

Western hemlock/Oregon oxalis-NWO Cascades

Tsuga heterophylla/*Oxalis oregana*-NWO Cascades

TSHE/OXOR-NWO Cascades

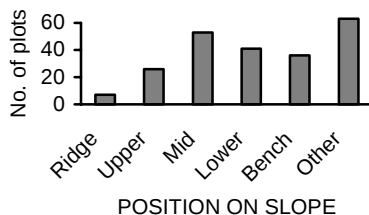
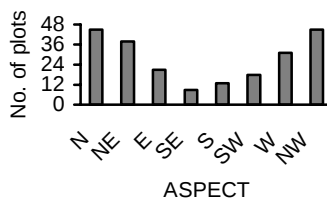
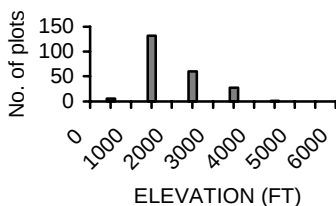
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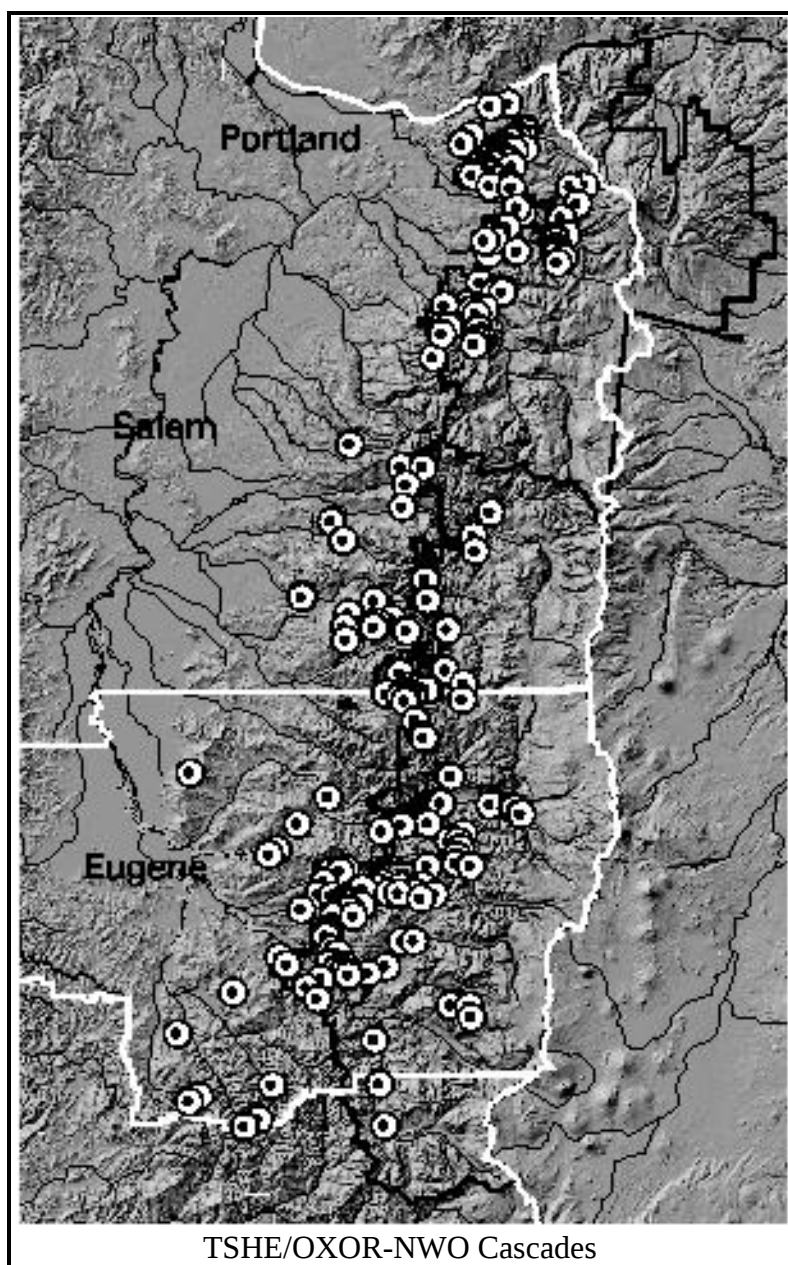
N=226 (MTH=80; WILL=104; EBLM=15; SBLM=27)

Environment and Distribution

This plant association occurs throughout the warm moist western portions of the Old Cascades. This is the most common association in the Mt. Hood sample. Plots are on flat to steep slopes averaging 29% (range 0-90%) on toe-slopes, benches and, lower to mid-slope positions. Most plots are on northerly aspects. This association usually occurs at relatively low elevations, with elevation of sample plots averaging 1,917 feet (range 580-4,000 ft.).

Soils are fertile, deep, and well watered.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/OXOR-NWO Cascades association is dominated by Douglas-fir, often with a large component of western hemlock and some western redcedar and/or big-leaf maple. Canopy closure of mature trees averages 75%. Cover of understory trees averages 6%.

This association has a relatively sparse shrub layer, with tall shrubs averaging 16% cover and low shrubs averaging 9% cover. The shrub layer is dominated by vine maple. The lush herb layer is dominated by Oregon oxalis and sword fern. Herb cover averages 65% cover. Moss cover averages 18%.

TSHE/OXOR-NWO Cascades stands average 161 years old and range from 40 to 298 years old. Stands are well stocked, with live basal area averaging 293 ft²/acre.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	98	41
Western hemlock	TSHE	96	35
Western redcedar	THPL	57	17
Big-leaf maple	ACMA3	45	13
Understory trees			
Western hemlock	TSHE	86	6
Western redcedar	THPL	35	2
Shrubs			
Red huckleberry	VAPA	87	3
Dwarf Oregon grape	MANE2	80	6
Vine maple	ACCI	78	17
Trailing blackberry	RUUR	58	2
Salal	GASH	50	5
Herbaceous			
Oregon oxalis	OXOR	100	46
Sword fern	POMU	99	27
Pacific trillium	TROV2	69	1
Sweetscented bedstraw	GATR3	56	1
Inside-out-flower	VAHE	50	3
Hooker fairybells	DIHO3	49	1
Coolwort foamflower	TITR	46	2

Plots average 25 vascular plant species, about the mean for the western hemlock series and for other forested series in western Oregon.

Management Implications

Douglas-fir grows well with an average site index of 158. Regeneration should be easy. Red alder and vine maple competition can develop on some sites. Mountain beaver may be present.

Soils are moist most of the growing season and subject to compaction. Soils are generally resistant to impacts from moderately hot slash fires.

	Site Index ABGR *	Site Index PSME	Site Index TSHE
Mean	98	158	140
SE	4	1	4
Range	90-110	75-217	60-269
Age	123	194	113
n	6	348	78

* SI for ABGR was calculated using a base-age of 50. PSME and TSHE were calculated using base 100.

Western hemlock/sword fern-NWO Cascades

Tsuga heterophylla/*Polystichum munitum*-NWO Cascades

TSHE/POMU-NWO Cascades

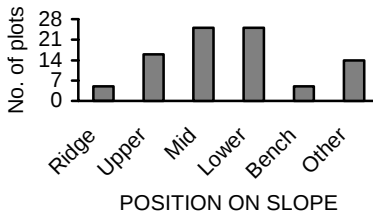
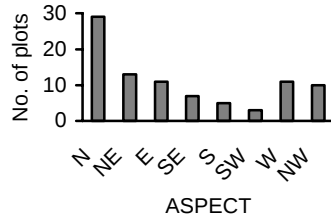
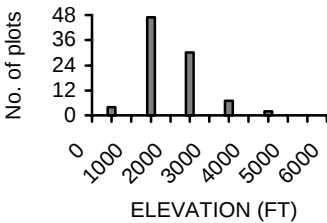
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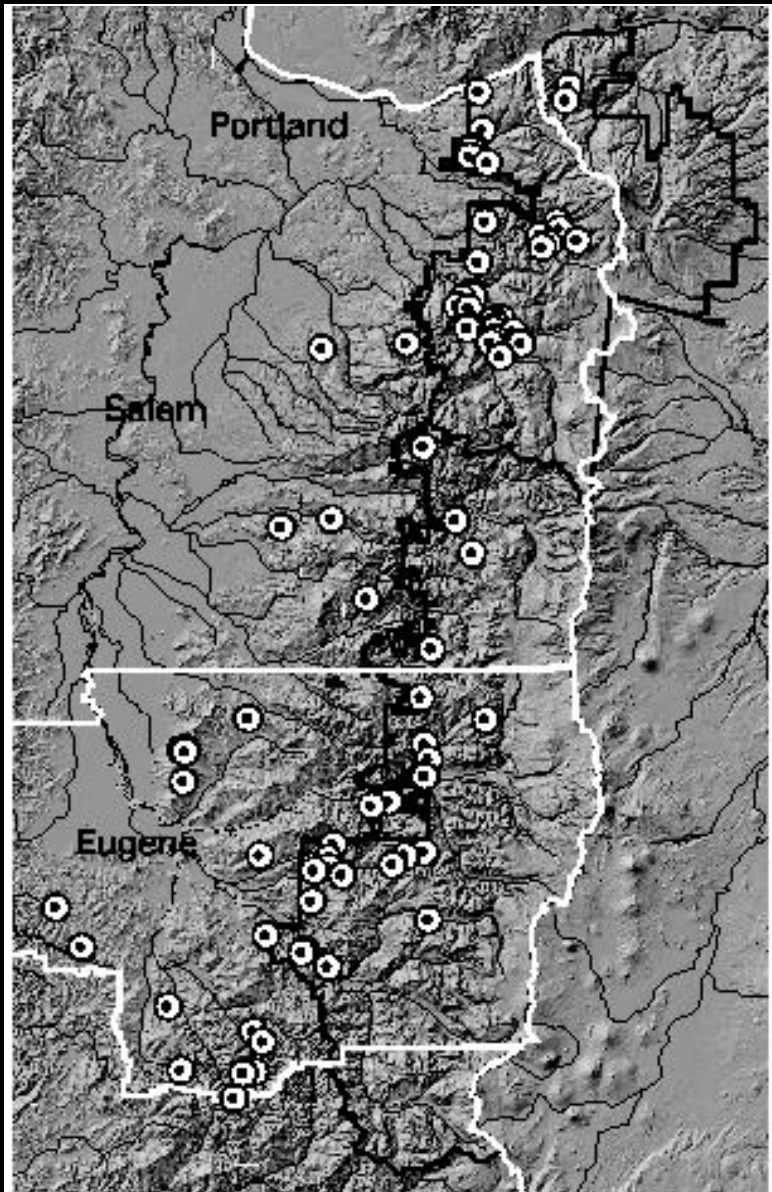
N=90 (MTH=34; WILL=29; EBLM=22; SBLM=5)

