR/FEID	ponderosa pine/bitterbrush/Idaho fescue
PIPO/PUTR/FEID-AGSP	ponderosa pine/antelope bitterbrush/Idaho fescue-bluebunch wheatgrass
PIPO/PUTR/STOC	ponderosa pine/antelope bitterbrush/western needlegrass
PIPO/PUTR2	ponderosa pine/antelope bitterbrush
PIPO/PUTR2/ACOCO	ponderosa pine/antelope bitterbrush/western needlegrass
PIPO/PUTR2/PSSPS	ponderosa pine/antelope bitterbrush/bluebunch wheatgrass
PIPO/PUTR2-CEVE/ACOCO	ponderosa pine/antelope bitterbrush-snowbrush ceanothus/western needlegrass

HABITAT TYPE / ASSOCIATION	COMMON NAME
PIPO/PUTR2-CEVE/CAINI3	ponderosa pine/antelope bitterbrush-snowbrush ceanothus/long-stolon sedge
PIPO/PUTR-ARPA/FEID	ponderosa pine/antelope bitterbrush-greenleaf manzanita/Idaho fescue (pumice)
PIPO/PUTR-ARPA/STOC	ponderosa pine/antelope bitterbrush-snowbrush ceanothus/western needlegrass
PIPO/QUGA	ponderosa pine/Gambel oak
PIPO/QUGA/FEAR2	ponderosa pine/Gambel oak/Arizona fescue
PIPO/QUGA4/BASA3	ponderosa pine-Oregon white oak/arrowleaf balsamroot
PIPO/QUGA-SYOR2	ponderosa pine/Gambel oak-mountain snowberry
PIPO/QUKE	ponderosa pine-California black oak
PIPO/QUMA2	ponderosa pine/bur oak
PIPO/SCSC	ponderosa pine/little bluestem
PIPO/SPBE	ponderosa pine/white spirea
PIPO/SYAL	ponderosa pine/common snowberry
PIPO/SYAL-SYAL	ponderosa pine/common snowberry-common snowberry phase
PIPO/SYOR	ponderosa pine/mountain snowberry
PIPO-PSME	ponderosa pine-Douglas-fir
PIPO-PSME/AGSP	ponderosa pine-Douglas-fir/bluebunch wheatgrass
PIPO-PSME/CAGE2	Ponderosa pine-Douglas-fir/Geyer's sedge
PIPO-PSME/MUMO	ponderosa pine-Douglas-fir/mountain muhly
PIPO-PSME/PSSPS	ponderosa pine-Douglas-fir/bluebunch wheatgrass
PIPO-PSME/PSSPS(AGSP)	ponderosa pine-Douglas-fir/bluebunch wheatgrass
PIPO-QUGA/BASA	ponderosa pine-Oregon white oak/arrowleaf balsamroot
PIPO-QUGA/PUTR	ponderosa pine-Oregon white oak/bitterbrush
PIPO-QUGA4/PUTR	ponderosa pine-Oregon white oak/bitterbrush
PIPO-QUKE	ponderosa pine-California black oak
PIPO-QUKE/PUTR2/ACOCO	ponderosa pine-California black oak/antelope bitterbrush/western needlegrass
PISI/GASH	Sitka spruce/salal
PISI/GASH-VAOV2	Sitka spruce/salal-California huckleberry
PISI/MEFE-VAPA	Sitka spruce/rusty menziesia-red huckleberry
PISI/OPHO	Sitka spruce/devilsclub
PISI/OXOR	Sitka spruce/redwood-sorrel
PISI/POMU	Sitka spruce/swordfern
PISI/POMU-OXOR	Sitka spruce/western swordfern-redwood-sorrel
PISI/RUSP	Sitka spruce/salmonberry
PISI/RUSP-GASH	Sitka spruce/salmonberry-salal
PISI/VAOV2	Sitka spruce/Evergreen huckleberry
PISI-ABCO/RUSP	Sitka spruce-White fir/salmonberry
PI/Junicom	lodgepole pine/common juniper
PI/Vacccae	lodgepole pine/dwarf bilberry
PIBIPa/ARLA-SETR	lodgepole pine-subalpine fir-whitebark pine/broadleaf arnicea-arrowleaf ragwort
PIBIPa/MEFE	lodgepole pine-subalpine fir-whitebark pine/rusty menziesia
PI-Calarub	lodgepole pine/pinegrass
PLWR2	Arizona sycamore

HABITAT TYPE / ASSOCIATION	COMMON NAME
