

Ecological site group EX044AESG03
**Frigid, Udic, Loamy, Foothills and Drainageways (Western Hemlock -
Western Redcedar Cool Moist Herb) Tsuga heterophylla / Clintonia uniflora
, Tsuga heterophylla / Asarum caudatum**

Last updated: 07/23/2020
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Key Characteristics

None specified

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Physiography

Physiographic Features

This ecological site group occurs mainly on forested glaciated hill or mountain back slopes, foot slopes and toe slopes. It is found between 785 feet and 5,590 feet in elevation on northwest to southeast aspects. Slopes generally range from 15 to 40 percent, but can be found on slopes up to 80 percent.

Landscapes: Mountains, Foothills, Valleys

Landform: Mountain slopes, Hill slopes, Outwash terraces, Lake Terraces, Escarpments, Flood plains
Elevation

Total range: 240 – 1,705m
(785to 5,590 feet)

Central tendency: 780-1155m
(2,560 to 3,790 feet)

Slope (percent):
Total range: 0-80
Central tendency: 15-40

Water Table Depth:
46 to >200 cm
(18 to >80 inches)

Flooding:
Frequency: None
Duration: None

Ponding:
Depth (inches): 0
Frequency: none Duration: None

Aspect:
Range: 235-20-170
Central tendency: 275-20-85

Climate

Climatic Features

During the spring and summer, a circulation of air around a high-pressure center brings a prevailing westerly and northwesterly flow of comparatively dry, cool and stable air into the region. As the air moves inland, it becomes warmer and drier which results in a dry season beginning in the late spring and reaching a peak in mid-summer. In the fall and winter, a circulation of air around two pressure centers over the ocean brings a prevailing southwesterly and westerly flow of air into the Pacific Northwest. This air from over the ocean is moist and near the temperature of the water. Condensation occurs as the air moves inland over the cooler land and rises along the windward slopes of the mountains or highlands. This results in a wet season beginning in October, reaching a peak in winter, then gradually decreasing in the spring.

Temperature

The pattern of average annual temperatures indicates the effect both of latitude and altitude. In general, it can be said that monthly means are 32° F or lower at stations above 5,000 feet from November through March; between 4,000 and 5,000 feet, November through February; 3,000 to 4,000 feet, December through February; and 2,000 to 3,000 feet, only one or two months. The diurnal range of temperature is, of course, most extreme in high valleys and in the semiarid plains. The magnitude of diurnal range varies with the season, being lowest in winter when cloudiness is much more prevalent, and greatest in the warmer part of the year. In summer, periods of extreme heat extending beyond a week are quite rare, and the same can be said of periods of extremely low temperatures in winter. In both cases the normal progress of weather systems across the region usually results in a change at rather frequent intervals.

Precipitation

To a large extent the source of moisture for precipitation regionally is the Pacific Ocean. In summer there are some exceptions to this when moisture-laden air is brought in from the south at high levels to produce thunderstorm activity. Seasonal distribution of precipitation shows a very marked pattern of winter maximum and midsummer minimum.

Snowfall

Snowfall distribution is affected both by availability of moisture and by elevation. Annual snowfall totals have reached nearly 500 inches. The major mountain ranges accumulate a deep snow cover during the winter months, and the release of water from the melting snowpack in late spring is a primary source of instream flows.

(from WRCC: Climate of Idaho)

Mean Annual precipitation

Total Range: 350-1420 mm

(14 to 56 inches)

Central tendency: 670-965 mm

(26 to 38 inches)

MAAT

Total Range 3.1-9.5 C

(38 to 49 F)

Central tendency: 5.6-7.2 C

(42 to 45 F)

Frost free period (days)

Total range: 80-135

Central tendency: 100-115

Climate Stations:

WA: GERMOME, NORTHPORT, SULLIVAN LAKE RS

ID: BENTON DAM, BENTON SPRING, BISMARK RS, BONNERS FERRY 1 SW, BONNERS FERRY BRG, CABINET GORGE, CLARK FORK 1 ENE, PORTHILL, PRIEST RIVER, PRIEST RIVER 2, PRIEST RIVER EXP STN, SANDPOINT KSPT, SANDPOINT EXP STN

Soil features

Representative Soil Features

This ecological site group is associated with several soil components. The soil components can be grouped into ten most common soil great groups: Udivitrands, Haploxerepts, Eutrudepts, Dystryudepts, Dystroxerepts, Hapludalfs, Fragixeralfs, Dystrochrepts, Dystrudepts, and Udifluvents.. Soils in this ecologic site are very deep to moderately deep with available water holding capacities mostly equal to or greater than 6.7 cm (in 100cm). Most of these soils have developed in till, outwash colluvium and residuum from various rock types that has strong influence from Mazama tephra. The soils are mostly well-drained or moderately well drained. Surface textures are dominantly ashy silt loam, or ashy loam.