Environment and Distribution

This plant association occurs throughout the foothills and Old Cascades. Plots are on flat to steep slopes averaging 49% (range 0-100%) on lower to upper-slope positions. Most plots are on northerly aspects. Elevation of sample plots average 2,036 feet (range 650-4,140 ft.).

Soils are mesic and well drained. Soils are relatively deep and fertile and often have high coarse fragment content.





TSHE/POMU-NWO Cascades

Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/POMU-NWO Cascades association is dominated by Douglas-fir, often with a large component of western hemlock and some western redcedar and/or big-leaf maple.

Canopy closure of mature trees averages 80%. Cover of understory trees averages 5%.

This association has a sparse shrub layer with tall shrubs averaging 6% cover and low shrubs averaging 6% cover. The herb layer is dominated by sword fern. Herb cover averages 33% cover. Moss cover averages 33%.

TSHE/POMU-NWO Cascades plots average 165 years old and range from 52 to 250 years old. Stands are well stocked, with live basal area averaging 280 ft²/acre.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	97	37
Western hemlock	TSHE	93	43
Western redcedar	THPL	69	17
Big-leaf maple	ACMA3	51	13
Understory trees			
Western hemlock	TSHE	82	5
Western redcedar	THPL	47	3
Shrubs			
Dwarf Oregon grape	MANE2	86	4
Red huckleberry	VAPA	73	2
Vine maple	ACCI	66	6
Trailing blackberry	RUUR	53	1
Salal	GASH	50	2
Herbaceous			
Sword fern	POMU	100	28
Pacific trillium	TROV2	72	1
Redwoods violet	VISE3	61	2
Sweetscented bedstraw	GATR3	47	1
Inside-out-flower	VAHE	40	1

Plots average 24 vascular plant species, which is near the average for the western hemlock series.

Management Implications

Douglas-fir grows relatively well with an average site index of 141. Regeneration should be easy. Moisture is usually available through the growing season. Red alder, big-leaf maple, and vine maple competition can develop on some sites. Excessive soil compaction or mass movement should be avoided. Soils are generally resistant to impacts from moderately hot slash fires.

Due to rapid tree growth, late successional structural characteristics can be achieved in a relatively short time period if large dead wood accumulates to acceptable levels.

	Site Index PSME	Site Index TSHE
Mean	141	131
SE	2	3
Range	74-210	86-166
Age	191	112
n	161	38

Western hemlock/rhododendron-dwarf Oregon grape-NWO Cascades

Tsuga heterophylla/Rhododendron macrophyllum-Mahonia nervosa-NWO Cascades

TSHE/RHMA3-MANE2-NWO Cascades

(old code: TSHE/RHMA-BENE)

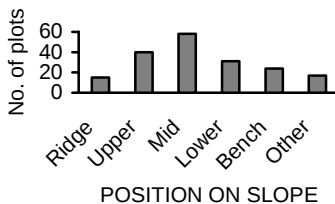
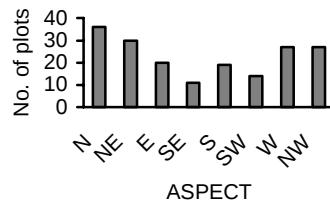
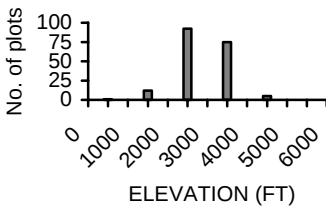
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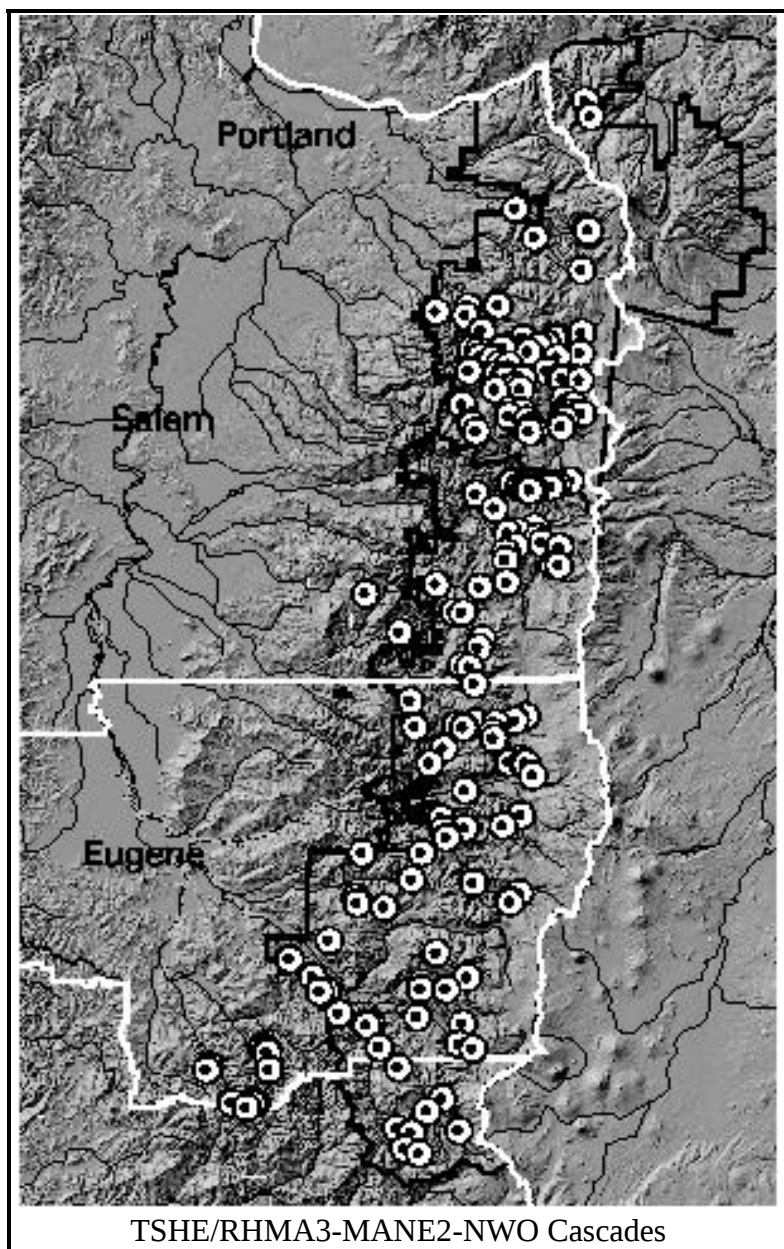
N=185 (MTH=61; WILL=111; EBLM=10; SBLM=3)

Environment and Distribution

This common plant association occurs throughout the study area, and is most common in the Old Cascades. This and other rhododendron plant associations are nearly absent in the highest precipitation area in the northwestern Mt. Hood N.F. Plots are on flat to steep slopes averaging 34% (range 0-82%) primarily on lower to upper-slope positions. Aspects vary, but cool northerly aspects are typical. Elevation of sample plots average 2,883 feet (range 1,500-4,500 ft.).

Soils tend to be shallow, with high coarse fragment content, and are moderately droughty.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3-MANE2-NWO Cascades association is dominated by Douglas-fir, often with a large component of western hemlock and some western redcedar. Canopy closure of mature trees averages 78%. Cover of understory trees averages 8%.