POAN3	narrowleaf cottonwood series
POAN3/RHAR4	narrowleaf cottonwood/fragrant sumac
PODE3/FRPE	eastern cottonwood/green ash
PODE3/JUSC2	eastern cottonwood/Rocky Mountain juniper
PODEM/SALIX	plains cottonwood/willow
PODEM/SYOC	plains cottonwood/western snowberry
PODEM-POAN3/SALIX	plains cottonwood-narrowleaf cottonwood/willow
POPUL	cottonwood series
POTR	quaking aspen
POTR/ALIN-COST	quaking aspen/thinleaf alder/redosier dogwood
POTR/AMAL2	quaking aspen/Saskatoon serviceberry
POTR/AMAL2-PRVIV	quaking aspen/Saskatoon serviceberry-chokecherry
POTR/CACA	quaking aspen/bluejoint
POTR/CALA3	quaking aspen/bluejoint
POTR/CARU	quaking aspen/pinegrass
POTR/COST	black cottonwood/red-osier dogwood
POTR/MESIC FORB	quaking aspen/mesic forb
POTR/POPR	quaking aspen/Kentucky bluegrass
POTR/SYAL	quaking aspen/common snowberry
POTR2/ALIN	quaking aspen/thinleaf alder
POTR2/ALIN-COST	quaking aspen/thinleaf alder/redosier dogwood
POTR2/COST	quaking aspen/redosier dogwood
POTR5	quaking aspen series
POTR5/2FORB	quaking aspen/mesic forb
POTR5/ALIN-COST	quaking aspen/thinleaf alder/redosier dogwood
POTR5/AMAL/2FORB	quaking aspen/Saskatoon serviceberry/tall forb
POTR5/AMAL2	quaking aspen/Saskatoon serviceberry
POTR5/AMAL2-SYOR2	quaking aspen/Saskatoon serviceberry-mountain snowberry
POTR5/ARTR2	quaking aspen/big sagebrush
POTR5/COCO6-COCO6	quaking aspen/beaked hazelnut-beaked hazelnut
POTR5/PTAQ	quaking aspen/western brackenfern
POTR5/SYOR2	quaking aspen/mountain snowberry
POTR5/SYOR2/2FORB	quaking aspen/mountain snowberry/tall forb phase
POTR5-ABCO/SYOR2	quaking aspen-white fir/mountain snowberry
POTR5-ABLA/JUCO6	quaking aspen-subalpine fir/common juniper
POTR5-ABLA/SYOR2/2FORB	quaking aspen-subalpine fir/mountain snowberry/tall forb
POTR5-ABLA/THFE	quaking aspen-subalpine fir/Fendler's meadow-rue
POTR5-PIFL2	quaking aspen-limber pine series
Pseuspi	bluebunch wheatgrass
PSME alliances	douglas-fir alliances
PSME/ACCI-BENE2	douglas-fir/vine maple-dwarf oregongrape
PSME/ACGL	Douglas-fir/Rocky Mountain maple

HABITAT TYPE / ASSOCIATION	COMMON NAME
PSME/ACGL-PHMA	Douglas-fir/Rocky Mountain maple-mallow ninebark
PSME/AGSP	Douglas-fir/bluebunch wheatgrass
PSME/ARNE	Douglas-fir/pinemat manzanita
PSME/ARPA6	Douglas-fir/greenleaf manzanita
PSME/ARUV	Douglas-fir/kinnikinnik
PSME/ARUV/CARU	Douglas-fir/kinnikinnick/pinegrass
PSME/ARUV-JUCO6	Douglas-fir/kinnikinnick-common juniper
PSME/BENE	Douglas-fir/dwarf Oregon grape
PSME/BENE2/POMU	douglas-fir/dwarf oregongrape/western sword-fern
PSME/CAGE	Douglas-fir/elk sedge
PSME/CAGE2	Douglas-fir/Geyer's sedge
PSME/CARU	Douglas-fir/pinegrass
PSME/CARU-AGSP	Douglas-fir/pinegrass-bluebunch wheatgrass
PSME/CARU-ARUV	Douglas-fir/pinegrass-kinnikinnick phase
PSME/CARU-CARU	Douglas-fir/pinegrass-pinegrass phase
PSME/CELE3	Douglas-fir/curl-leaf mountain mahogany
PSME/CEMO	Douglas-fir/alderleaf mountain mahogany