Soil series occurring in this ES group:

Ahren, Aits, Bane, Berray, Bonner, Boulder creek, Boundary, Brodeer, Cabinet, Caribouridge, Courvash, Crash, Dewberry, Dodgecreek, Elmira variant, Fernline, Frycanyon, Garveson, Glaciercreek, Hartill, Highfalls, Hubub, Huckle, Hugus, Hun, Ibex, Jaypeak, Jeru, Keeler, Klootch, Kruse variant, Leadpoint, Mission, Moscow, Moso, Myrtle creek, Noxlin, Ojibway, Pearsoncreek, Pend Oreille, Porthill, Priestlake, Rathdrum, Redlock, Rubson, Smackout, Smackout variant, Stevie, Tamarack, Threemile, Typic Udifluvents, Vassar, Vay, Waits, Zee, Zioncreek.

Parent Materials:

Kind: Volcanic ash, Till, Outwash, alluvium, Residuum, and Colluvium

Origin: Granite, Metamorphics, and Metasedimentary rock

Surface Texture: (<2mm fraction)

(1) Ashy Silt Loam

(2) Ashy Loam

Subsurface Texture Groups: Loamy, Sandy

Surface Fragments

Vegetation dynamics

Ecological Dynamics of the Site

This site occurs most commonly on north slopes, cool benches, and dissected drainages in Northern Idaho and NE Washington. The bulk of this site occurs in The Selkirk Mts. LRU in Northern Idaho and extends west to the NE corner of Washington. The depth of volcanic ash in the soil along with high precipitation makes this site highly productive. It is recognized by USFS Forest Habitat Types of Northern Idaho as the Western hemlock / Queenscup bead lily and Western hemlock / Wild Ginger habitat types. The WH/beadlilly habitat type is the most prolific and occurs on all aspects. The wild ginger type occurs on moister landscapes, usually on toe slopes or drainage areas. The cooler portions of this site occur at higher elevation lack western redcedar and have rusty menziesia as key shrub indicator.

This site has the highest ecological dynamics depending on type and degree of disturbance, and tree species seed source. Western hemlock and western redcedar will eventually dominate the overstory without major fire disturbance. Grand fir, Douglas-fir, western white pine, and western larch could be present in varying amounts. Understory reproduction and 2nd level overstory will be dominated by western hemlock and western redcedar due to their high degree of shade tolerance. There will be a large component of downed wood caused by windthrow, seral species die-out, and insect and disease mortality. Paper birch is a key deciduous tree species in this hemlock-cedar ecological site. It can be a prominent understory component in early to mature stands and eventually dies out in the late climax forest.

Fire frequency in these stands occurs in long intervals of 150+ years. Due to the large volume of wood, stand replacing fires were the norm leaving the site naturally reforested by western white pine. After the white pine blister rust epidemic western larch, Douglas-fir, and in drier areas ponderosa pine gets established depending on seed source and competing shrub species. Grand fir, western hemlock, and western redcedar will also reestablish on the site through time. Lodgepole pine can be present and prevalent on sites after fire.

Ceanothus, alder species, and Douglas maple can reestablish quickly on these burnt sites slowing down natural reforestation. Reoccurring severe fires causing soil degradation can keep the site in a shrub dominated condition for long periods. Western larch is not as hardy as western white pine in competing with the brush species through natural regeneration. Larch needs to immediately establish on bare soil without much competition. The loss of the dominant white pine component again has caused a higher occurrence of Douglas-fir, grand fir, western hemlock, and western redcedar in developing stands.

The understory vegetation can be very rich in areas receiving enough sunlight. Key species include Queenscup bead lily, hooker fairybells, starry Solomon seal, wintergreen, huckleberry spp., and sword fern.