This association has a relatively well-developed shrub layer with tall shrubs averaging 33% cover and low shrubs averaging 22% cover. The shrub layer is dominated by rhododendron and dwarf Oregon grape, and often has significant amounts of vine maple. The presence of rhododendron can indicate nitrogen-poor soils. The herb layer is sparse, with herb cover averaging 14% cover. Moss cover averages 42%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	45
Western hemlock	TSHE	98	39
Western redcedar	THPL	61	15
Understory trees			
Western hemlock	TSHE	93	6
Western redcedar	THPL	41	3
Shrubs			
Dwarf Oregon grape	MANE2	100	17
Rhododendron	RHMA3	100	27
Vine maple	ACCI	76	12
Red huckleberry	VAPA	74	3
Prince's pine	CHUM	68	3
Little prince's pine	CHME	57	1
Trailing blackberry	RUUR	54	1
Salal	GASH	49	3
Herbaceous			
Twinflower	LIBO3	84	7
Redwoods violet	VISE3	71	2
Rattlesnake plantain	GOOB2	66	1
Pacific trillium	TROV2	62	1
Sword fern	POMU	54	4
Vanilla leaf	ACTR	47	2

TSHE/RHMA3-MANE2-NWO Cascades plots average 207 years old (range 50-355 years). Stands are densely stocked, with live basal area averaging 350 ft²/acre.

Plots average 24 vascular plant species, which is near the average for the western hemlock series.

Management Implications

Douglas-fir grows relatively slowly with an average site index of 120. Site productivity is low due to low soil nitrogen, and shallow, rocky soils. Shrub competition can be a problem for regeneration. Sites that have a dense shrub cover prior to logging may develop a heavy rhododendron component. Ceanothus competition may be serious after slash burning unless tree seedlings are established quickly. On steep, south-facing slopes soils may be droughty. On these sites, shade should enhance Douglas-fir seedling survival.

	Site Index PSME	Site Index TSHE
Mean	120	121
SE	2	3
Range	60-331	75-180
Age	231	193
n	268	44

Soils may be rocky and hard to plant. Soils may also be sensitive to moderately hot slash fires. Dry ravel and nitrogen loss may occur on severely burned sites.

Western hemlock/rhododendron-salal-NWO Cascades

Tsuga heterophylla/*Rhododendron macrophyllum*-*Gaultheria shallon*-NWO Cascades

TSHE/RHMA3-GASH-NWO Cascades

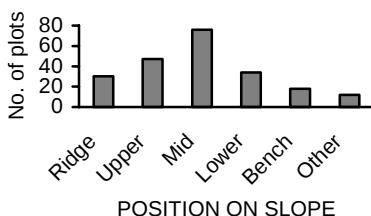
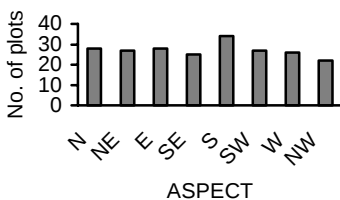
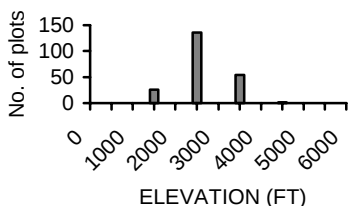
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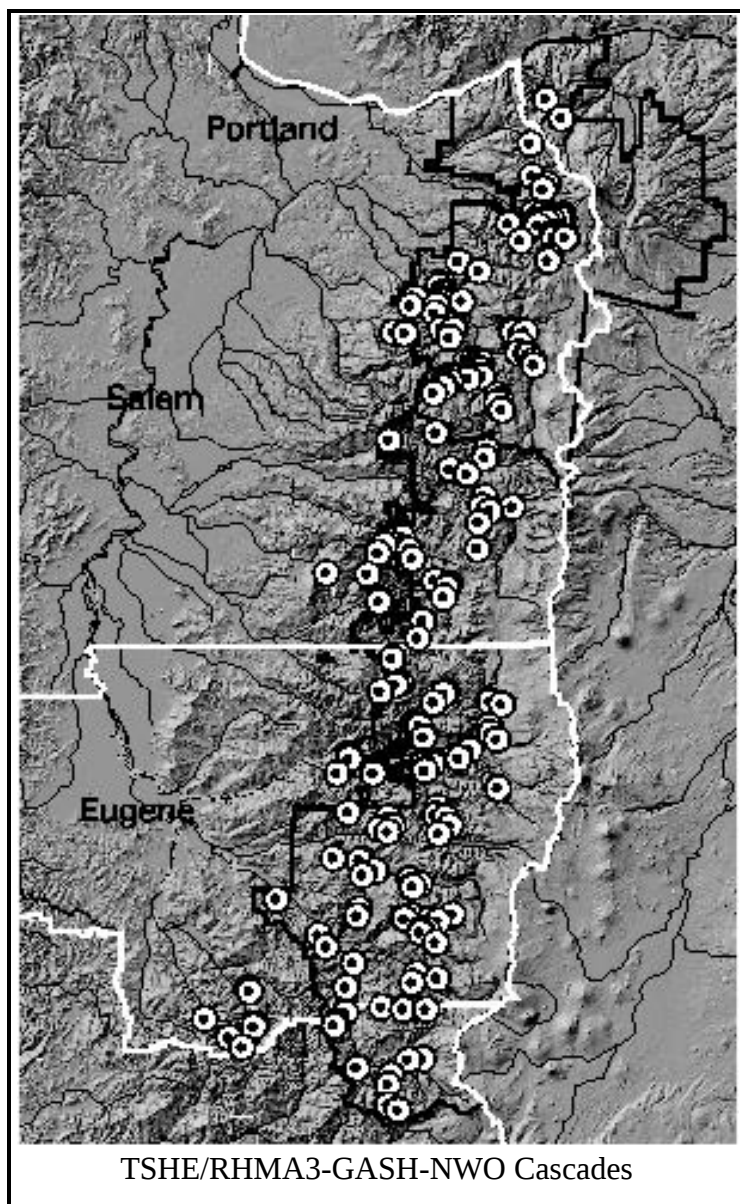
N=217 (MTH=74; WILL=122; EBLM=11; SBLM=10)

Environment and Distribution

This common plant association occurs throughout the Old Cascades. It is the most numerous in the Willamette N.F. sample, along with TSHE/MANE2-GASH-NWO Cascades. This and other rhododendron plant associations are nearly absent in the highest precipitation area in the northwestern Mt. Hood N.F. Plots are on flat to steep slopes averaging 36% (range 0-90%), mostly on middle to upper-slope positions. Plots occur on all aspects. Elevation averages 2,598 feet (range 1,050-4,400 ft.).

Soils tend to be shallow, with high coarse fragment content, or are coarse textured. Soils are often infertile and excessively drained.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3-GASH-NWO Cascades association is dominated by Douglas-fir, often with a large component of western hemlock and some western redcedar. Canopy closure of mature trees on sample plots averages 73%. Cover of understory trees averages 6%.

This association has a well-developed shrub layer, with tall shrubs averaging 47% cover and low shrubs averaging 48% cover. The shrub layer is dominated by rhododendron and salal, often with significant amounts of vine maple and dwarf Oregon grape. The presence of rhododendron can indicate nitrogen-poor soils.

The herb layer is sparse, with herb cover averaging 11% cover. Moss cover averages 39%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	99	44
Western hemlock	TSHE	90	29
Western redcedar	THPL	62	16
Understory trees			
Western hemlock	TSHE	88	6
Golden chinquapin	CHCH7	43	3
Western redcedar	THPL	41	4
Shrubs			
Salal	GASH	100	35
Rhododendron	RHMA3	100	38
Dwarf Oregon grape	MANE2	94	15
Red huckleberry	VAPA	76	3
Vine maple	ACCI	67	12
Trailing blackberry	RUUR	63	1
Prince's pine	CHUM	55	2
Herbaceous			
Twinflower	LIBO3	78	7
Redwoods violet	WISE3	61	2
Rattlesnake plantain	GOOB2	58	1
Sword fern	POMU	47	3

TSHE/RHMA3-GASH-NWO Cascades plots average 193 years old (range 53-342 years). Stands are well stocked, with live basal area averaging 280 ft²/acre.

Plots average 24 vascular plant species, slightly below average for the western hemlock series and for other forested series in western Oregon.

Management Implications

Douglas-fir grows slowly with an average site index of 117. Tree growth rates are slightly lower than the TSHE/RHMA3-MANE2-NWO Cascades association. Site productivity is low due to low soil nitrogen, and shallow, rocky soils. Early and substantial summer drought is common. Shade should enhance Douglas-fir seedling survival. Sugar pine grows better than Douglas-fir on many sites.

Shrub competition can be a problem for regeneration. Sites that have a dense shrub cover prior to logging may develop a heavy rhododendron component unless controlled. Ceanothus competition may be serious after slash burning unless tree seedlings are established quickly. Soils may be stony and hard to plant. Soils may be sensitive to moderately hot slash fires.