PSME/CEMO2	Douglas-fir/alderleaf mountain mahogany
PSME/COCO6/SYMO/POMU	Douglas-fir/California hazel-creeping snowberry/swordfern
PSME/DRYSHRUB	Douglas-fir/dry shrub
PSME/FEAR2	Douglas-fir/Arizona fescue
PSME/FEID	Douglas-fir/Idaho fescue
PSME/FOOC	Douglas-fir/western fescue
PSME/FESC	Douglas-fir/rough fescue
PSME/GASH	Douglas-fir/salal
PSME/GASH-BENE2	douglas-fir/salal-dwarf oregongrape
PSME/GASH-HODI	douglas-fir/salal-oceanspray
PSME/GASH-RHMA3	Douglas-fir/salal-Pacific rhododendron
PSME/HODI	Douglas-fir/oceanspray
PSME/HODI/CAGE	Douglas-fir/oceanspray/Geyer's sedge
PSME/HODI/CAGE2	Douglas-fir/oceanspray/Geyer's sedge
PSME/HODI/WHMO	Douglas-fir/oceanspray/whipple vine
PSME/HODI-MANE2	Douglas-fir/oceanspray-Cascade barberry
PSME/HODI-ROGY	Douglas-fir/oceanspray-dwarf rose
PSME/HODI-SYMPH	Douglas-fir/oceanspray-snowberry
PSME/JUCO	Douglas-fir/common juniper
PSME/JUCO6	Douglas-fir/common juniper
PSME/JUSC2	Douglas-fir/Rocky Mountain juniper
PSME/LIBO3-SYAL	Douglas-fir/twinflower-common snowberry
PSME/MANE2	Douglas-fir/dwarf Oregon grape
PSME/MANE2-GASH	Douglas-fir/dwarf Oregon grape-salal
PSME/MARE11-JUCO6	Douglas-fir/creeping barberry-common juniper

HABITAT TYPE / ASSOCIATION	COMMON NAME
PSME/PAMY	Douglas-fir/Oregon boxleaf
PSME/PAMY/CARU	Douglas-fir/Oregon boxleaf/pinegrass
PSME/PHMA	Douglas-fir/ninebark
PSME/PHMA3-VAOV2	Douglas-fir/mallow ninebark-California huckleberry
PSME/PHMA5	Douglas-fir/mallow ninebark
PSME/PHMA5/CARU	Douglas-fir/mallow ninebark/pinegrass
PSME/PHMA5/MAST4	Douglas-fir/mallow ninebark/starry false lily of the vally
PSME/PHMA5/PIPO	Douglas-fir/mallow ninebark/ponderosa pine
PSME/PHMA5-CARU	Douglas-fir/mallow ninebark-pinegrass phase
PSME/PHMA5-PHMA5	Douglas-fir/mallow ninebark-mallow ninebark phase
PSME/PHMA-LIBOL	Douglas-fir/mallow ninebark/longtube twinflower
PSME/PHMO4	Douglas-fir/mountain ninebark
PSME/PSSPS	Douglas-fir/bluebunch wheatgrass
PSME/PUTR	Douglas-fir/bitterbrush
PSME/PUTR/AGSP	Douglas-fir/antelope bitterbrush/bluebunch wheatgrass
PSME/QUGA	Douglas-fir/Gambel oak
PSME/QUGA/FEAR2	Douglas-fir/Gambel oak/Arizona fescue
PSME/RUSP/POMU	Douglas-fir/salmonberry/western swordfern
PSME/SPBE	Douglas-fir/shinyleaf spirea
PSME/SPBEL	Douglas-fir/shinyleaf spirea
PSME/SPBEL/CARU	Douglas-fir/shinyleaf spirea/pinegrass
PSME/SYAL	Douglas-fir/common snowberry
PSME/SYAL/AGSP	Douglas-fir/common snowberry/bluebunch wheatgrass
PSME/SYAL/CARU	Douglas-fir/common snowberry/pinegrass
PSME/SYAL-CARU	Douglas-fir/common snowberry-pinegrass phase
PSME/SYAL-SYAL	Douglas-fir/common snowberry-common snowberry phase
PSME/SYOR	Douglas-fir/mountain snowberry
PSME/SYOR2	Douglas-fir/mountain snowberry
PSME/TODI	Douglas-fir/poison oak
PSME/VACA	Douglas-fir/dwarf bilberry
PSME/VACA13	Douglas-fir/dwarf bilberry
PSME/VAME	Douglas-fir/thinleaf huckleberry
PSME/VAMY	Douglas-fir/velvetleaf huckleberry (Wenatchee)