Major Land Resource Area

MLRA 044A

Northern Rocky Mountain Valleys

Subclasses

- F044AY504WA–Frigid, Udic, Loamy Foothills and Drainageways, high water table (Western Hemlock/Moist Forbes) *Tsuga heterophylla* / *Clintonia uniflora* , *Tsuga heterophylla* / *Asarum caudatum*
- F044AY505WA–Frigid, Udic, Sandy Hill slopes and Outwash terraces (Western Hemlock/Moist Forbes) *Tsuga heterophylla* / *Clintonia uniflora* , *Tsuga heterophylla* / *Asarum caudatum*

Stage

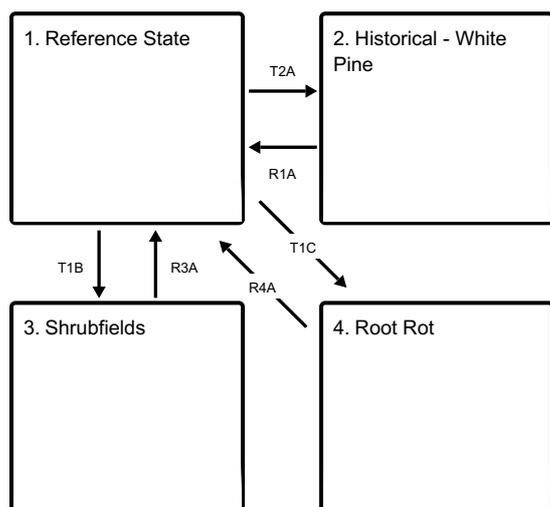
Provisional

Contributors

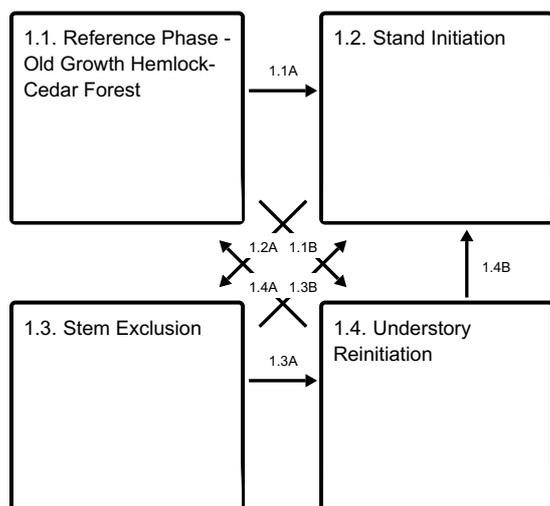
Gary Kuhn

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1

Reference State

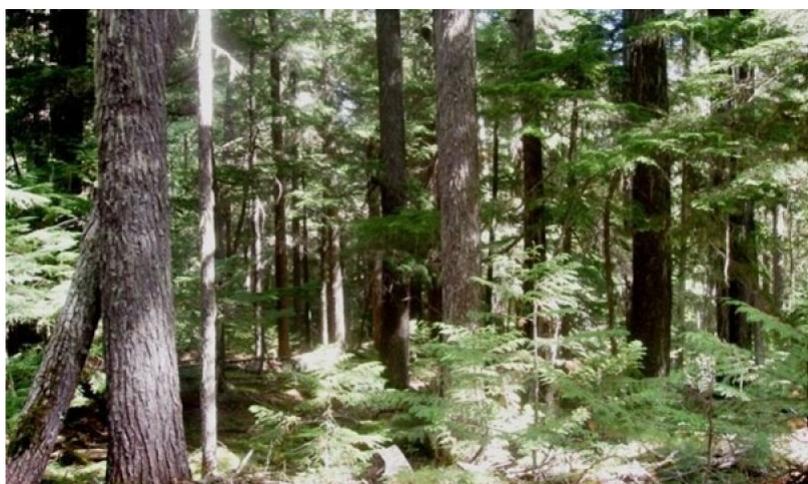
This state results in an old growth western hemlock and western redcedar forest. Fire return intervals are far apart due to its moist environment. It is highly dynamic in its seral stages after major disturbance with many tree species capable of establishing and growing to mature age. Western white pine used to be a dominant tree in this state establishing after a severe fire and be a major overstory component in the mature to old growth phase, however, the white pine blister rust epidemic in the 1930s reduced it to a minor component in stand composition of current forests. White pine stabilized the site for long periods due to its disease and insect resistance. Currently Western Larch, Douglas-fir, Grand fir, cedar, and hemlock have taken its place in early stand establishment through the mature and old growth phases. This has led to more root rot in mature stands with Douglas-fir, Grand fir, cedar, and hemlock. Eventually, western hemlock and western redcedar dominate regeneration in mature stands and a hemlock-cedar forest develops without major disturbance. This state can be floristically rich with shrubs and herbs when canopy gaps are created. Major shrub species include big huckleberry, twinflower, pachistima, prince's pine, pyrola, honeysuckle, and rose. Herbs include queencup beadlily, violet, western rattlesnake plantain, wild ginger, sword fern, Hooker fairybells, and twisted stalk. A key understory tree species in this ecological site is paper birch. It is usually more prominent early to middle seral stages and notable snags present in mature to old growth phases. Another key seral species descriptive of this ecological site is Sitka alder. It is present during the stand initiation phase located in moisture receiving areas. Redstem and snowbrush ceanothus species can be prominent in fire disturbed areas. Black cottonwood is also prominent seral species and usually died out by the mature forest phase.