	Site Index PSME	Site Index TSHE
Mean	117	122
SE	1	4
Range	50-210	67-180
Age	205	183
n	359	9

**Western hemlock/rhododendron-Alaska
huckleberry/bunchberry dogwood**

*Tsuga heterophylla/Rhododendron macrophyllum-Vaccinium
alaskaense/Cornus canadensis*

TSHE/RHMA3-VAAL/COCA13

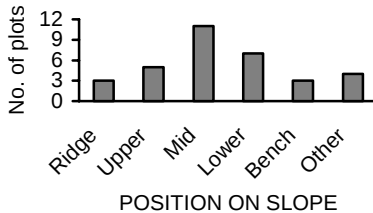
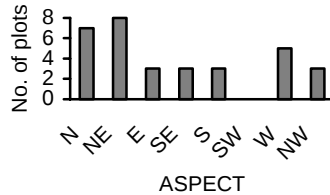
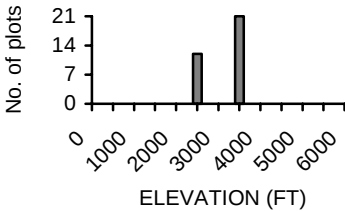
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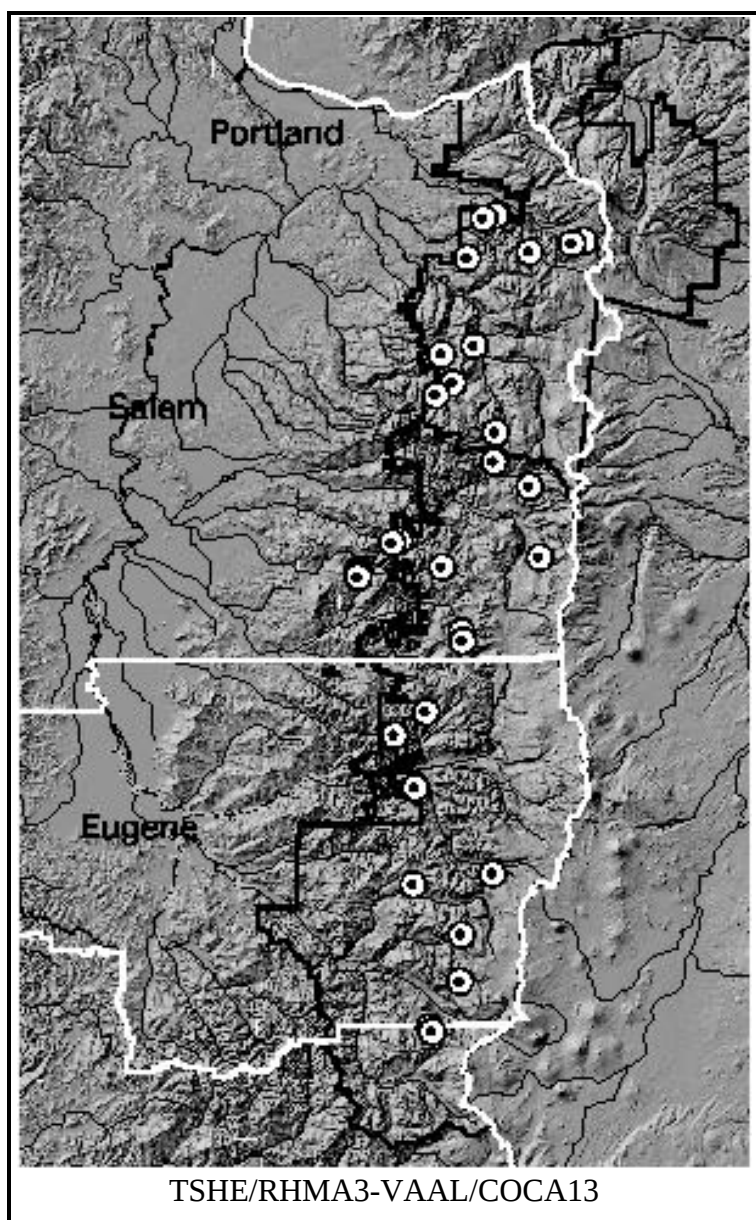
N=33 (MTH=11; WILL=16; SBLM=6)

Environment and Distribution

This plant association occurs throughout the westside Cascades in the transition between the Pacific silver fir and western hemlock vegetation zones. This and other rhododendron plant associations are nearly absent in the highest precipitation area in the northwestern Mt. Hood N.F. Plots are located on flat to steep slopes averaging 29% (range 0-65%) primarily on lower to upper-slope positions. Plots occur primarily on northerly and westerly aspects. Elevation averages 3,101 feet (range 2,300-3,900 ft.).

Soils tend to be deeper and finer textured than in other rhododendron types, though stony, well-drained soils are still common.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3-VAAL/COCA13 association is dominated by Douglas-fir and western hemlock, often with some western redcedar. Canopy closure of mature trees averages 67%. Cover of understory trees averages 10%.

This association has a relatively well-developed shrub layer, with tall shrubs averaging 44% cover and low shrubs averaging 18% cover. The shrub layer is dominated by rhododendron, often with significant amounts of vine maple and Alaska huckleberry. The presence of rhododendron can indicate nitrogen-poor soils.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	34
Western hemlock	TSHE	100	33
Western redcedar	THPL	67	17
Understory trees			
Western hemlock	TSHE	79	8
Pacific silver fir	ABAM	52	1
Western redcedar	THPL	45	4
Pacific yew	TABR2	39	7
Shrubs			
Rhododendron	RHMA3	100	31
Dwarf Oregon grape	MANE2	91	5
Red huckleberry	VAPA	85	4
Alaska huckleberry	VAAL	82	17
Trailing blackberry	RUUR	76	1
Vine maple	ACCI	61	12
Prince's pine	CHUM	58	3
Salal	GASH	45	3
Herbaceous			
Bunchberry dogwood	COCA13	85	7
Twinflower	LIBO3	85	12
Pacific trillium	TROV2	64	1
Redwoods violet	WISE3	61	3
Bear grass	XETE	58	2
Queencup beadlily	CLUN2	55	3
Vanilla leaf	ACTR	52	3
Liverleaf wintergreen	PYAS	52	2

The herb layer is relatively sparse, with herb cover averaging 25% cover. Twinflower and bunchberry dogwood are the most common herbs. Moss cover averages 41%.

TSHE/RHMA3-VAAL/COCA13 stands average 223 years old (range 51-573 years). Stands are well stocked, with live basal area averaging 293 ft²/acre.

Plots average 27 vascular plant species, about the mean for the western hemlock series.

Management Implications

Productivity is below average for the western hemlock series. Douglas-fir site index is 127. These sites are relatively easy to manage. Sites are cool and well watered, so drought stress is low. Winter snow accumulations can be substantial and summer frost may occur. Where this association is found on flat sites, frost-tolerant species such as noble fir or western white pine should be considered along with Douglas-fir in the mix of species to be planted.

Shrub competition may be a problem for regeneration, primarily where rhododendron, huckleberries, or other shrub cover is high prior to logging. Snowbrush may be important on south-facing slopes. Some sites may be difficult to plant due to rocky soils. The stony, nutrient-poor soils may be sensitive to fire impacts.

	Site Index PSME	Site Index TSHE
Mean	127	133
SE	3	13
Range	80-180	100-170
Age	214	368
n	54	5

Western hemlock/rhododendron/twinflower

Tsuga heterophylla/*Rhododendron macrophyllum*/*Linnaea borealis*

TSHE/RHMA3/LIBO3

(old code: TSHE/RHMA/LIBO2)

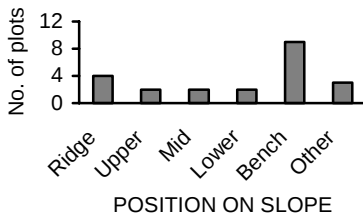
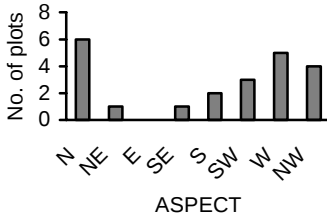
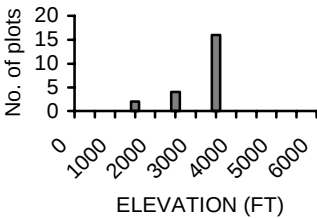
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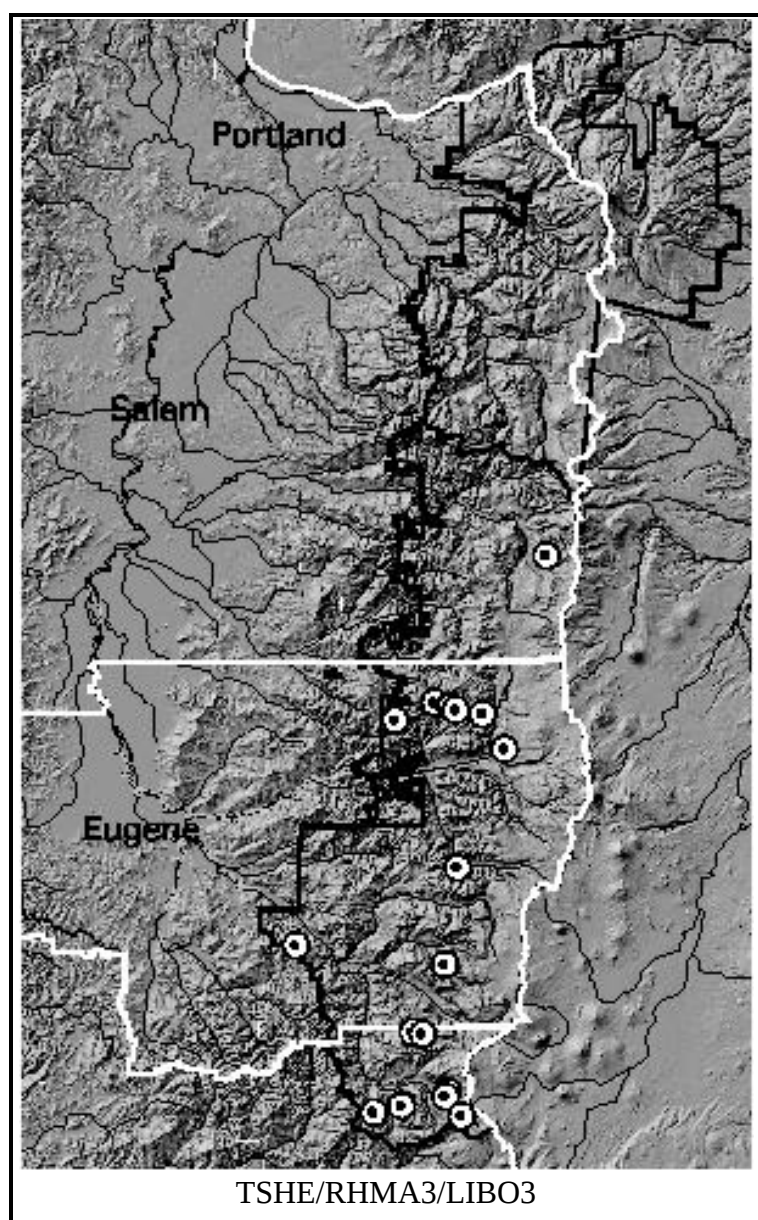
N=22 (WILL=22)