PSME/VAMY/CARU	Douglas-fir/velvetleaf huckleberry/pinegrass
PSME-ABCO	DOUGLAS-FIR-WHITE FIR
PSME-ABCO/SYMO	Douglas-fir-white fir/creeping snowberry
PSME-ARME/GASH	Douglas-fir/Pacific madrone/salal
PSME-CACH6/BENE2	Douglas-fir-giant chinquapin/Cascade barberry
PSME-CADE27/BEPI2	douglas-fir-incense-cedar/piper's oregonrape
PSME-CADE27-PIJE	Douglas-fir-incense cedar-Jeffery pine
PSME-PIPO/RHDI6	douglas-fir-ponderosa pine/poison oak
PSME-PIPO/TODI	Douglas-fir-ponderosa pine/Pacific poison oak

HABITAT TYPE / ASSOCIATION	COMMON NAME
PSME-QUCH2/BENE2	douglas-fir-canyon live oak/dwarf oregonrape
PSME-QUCH2/POMU	douglas-fir-canyon live oak/swordfern
PSME-QUCH2/RHDI6	douglas-fir-canyon live oak/poison oak
PSME-QUCH2-LIDE3	douglas-fir-canyon live oak-tanoak
PSME-QUKE/RHDI6	douglas-fir-california black oak/poison oak
PSME-TSHE/MANE2	Douglas-fir-western-hemlock/Cascade barberry
PSME-TSHE/RHMA3	Douglas-fir-western hemlock/Pacific rhododendron
PSSPS	bluebunch wheatgrass series
PSSPS-ERHE2	bluebunch wheatgrass-parsnipflower buckwheat
PSSPS-FEID	bluebunch wheatgrass-Idaho fescue
PSSPS-POSE	bluebunch wheatgrass-Sandberg bluegrass
Py/Agrospi	Ponderosa Pine/Bluebunch Wheatgrass
PyFd/Amelaln/Calarub	Ponderosa Pine-Douglas-fir/saskatoon serviceberry/pinegrass
PyFd/Pseuspi	Ponderosa Pine-Douglas-fir/Bluebunch Wheatgrass
PyFd-Ceanvel	Ponderosa Pine-Douglas-fir/snowbrush ceanothus
PyFd-Pseuspi	Ponderosa Pine-Douglas-fir/Bluebunch Wheatgrass
PyFd-Purstri	Ponderosa Pine-Douglas-fir/antelope bitterbrush
Py-Festida	ponderosa pine/Idaho fescue
Py-Pseuspi	Ponderosa Pine/Bluebunch Wheatgrass
QUGA	Gambel oak series
QUGA/AMAL2	Gambel oak/Saskatoon serviceberry
QUGA/CARU-CAGE	Oregon white oak/pinegrass-Geyer's sedge
QUGA/COCO2-SYAL	Oregon white oak/beaked hazelnut-common snowberry
QUGA/SYOR2	Gambel oak/mountain snowberry
QUGA4/CYEC	Oregon white oak/bristly dogstail grass
QUGA4/PSSPS	Oregon white oak/bluebunch wheatgrass
QUGA4-PSME/RHDI6	oregon white oak-douglas-fir/poison oak
QUGA4-PSME/TODI	Oregon white oak-Douglas-fir/Pacific poison oak
QUGA4-QUKE	Oregon white oak-California black oak
Salix exigua	narrowleaf willow
Se/Calacan	Engelmann spruce/bluejoint reedgrass
Se/CAUT	Engelmann spruce/Northwest Territory sedge
Se/Cornsto	Engelmann spruce/redosier dogwood (PIEN/COST)
Se/Equiarv	Engelmann spruce/horsetail (PIEN/EQAR)
SeBI/Athyfil-Equiarv-Tiartri	Engelmann spruce-subalpine fir/lady fern-field horsetail-foamflower
SeBI/CACA	Engelmann spruce-subalpine fir/bluejoint reedgrass
SeBI/Calacan	Engelmann spruce-subalpine fir/bluejoint reedgrass
SeBI/Ledugla/Xeroten	Engelmann spruce-subalpine fir/western Labrador tea/beargrass
SeBI/LEGL/SETR	Engelmann spruce-subalpine fir/western Labrador tea/arrowleaf ragwort
SeBI/Oplohor	Engelmann spruce-subalpine fir/devilsclub
SeBI/Ribelac	Engelmann spruce-subalpine fir/prickly currant
SeBI/Streamp	Engelmann spruce-subalpine fir/clapleaf twistedstalk