Dominant plant species

- western hemlock (*Tsuga heterophylla*), tree
- western redcedar (*Thuja plicata*), tree
- grand fir (*Abies grandis*), tree
- Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*), tree
- western larch (*Larix occidentalis*), tree
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- longtube twinflower (*Linnaea borealis* ssp. *longiflora*), shrub
- Oregon boxleaf (*Paxistima myrsinites*), shrub
- pipsissewa (*Chimaphila umbellata*), shrub
- wintergreen (*Pyrola*), shrub
- common lomatium (*Lomatium utriculatum*), shrub
- dwarf rose (*Rosa gymnocarpa*), shrub

Community 1.1

Reference Phase - Old Growth Hemlock-Cedar Forest



Old growth stands of western hemlock and western redcedar 200+ years old. Grand fir, Douglas-fir, and western larch may be present in the overstory. Second level overstory mostly western hemlock, western redcedar. . Natural regeneration mostly western hemlock and some western redcedar, some grand fir, Douglas-fir, and white pine possible. Canopy openings from windthrow or root rot advance understory forb/shrub vegetation, and hemlock and cedar regeneration. Large volume of down and dead wood. Without major disturbance this community phase will

perpetuate itself with hemlock and cedar. Forest Overstory: Old growth stand dynamics with overstory of WH, and WRC. Some DF, GF, and WL may be present. Mid-level canopy dominated by WH and WRC. Large snags present. Understory vegetation increases in canopy openings due to root rot or wind fall. Forest Overstory Characterization Summary (tree, tree fern and vine species > 13 feet in height) Forest Canopy (all species > 13' height) Low Canopy Cover % 75 RV Canopy Cover % 85 High Canopy Cover % 95 Overstory - Plant Type: Tree Name Symbol Nativity Cover grand fir *Abies grandis* ABGR N western larch *Larix occidentalis* LAOC N Rocky Mountain Douglas fir *Pseudotsuga menziesii* var. *glauca* PSMEG N western redcedar *Thuja plicata* THPL N western hemlock *Tsuga heterophylla* TSHE N Forest Understory: Forest regeneration dominated by WH and WRC. Forb and shrub component with good ground cover in areas of canopy openings from wind fall or root rot. Forest Understory Canopy Cover Summary (all species < 13 feet in height) Understory - Plant Type: Forb/Herb Name Symbol Nativity pipsissewa *Chimaphila umbellata* CHUM N bride's bonnet *Clintonia uniflora* CLUN2 N western rattlesnake plantain *Goodyera oblongifolia* GOOB2 N liverleaf wintergreen *Pyrola asarifolia* PYAS N sidebells wintergreen *Pyrola secunda*(syn) PYSE N Understory - Plant Type: Shrub/Subshrub Name Symbol Nativity twinflower *Linnaea borealis* LIBO3 N Utah honeysuckle *Lonicera utahensis* LOU2 N myrtle pachistima *Paxistima myrsinites* PAMY N thimbleberry *Rubus parviflorus* RUPA N thinleaf huckleberry *Vaccinium membranaceum* VAME N Understory - Plant Type: Tree Name Symbol Nativity Cover grand fir *Abies grandis* ABGR N western white pine *Pinus monticola* PIMO3 N western redcedar *Thuja plicata* THPL N western hemlock *Tsuga heterophylla* TSHE N

Community 1.2 Stand Initiation

Stand replacing fire creates seedbed for natural regeneration. Natural regeneration species composition depends on available seed source and level of disturbance. Western white pine can no longer dominate natural regeneration due to blister rust. Western larch has taken over to a lesser degree and can dominate natural regeneration after hot burns exposing mineral soil and good seed dispersal years. Otherwise mixed species natural regeneration will occur with the whole tree species mix of this ecological site occurring. Severe disturbance can advance shrub competition from ceanothus species, alder, willow, snowberry, and ribes spp. which deter natural regeneration. Paper birch and black cottonwood can also be present in this early stage.

Community 1.3 Stem Exclusion



Dense pole to early mature stands 20 to 100 years old. Stand composition depending on natural regeneration. Stands could be consist of mainly western hemlock and western redcedar, solid stands of western larch, or a mix of western larch, western white pine, Douglas-fir, and grand fir. Western hemlock and western redcedar may be present in understory of these mixed stands. Due to high moisture and ash depth in soils sites can carry high stand densities. Understory vegetation is depauperate.