Environment and Distribution

This plant association occurs mainly on the Willamette National Forest often in the transition to the Pacific silver fir zone. Plots are located on gentle to steep slopes averaging 24% (range 5-75%), with benches being the most common slope position. Plots occur primarily on north and westerly aspects. Elevation averages 3,229 feet (range 1,880-3,900 ft.).

Soils tend to be moderately deep to deep, often with high coarse fragment content.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3/LIBO3 association is dominated by Douglas-fir, often with western hemlock and/or western redcedar. Canopy closure of mature trees averages 77%. Cover of understory trees averages 8%.

This association has a moderate shrub layer with tall shrubs averaging 37% cover and low shrubs averaging 6% cover. The shrub layer is dominated by rhododendron, often with significant amounts of vine maple. The herb layer is relatively sparse, with herb cover averaging 23% cover. Twinflower is the most common herb. Moss cover averages 35%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	55
Western hemlock	TSHE	86	23
Western redcedar	THPL	55	24
Understory trees			
Western hemlock	TSHE	86	4
Western redcedar	THPL	50	4
Pacific yew	TABR2	45	2
Shrubs			
Rhododendron	RHMA3	100	28
Dwarf Oregon grape	MANE2	95	3
Prince's pine	CHUM	82	2
Red huckleberry	VAPA	64	2
Trailing blackberry	RUUR	59	2
Vine maple	ACCI	55	12
Little prince's pine	CHME	55	1
Big huckleberry	VAME	50	1
Herbaceous			
Twinflower	LIBO3	100	15
Redwoods violet	VISE3	73	2
Rattlesnake plantain	GOOB2	73	1
Pacific trillium	TROV2	64	1
Three-leaved anemone	ANDE3	55	1
White veined wintergreen	PYPI2	50	1
Sword fern	POMU	45	2
Star-flower	TRLA6	45	1

TSHE/RHMA3/LIBO3 plots average 176 years old (range 73-275 years). Stands are densely stocked, with live basal area averaging 427 ft²/acre.

Plots average 26 vascular plant species, about average for the western hemlock series.

Management Implications

Douglas-fir grows moderately well, with an average site index of 136. Drought develops by late summer in most years. Winter snow accumulations can be substantial and summer frost may occur.

Where this association is found on flat sites, frost-tolerant species such as noble fir or western white pine should be considered along with Douglas-fir in the mix of species to be planted.

Shrub competition may be a problem for regeneration, especially where rhododendron cover is high prior to logging. Snowbrush may also be an important competitor. Soils have deep duff accumulations and are not as sensitive to fire effects as those of other rhododendron associations. The presence of rhododendron can indicate nitrogen-poor soils.

	Site Index PSME
Mean	136
SE	4
Range	80-180
Age	178
n	35

Western hemlock/rhododendron/Oregon oxalis

Tsuga heterophylla/*Rhododendron macrophyllum*/*Oxalis oregana*

TSHE/RHMA3/OXOR

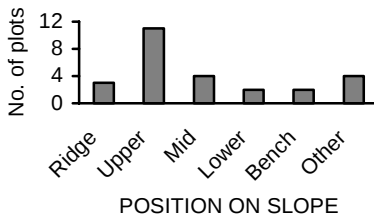
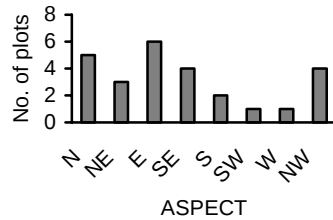
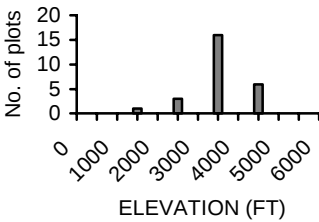
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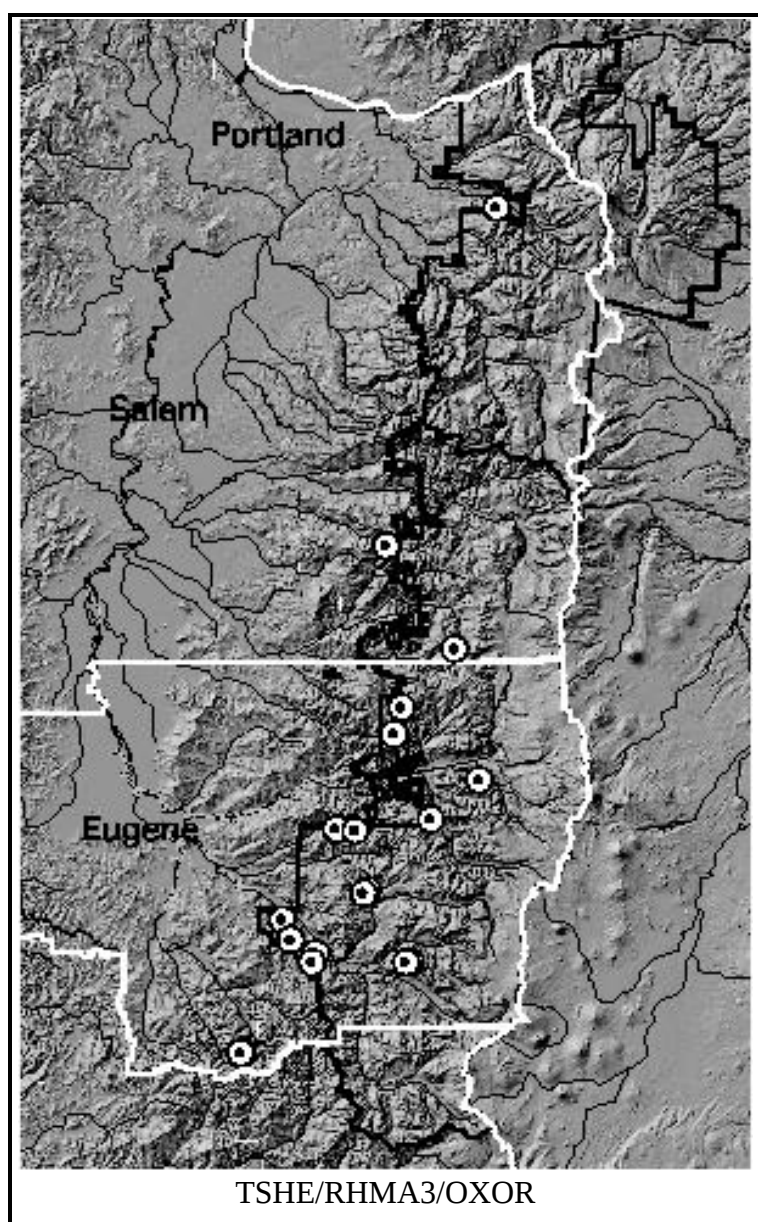
N=26 (WILL=22; EBLM=2; SBLM=2)

Environment and Distribution

This plant association occurs primarily on the Willamette National Forest. Plots are on flat to steep slopes averaging 33% (range 1-70%), with upper slopes being the most common slope position. Aspects vary, but cool north and east aspects are most common. Elevation averages 3,560 feet (range 1,100-4,200 ft.).

Soils tend to be deep with relatively low rock content.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3/OXOR association is dominated by Douglas-fir and western hemlock. Canopy closure of mature trees averages 71%. Cover of understory trees averages 4%. This association has a well-developed shrub layer, with tall shrubs averaging 45% cover and low shrubs averaging 19% cover. The shrub layer is dominated by rhododendron and vine maple, often with significant amounts of dwarf Oregon grape. The herb layer is relatively lush and diverse, with herb cover averaging 46% cover. Oregon oxalis is the most common herb. Moss cover averages 16%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	46
Western hemlock	TSHE	96	35
Understory trees			
Western hemlock	TSHE	100	6
Shrubs			
Rhododendron	RHMA3	100	37
Vine maple	ACCI	85	24
Dwarf Oregon grape	MANE2	77	14
Red huckleberry	VAPA	73	3
Trailing blackberry	RUUR	54	2
Little prince's pine	CHME	54	1
Baldhip rose	ROGY	42	2
Herbaceous			
Oregon oxalis	OXOR	100	37
Sword fern	POMU	92	5
Vanilla leaf	ACTR	73	4
Coolwort foamflower	TITR	69	4
Oregon goldthread	COLA3	65	4
Pacific trillium	TROV2	65	1
Twinflower	LIBO3	62	6
Starry Solomon plume	MAST4	62	5
Redwoods violet	WISE3	62	3
Three-leaved anemone	ANDE3	46	1
Inside-out-flower	VAHE	46	1

TSHE/RHMA3/OXOR plots average 201 years old (range 89-250 years). Stands are densely stocked, with live basal area averaging 317 ft²/acre.