HABITAT TYPE / ASSOCIATION	COMMON NAME
SeDm-Cornsto	Engelmann spruce-mountain alder/redosier dogwood
SeFd-Ribelac	Engelmann spruce-Douglas-fir/prickly currant
Se-Oplohor	Engelmann spruce/devilsclub
Se-Ribelac-Equiarv	Engelmann spruce/prickly currant/field horsetail
Se-Ribelac-Maiaste	Engelmann spruce/prickly currant/starry false lily of the valley
SESE2/MAFA-VIAN	redwood/California manroot-garden vetch
SESE2/POMU1-TROV	redwood/western swordfern-Pacific trillium
SESE2/PTAQL-WOFI//Streamsides	redwood/western brackenfern-giant chainfern (streamsides)
SESI2-LIDE2/CAGL1-IRDO	redwood-tanoak/roundfruit sedge-Douglas iris
SYAL/FEID-PSSPS	common snowberry/Idaho fescue-bluebunch wheatgrass
SYAL/PSSPS-FEID	common snowberry/bluebunch wheatgrass-Idaho fescue
THPL/ADPE	western red cedar/northern maidenhair
THPL/ARNU3	western red cedar/wild sarsparilla
THPL/ASCA2	western red cedar/British Columbia wildginger
THPL/ASCA2 (ASCA2)	western red cedar/British Columbia wildginger-British Columbia wildginger
THPL/ATFI	western red cedar/common ladyfern
THPL/ATFI-ADPE	western red cedar/common ladyfern-northern maidenhair
THPL/ATFI-ATFI	western red cedar/common ladyfern-common ladyfern
THPL/Athyfil-Asarcau	western red cedar/lady fern-British Columbia wildginger
THPL/BENE2/POMU	western redcedar/dwarf oregongrape/western sword-fern
THPL/CLUN	western red cedar/queencup beadlily
THPL/CLUN2	western red cedar/bride's bonnet
THPL/CLUN2-ARNU2	western red cedar/bride's bonnet-wild sarsaparilla
THPL/CLUN2-CLUN2	western red cedar/bride's bonnet-bride's bonnet
THPL/CLUN2-TABR2	western red cedar/bride's bonnet-Pacific yew
THPL/CLUN2-XETE	western red cedar/bride's bonnet-common beargrass
THPL/GYDR	western redcedar/oakfern
THPL/OPHO	western red cedar/devilsclub
THPL/VAME	western red cedar/thinleaf huckleberry
THPL-ABGR/ACTR	western red cedar-grand fir/sweet after death
TSHE/ACCI/ACTR	western hemlock/vine maple/sweet after death
TSHE/ACCI/POMU	western hemlock/vine maple/western swordfern
TSHE/ACCI-GASH	western hemlock/vine maple-salal
TSHE/ACCI-MANE2	western hemlock/vine maple-Cascade barberry
TSHE/ACCI-RHMA3	western hemlock/vine maple-pacific rhododendron
TSHE/ACTR	western hemlock/sweet after death
TSHE/ARNU3	western hemlock/wild sarsparilla
TSHE/ASCA3	western hemlock/wild ginger
TSHE/ASCA-ARNU	western hemlock/British Columbia wildginger-wild sarsaparilla
TSHE/ATFI	western hemlock/common ladyfern
TSHE/BENE	western hemlock/Cascade barberry
TSHE/BENE-CHME	western hemlock/Cascade barberry/little prince's pine

HABITAT TYPE / ASSOCIATION	COMMON NAME
TSHE/CLUN	Western hemlock/Queencup beadlily
TSHE/CLUN2	western hemlock/bride's bonnet
TSHE/CLUN2-CLUN2	western hemlock/bride's bonnet-bride's bonnet
TSHE/CLUN-XETE	western hemlock/bride's bonnet-common beargrass
TSHE/Dep.	western hemlock depauperate
TSHE/GASH	western hemlock/salal