Community 1.4 Understory Reinitiation



Canopy gaps for overstory mortality allow understory shrubs and herbs to increase. Stand competition, Armillaria root rot, bark beetles, and defoliators causes mortality in hemlock, grand fir and Douglas-fir. Western redcedar and western hemlock dominate regeneration. Overstory dominated by cedar and hemlock, however, western larch, Douglas-fir, and grand fir can compose of good percentage of the overstory depending on initial stand establishment. Snags and downed wood scattered throughout stand.

Pathway 1.1A
Community 1.1 to 1.2

Stand Replacing Fire. Succession of shrubs and tree regeneration following fire. Tree species regeneration dependent on seed source. This pathway moves 1.1 (Old Growth) to Plant Community phase 1.4 (Stand Initiation).

Pathway 1.1B
Community 1.1 to 1.4



Reference Phase - Old Growth
 Hemlock-Cedar Forest



Understory Reinitiation

Overstory mortality form root rot, insects, and windthrow create canopy gaps for understory plants to release moving Plant Community to 1.4. Mixed severity fires could also create gaps for understory establishment, however, occur infrequently.

Pathway 1.2A
Community 1.2 to 1.3

Time. Tree regeneration grows into dense pole stands excluding understory moving Plant Community 1.2 Stand Initiation to 1.3 Stem Exclusion.

Pathway 1.3B
Community 1.3 to 1.2

Stand replacing fire

Pathway 1.3A
Community 1.3 to 1.4



Stem Exclusion



Understory Reinitiation

Time. Crown competition from dense pole to early mature stands. Root rot, bug kill, and wind fall create canopy gaps. This pathway moves 1.3 Stem Exclusion to Plant Community 1.4 Understory Initiation.

Pathway 1.4A Community 1.4 to 1.1



Understory Reinitiation



Reference Phase - Old Growth
Hemlock-Cedar Forest

Pathway 1.4B Community 1.4 to 1.2

Stand replacing fire

State 2 Historical - White Pine



Before the 1910 outbreak of western white pine blister rust N. Idaho and parts of NE WA were covered with white pine stands from pole to old growth stages. Severe fires over large acreages allowed white pine to establish and dominate the area. Mature to old growth stands of pine stabilized the area due to its root rot and insect resistance. A mixed understory of shrubs and forbs existed due to sufficient light coming through the white pine canopy. Cedar and hemlock regeneration would also have been present. Large fires again would allow the white pine to establish and the cycle would start again. The blister rust epidemic basically wiped out the white pine and eliminated this stable forest cycle. In its place Douglas-fir, grand fir, western larch, cedar, and hemlock increased in abundance through the growth stages. More root rot and insect mortality are now present in the stands. In addition, more cedar-hemlock stands reach old stages without a white pine component. To address the white pine blister rust problem cooperative forestry organizations developed a blister rust resistant white pine that has been planted on hemlock and cedar sites. White pine can now be seen growing on these harvested areas.

Dominant plant species

- western white pine (*Pinus monticola*), tree

State 3 Shrubfields

Multiple severe fires keep site in a shrub field state.

Dominant plant species

- redstem ceanothus (*Ceanothus sanguineus*), shrub
- snowbrush ceanothus (*Ceanothus velutinus*), shrub

State 4 Root Rot



With the increased abundance of Douglas-fir, grand fir, and hemlock in stand development since the white pine blister rust epidemic *Armillaria* root rot has increased creating pockets to large areas of shrub/small deciduous trees. These root rot areas can exist for long periods until resistant species establish. In areas with metasedimentary parent material this situation is amplified. Species resistant to *Armillaria* include western larch, white pine, and western redcedar (after seedling stage).

Transition T2A State 1 to 2

Loss of white pine dominance in seral and late seral overstory plant community due to white pine blister rust. Crossed a threshold where shade tolerant cedar and hemlock took over mature to old growth forests.

Transition T1B State 1 to 3

Severe fire causing soil degradation or reoccurring fires in stand initiation phase keep state in a shrub state.

Transition T1C State 1 to 4

Root rot, mainly *Armillaria*, killing hemlock, Douglas-fir, and grand fir creates small to large areas dominated by shrubs or small deciduous trees.

Restoration pathway R1A State 2 to 1

To return to the historical state of white pine dominant late seral forests landscape level planting of blister rust resistant white pine after large stand replacing fires or clearcut regeneration harvests.

Restoration pathway R3A

State 3 to 1

Site by site analysis to determine feasibility of tree planting.

Restoration pathway R4A

State 4 to 1

Where feasible, planting blister rust resistant white pine, western larch, and western redcedar in root rot pockets.

Citations