Plots average 26 vascular plant species, near the mean for the western hemlock series.

Management Implications

Douglas-fir grows moderately well, with an average site index of 137, the highest of the rhododendron types. The growing season is cool with relatively minor drought development in most years. Winter snow accumulations can be substantial and summer frost may occur.

Shrub competition may be a problem for regeneration, especially where rhododendron cover is high prior to logging. Snowbrush may also be an important competitor. Soils are moderately rich and well watered. The presence of rhododendron can indicate nitrogen-poor soils.

	Site Index PSME
Mean	137
SE	3
Range	90-190
Age	236
n	52

Western hemlock/rhododendron/bear grass

Tsuga heterophylla/*Rhododendron macrophyllum*/*Xerophyllum tenax*

TSHE/RHMA3/XETE

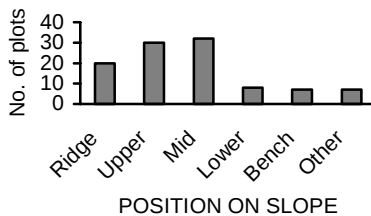
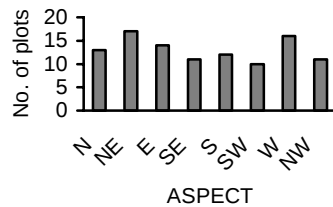
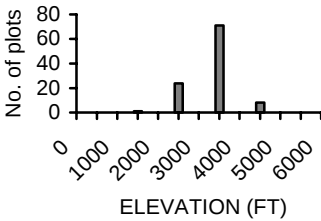
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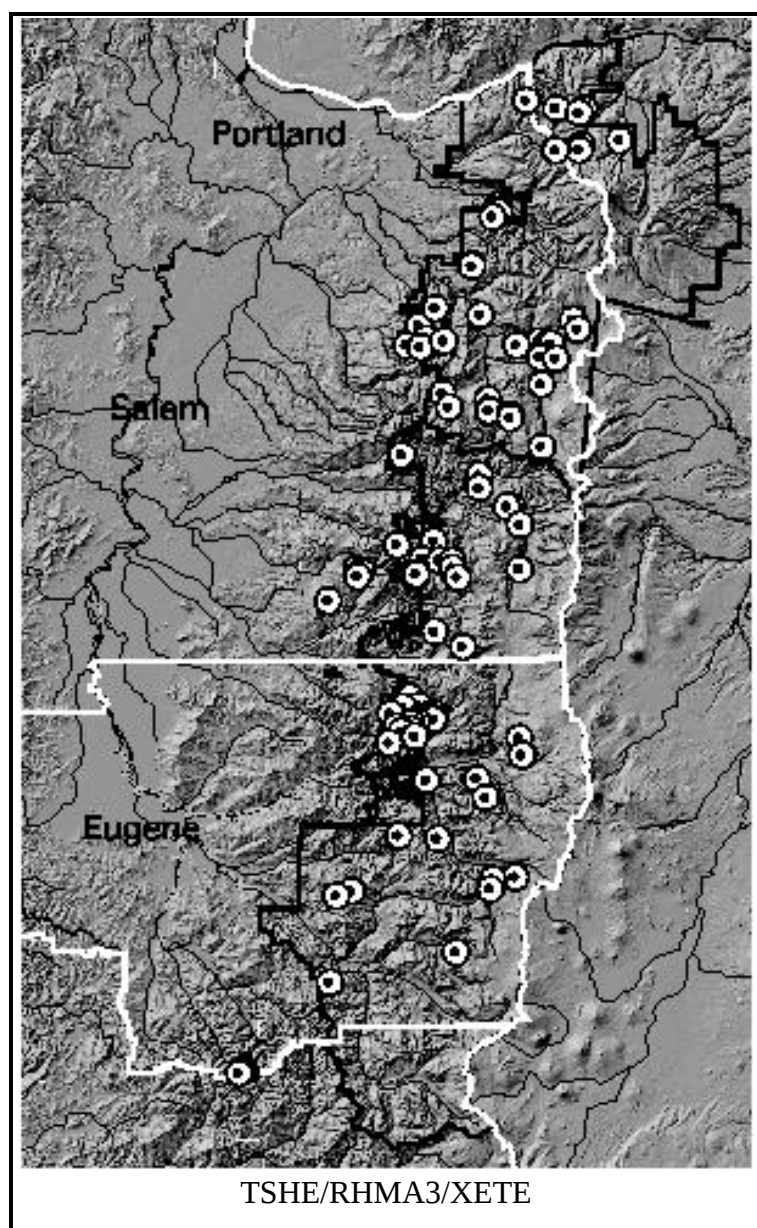
N=106 (MTH=35; WILL=58; EBLM=3; SBLM=10)

Environment and Distribution

This common plant association occurs throughout the westside Cascades, at elevations transitioning into the Pacific silver fir zone. This and other rhododendron plant associations are nearly absent in the highest precipitation area in the northwestern Mt. Hood N.F. TSHE/RHMA3/XETE sites are cool, dry and unproductive. Plots are on flat to steep slopes averaging 36% (range 0-85%) on upper to ridgetop slope positions. Plots occur on a variety of aspects. Elevation averages 3,275 feet (range 1,725-4,600 ft.).

Soils are shallow to fairly deep and sometimes with high coarse-fragment content. Soils are nutrient poor.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/RHMA3/XETE association is dominated by Douglas-fir and western hemlock, often with a component of western redcedar. Canopy closure of mature trees averages 72%. Cover of understory trees averages 5%. This association has a well-developed shrub layer with tall shrubs averaging 47% cover and low shrubs averaging 20% cover. The shrub layer is dominated by rhododendron, often with significant amounts of vine maple and salal. The herb layer is sparse, with herb cover averaging 20% cover. Bear grass is the most common herb. Moss cover averages 31%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	99	39
Western hemlock	TSHE	96	38
Western redcedar	THPL	46	10
Understory trees			
Western hemlock	TSHE	88	6
Shrubs			
Rhododendron	RHMA3	96	44
Dwarf Oregon grape	MANE2	88	7
Red huckleberry	VAPA	85	3
Prince's pine	CHUM	57	4
Vine maple	ACCI	49	10
Big huckleberry	VAME	49	3
Trailing blackberry	RUUR	45	1
Salal	GASH	43	10
Herbaceous			
Bear grass	XETE	100	17
Twinflower	LIBO3	76	5
Rattlesnake plantain	GOOB2	57	1

TSHE/RHMA3/XETE averages 193 years old (range 62-355 years). Stands are well stocked, with live basal area averaging 283 ft²/acre.

Plots average 22 vascular plant species, low for the western hemlock series and more similar to the Pacific silver fir series.

Management Implications

Douglas-fir growth is poor, with an average site index of 102, the lowest of the western hemlock zone. Winters are usually harsh and summers are hot and dry. Winter snow accumulations can be substantial and summer frost may occur. In flat areas that appear frost-prone, it may be desirable to consider shelter wood harvest and/or frost-tolerant species in the planting mix. Nitrogen may be limiting on some sites. Drought and exposure may limit seedling survival.

Shrub competition may be a problem for regeneration, especially where rhododendron cover is high prior to logging. Snowbrush and bear grass may also be important competitors. Sites with shallow, rocky soils may be difficult to plant. The presence of rhododendron can indicate nitrogen-poor soils. Nitrogen poor or rocky soils on steep sites are sensitive to fire.