TSHE/GASH/OXOR	western hemlock/salal/redwood-sorrel
TSHE/GASH/POMU	western hemlock/salal/western swordfern
TSHE/GASH-BENE	western hemlock/salal-Cascade barberry
TSHE/GASH-BENE2	western hemlock/salal-Cascade barberry
TSHE/GASH-HODI	western hemlock/salal-oceanspray
TSHE/GASH-MANE2	western hemlock/salal-Cascade barberry
TSHE/GASH-RHMA3	western hemlock/salal-Pacific rhododendron
TSHE/GASH-VAOV2	western hemlock/salal-California hucklebery
TSHE/GASH-XETE	western hemlock/salal-beargrass
TSHE/GYDR	western hemlock/western oakfern
TSHE/LYAM	western hemlock/skunk cabbage
TSHE/LYAM3	western hemlock/American skunkcabbage
TSHE/MANE2	western hemlock/Cascade barberry
TSHE/MANE2/POMU	western hemlock/Cascade barberry/western swordfern
TSHE/MANE2-DRY	western hemlock/Cascade barberry-Dry
TSHE/MANE2-GASH	western hemlock/Cascade barberry-salal
TSHE/MANE2-GASH-NWO	western hemlock/Cascade barberry-salal (NW Oregon)
TSHE/MEFE	western hemlock/rusty menziesia
TSHE/OPHO	western hemlock/devilsclub
TSHE/OPHO/MAST4	western hemlock/devilsclub/starry false lily of the vally
TSHE/OPHO-ATFI	western hemlock/devilsclub-common ladyfern
TSHE/OXOR	western hemlock/redwood-sorrel
TSHE/POMU	western hemlock/western swordfern
TSHE/POMU-GASH	western hemlock/western swordfern-salal
TSHE/POMU-OXOR	western hemlock/western swordfern-redwood-sorrel
TSHE/POMU-TITR	western hemlock/western swordfern-threelaf foamflower
TSHE/RHMA3/GASH	western hemlock/Pacific rhododendron-salal
TSHE/RHMA3/POMU	western hemlock/Pacific rhododendron/western swordfern (coast)
TSHE/RHMA3/XETE	western hemlock/Pacific rhododendron/common beargrass
TSHE/RHMA3-GASH	western hemlock/Pacific rhododendron-salal
TSHE/RHMA3-MANE2	western hemlock/Pacific rhododendron-Cascade barberry
TSHE/RHMA3-VAOV2	western hemlock/Pacific rhododendron-California huckleberry
TSHE/RUSP	western hemlock/salmonberry
TSHE/RUSP-ACCI	western hemlock/salmonberry-vine maple (coast)
TSHE/RUSP-GASH	western hemlock/salmonberry-salal (coastal)
TSHE/TITR	western hemlock/threelaf foamflower

HABITAT TYPE / ASSOCIATION	COMMON NAME
TSHE/VAAL	western hemlock/Alaska huckleberry
TSHE/VAAL/OXOR	western hemlock/Alaska huckleberry/oxalis
TSHE/VAAL-GASH	western hemlock/Alaska huckleberry/salal
TSHE/VAAL-OPHO	western hemlock/Alaska huckleberry-devil's club
TSHE/VAOV	western hemlock/oval-leaf blueberry
TSHE/VAOV2	western hemlock/California huckleberry
TSHE/VAOV-GASH	western hemlock/oval-leaf blueberry-salal
TSHE/XETE	western hemlock/common beargrass
TSHE-ABCO/BENE2	western hemlock-white fir/dwarf oregonrape
TSHE-LIDE3-UMCA	western hemlock-tanoak-California laurel
TSHE-THPL/POMU	western hemlock-western redcedar/western swordfern
TSME/ARNE	mountain hemlock/pinemat manzanita
TSME/ARNE/CHUM	mountain hemlock/pinemat manzanita/common prince's-pine
TSME/CABI	mountain hemlock/white marshmarigold
TSME/CAREX	mountain hemlock/sedge
TSME/CLPY-RUPE	mountain hemlock/copperbush/strawberyleaf raspberry