	Site Index PSME	Site Index TSHE
Mean	102	108
SE	2	5
Range	50-170	75-140
Age	207	187
n	133	14

Western hemlock/Alaska huckleberry-salal

Tsuga heterophylla/Vaccinium alaskaense-Gaultheria shallon

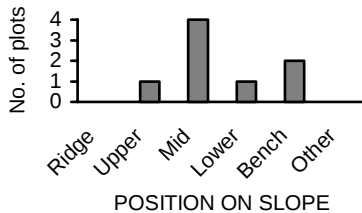
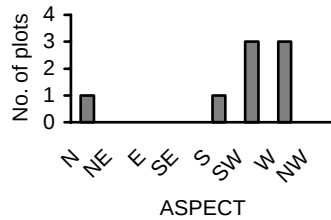
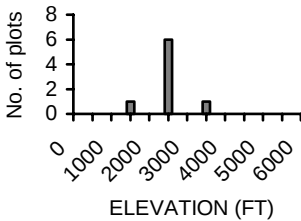
TSHE/VAAL-GASH

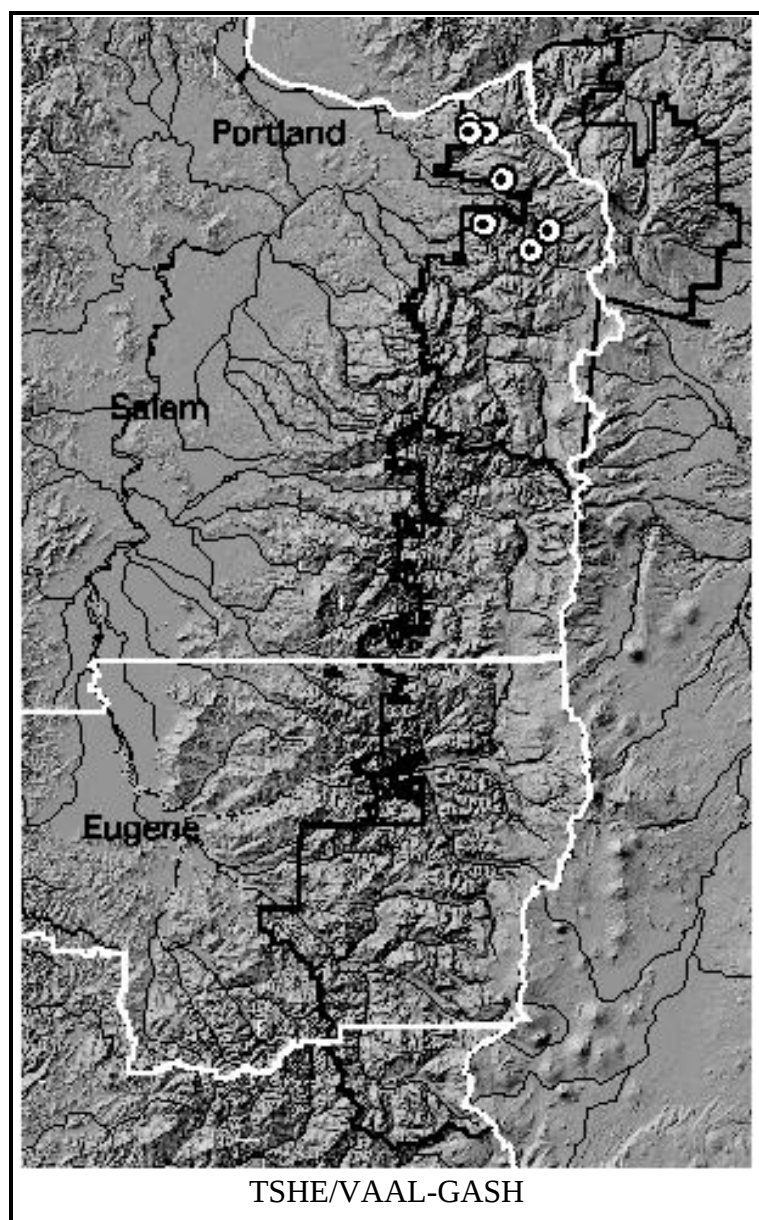
CHS614

N=8 (MTH=8)

Environment and Distribution

This uncommon plant association occurs in the high precipitation zone of the northwest portion of the Mt. Hood N.F., where other Alaska huckleberry types are centered. TSHE/VAAL-GASH sites are cool, with moderate moisture conditions. Plots are on gentle to moderate slopes averaging 25% (range 5-55%), primarily on mid-slope and bench positions. Plots mostly occur on westerly aspects. Elevation averages 2,451 feet (range 1,950-3,000 ft.).





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/VAAL-GASH association is dominated by Douglas-fir and western hemlock, often with a component of western redcedar. Canopy closure of mature trees averages 69%. Cover of understory trees averages 4%. This association has a moderately well developed shrub layer, with tall shrubs averaging 21% cover and low shrubs averaging 27% cover. The shrub layer is dominated by salal, often with significant amounts of vine maple and huckleberries. The herb layer is sparse, with herb cover averaging 17% cover. Moss cover averages 28%.

TSHE/VAAL-GASH plots average 178 years old (range 73-379 years). Stands density is relatively low, with live basal area averaging 216 ft²/acre.

Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	100	51
Douglas-fir	PSME	75	42
Western redcedar	THPL	50	10
Understory trees			
Western hemlock	TSHE	100	3
Shrubs			
Salal	GASH	100	16
Alaska huckleberry	VAAL	100	6
Dwarf Oregon grape	MANE2	75	4
Red huckleberry	VAPA	75	3
Vine maple	ACCI	63	14
Herbaceous			
Sword fern	POMU	88	1
Pacific trillium	TROV2	75	1

Plots average 22 vascular plant species, low for the western hemlock series.

Management Implications

Douglas-fir growth is poor with an average site index of 120. This association is a good place to plant noble fir occasionally and western hemlock frequently, as well as Douglas-fir.

Opportunities for benefits from intensive forestry practices, such as tree improvement, pre-commercial and commercial thinning, are good. Management concerns include the possibility of frost and reduced growth due to cool temperatures, even at lower elevations.

High stocking levels may not be appropriate to these sites. Pre-commercial thinning should retain western hemlock.

This association may respond to slash burning with considerable shrub re-growth, so reforestation needs to proceed rapidly. The gentle slopes where this association is usually found are suitable for tractor logging, but considerable care needs to be exercised so as not to compact soils and further reduce the productive capacity of these sites.

	Site Index PSME	Site Index TSHE
Mean	120	123
SE	6	7
Range	103-142	109-153
Age	292	282
n	6	6

Western hemlock/Alaska huckleberry-devil's club

Tsuga heterophylla/Vaccinium alaskaense-Oplopanax horridum

TSHE/VAAL-OPHO

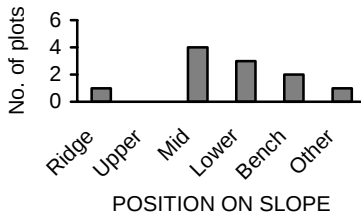
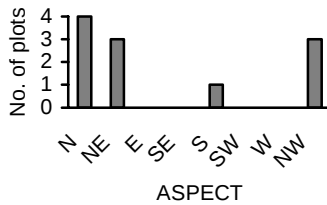
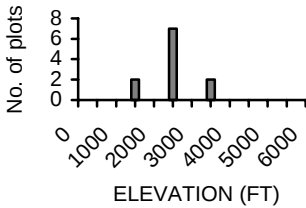
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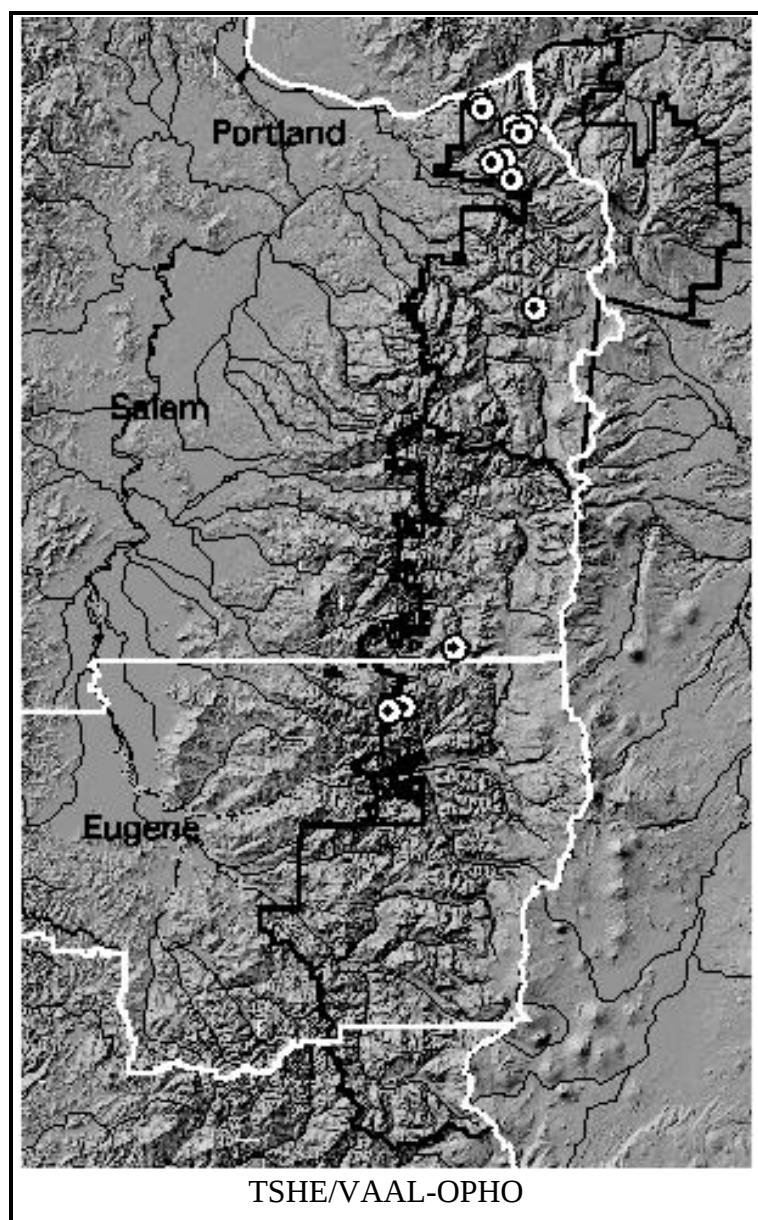
N=11 (MTH=8; WILL=3)

Environment and Distribution

This uncommon plant association occurs in cool, wet areas on both the Mt. Hood and Willamette N.F.s. It has the highest mean annual precipitation in the series. TSHE/VAAL-OPHO sites often occur as stringers along drainages or pockets in seeps. Plots are on flat to moderate slopes averaging 29% (range 1-55%), primarily on lower to mid-slope and bench positions. Plots mostly occur on northerly aspects. Elevation averages 2,595 feet (range 1,750-3,780 ft.).