TSME/CLUN2-MEFE	mountain hemlock/bride's bonnet-rusty menziesia
TSME/GYDR	mountain hemlock/oakfern
TSME/HERB	mountain hemlock/herb
TSME/LUGLH	mountain hemlock/smooth woodrush
TSME/LUHI	mountain hemlock/smooth woodrush
TSME/MEFE	mountain hemlock/rusty menziesia
TSME/MEFE-VAME	mountain hemlock/rusty menziesia-thinleaf huckleberry
TSME/MEFE-XETE	mountain hemlock/rusty menziesia-common beargrass
TSME/PHEM-VADE	mountain hemlock/pink mountain heath-Cascade bilberry
TSME/RHAL	mountain hemlock/Cascade azalea
TSME/RHAL2/XETE	mountain hemlock/Cascades azalea/beargrass
TSME/RHAL-VAAL	mountain hemlock/Cascade azalea-Alaska blueberry
TSME/RHAL-VAME	mountain hemlock/Cascade azalea-thinleaf huckleberry
TSME/RULA	mountain hemlock/roughfruit berry
TSME/TIUN-STRO	mountain hemlock/oneleaf foamflower-twistedstalk
TSME/VAAL	mountain hemlock/Alaska blueberry
TSME/VAAL-STRO	mountain hemlock/Alaska blueberry/twistedstalk
TSME/VAAL-CLUN	mountain hemlock/Alaska blueberry/bride's bonnet
TSME/VAAL-ERMO	mountain hemlock/Alaska blueberry/white avalanche-lily
TSME/VAAL-MADI2	mountain hemlock/Alaska blueberry/false lily of the valley
TSME/VACCI/CALEH2	mountain hemlock/blueberry/Howells marsh marigold
TSME/VAME	mountain hemlock/thinleaf huckleberry
TSME/VAME/CLUN	mountain hemlock/thinleaf huckleberry/bride's bonnet
TSME/VAME/CLUN2	mountain hemlock/thinleaf huckleberry/bride's bonnet
TSME/VAME/PYSE	mountain hemlock/thin-leaved huckleberry/one-sided pyrola
TSME/VAME/VASI	mountain hemlock/thinleaf huckleberry/Sitka valerian

HABITAT TYPE / ASSOCIATION	COMMON NAME
TSME/VAME/XETE	mountain hemlock/thinleaf huckleberry/common beargrass
TSME/VAME-SOSI2	mountain hemlock/big huckleberry-Sitka mountain ash
TSME/VAME-STRO	mountain hemlock/thinleaf huckleberry/twistedstalk
TSME/VAME-VAAL	mountain hemlock/thinleaf huckleberry-Alaska blueberry
TSME/VAME-XETE	mountain hemlock/thinleaf huckleberry/common beargrass
TSME/VASC	mountain hemlock/grouse whortleberry
TSME/VASC/CHUM	mountain hemlock/grouse whortleberry/pipsissewa
TSME/VASC/LUHI	mountain hemlock/grouse whortleberry/Hitchcock's smooth woodrush
TSME/XETE	mountain hemlock/common beargrass
TSME/XETE/VAMY	mountain hemlock/common beargrass-thinleaf huckleberry
TSME-ABAM/VAME/CLUN	mountain hemlock-Pacific silver fir/thinleaf huckleberry/bride's bonnet
TSME-ABAM/VAME/RULA	mountain hemlock-Pacific silver fir/thinleaf huckleberry/roughfruit berry
TSME-ABAM/VAME/XETE	mountain hemlock-Pacific silver fir/thinleaf huckleberry/common beargrass
TSME-ABAM/VAME-ACTR	mountain hemlock-Pacific silver fir/thinleaf huckleberry/vanilla leaf
TSME-ABAM/VAME-VASC	mountain hemlock-Pacific silver fir/thinleaf huckleberry-grouse whortleberry
TSME-ABMAS/RULA2/PYSE	mountain hemlock-shasta red fir/dwarf bramble/one-sided pyrola
TSME-ABMAS/VAME/CHUM	mountain hemlock-shasta red fir/thin-leaved huckleberry/common prince's-pine