Soils are deep and very moist with abundant nutrients.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/VAAL-OPHO association is dominated by Douglas-fir and western hemlock, often with a component of

Western redcedar. Canopy closure of mature trees averages 70%. Cover of understory trees averages 12%. This association has a moderately well developed shrub layer, with tall shrubs averaging 44% cover and low shrubs averaging 12% cover.

The shrub layer is dominated by devil's club and Alaska huckleberry, often with significant amounts of vine maple. The composition of the shrub layer is indicative of cool, moist sites. The herb layer is lush, with herb cover averaging 69% cover. Oregon oxalis dominates the herb layer, with other moist-site forbs in lesser amounts. Moss cover averages 35%.

Woodfern	DRAU8	45	3
Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	100	46
Douglas-fir	PSME	91	37
Western redcedar	THPL	55	12
Understory trees			
Western hemlock	TSHE	100	11
Shrubs			
Devil's club	OPHO	100	29
Alaska huckleberry	VAAL	100	15
Vine maple	ACCI	73	11
Red huckleberry	VAPA	64	4
Dwarf Oregon grape	MANE2	45	2
Herbaceous			
Oregon oxalis	OXOR	91	61
Pacific trillium	TROV2	91	1
Sword fern	POMU	82	3
Starry false Solomon's seal	MAST4	82	4
Coolwort foamflower	TITR	82	2
Deerfern	BLSP	73	2
Bunchberry dogwood	COCA13	73	2
Queencup beadlily	CLUN2	64	2
Twinflower	LIBO3	64	2
Inside-out-flower	VAHE	64	3
Ladyfern	ATFI	45	3

TSHE/VAAL-OPHO plots average 233 years old (range 109-250 years). Stand density is calculated for just one plot; live basal area is relatively low at 200 ft²/acre.

Plots average 25 vascular plant species, near the mean for the western hemlock series.

Management Implications

TSHE/VAAL-OPHO sites are more productive than average for the western hemlock zone. Douglas-fir site index averages 144. These sites may be excessively moist, however, and decreased productivity due to soil erosion and/or compaction may result from ground disturbance.

In addition, poorly aerated soils with high organic material content may be difficult to reforest following logging. Such soils are not only physically hard to work in, but may have chemical conditions unfavorable to the growth of Douglas-fir. Also, shallow rooting may contribute to increased likelihood of wind throw.

Use of western redcedar, red alder or black cottonwood should be considered for reforestation in swampy sites.

	Site Index PSME
Mean	144
SE	4
Range	115-182
Age	373
n	14

Western hemlock/Alaska huckleberry/bunchberry dogwood

Tsuga heterophylla/Vaccinium alaskaense/Cornus canadensis

TSHE/VAAL/COCA13

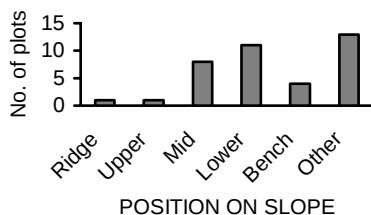
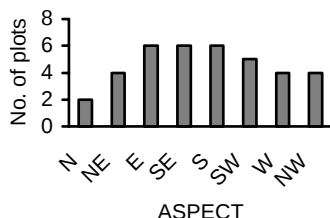
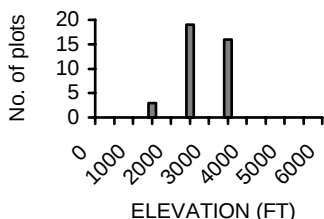
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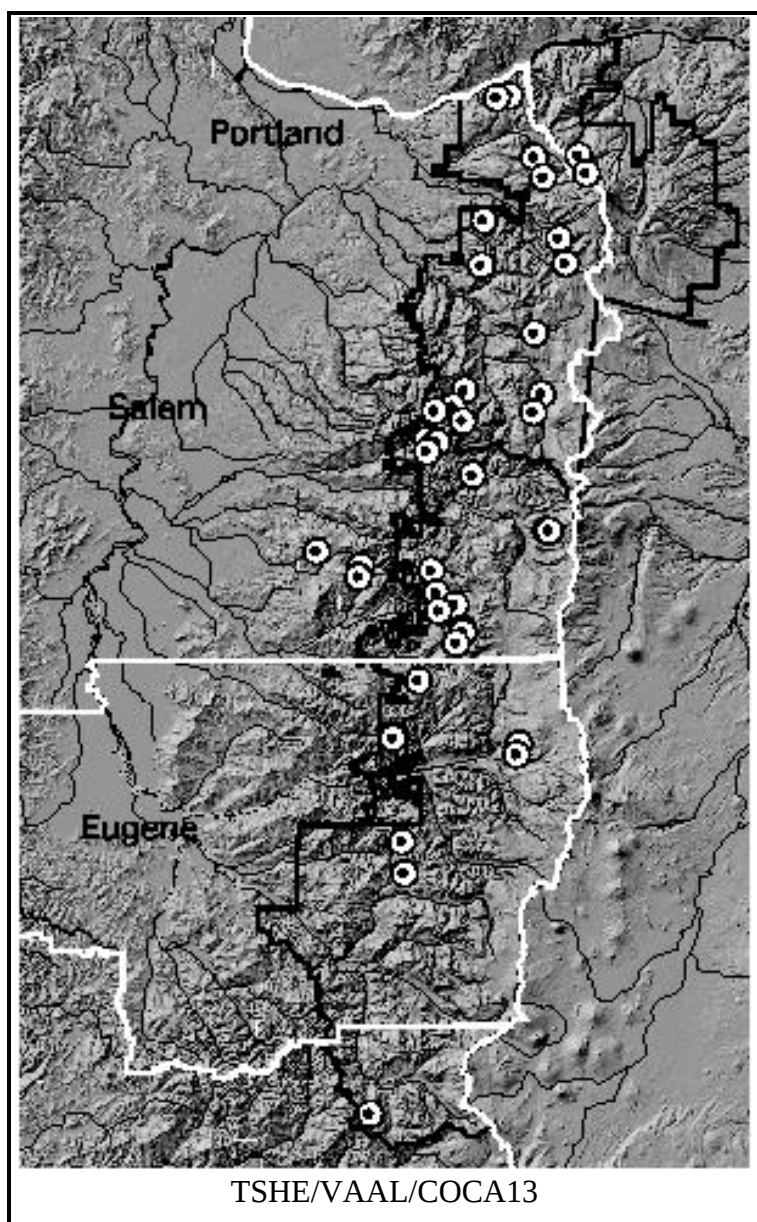
N=38 (MTH=15; WILL=19; SBLM=4)

Environment and Distribution

This plant association occurs in cool, moist areas on throughout the westside Cascades. TSHE/VAAL/COCA13 sites are in cooler portions of the western hemlock zone and may intergrade with the Pacific silver fir zone. Plots are on flat to steep slopes averaging 25% (range 0-90%), primarily on lower to mid-slope and canyon positions. Plots occur on all aspects. Elevation averages 2,882 feet (range 1,810-3,900 ft.).

Soils are moderately deep and fertile.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/VAALCOCA13 association is dominated by Douglas-fir and western hemlock, often with a component of western redcedar. Canopy closure of mature trees averages 71%. Cover of understory trees averages 8%. This association has a moderate shrub layer, with tall shrubs averaging 13% cover and low shrubs averaging 25% cover. The shrub layer is dominated by huckleberries, often with significant amounts of vine maple. Herb cover averages 36% cover. Bunchberry dogwood and twinflower dominate the herb layer. Beargrass is sometimes present indicating colder sites. Moss cover averages 41%.

Common name	Code	Constancy	Cover
Overstory trees			
Douglas-fir	PSME	100	38
Western hemlock	TSHE	97	37
Western redcedar	THPL	71	15
Understory trees			
Western hemlock	TSHE	87	7
Western redcedar	THPL	50	3
Pacific yew	TABR2	45	2
Shrubs			
Red huckleberry	VAPA	84	5
Alaska huckleberry	VAAL	79	16
Dwarf Oregon grape	MANE2	79	9
Trailing blackberry	RUUR	79	2
Vine maple	ACCI	76	12
Rhododendron	RHMA3	68	3
Big huckleberry	VAME	50	3
Little prince's pine	CHME	47	1
Prince's pine	CHUM	45	5
Herbaceous			
Bunchberry dogwood	COCA13	89	8
Twinflower	LIBO3	84	12
Vanilla leaf	ACTR	71	5
Queencup beadlily	CLUN2	66	2
Sword fern	POMU	66	4
Coolwort foamflower	TITR	66	5
Pacific trillium	TROV2	66	1
Starry false Solomon's seal	MAST4	58	6
Redwoods violet	VISE3	50	3

TSHE/VAAL/COCA13 plots average 201 years old (range 50-250 years). Stands density is high, with live basal area averaging 328 ft²/acre.

Plots average 29 vascular plant species, slightly above average for the western hemlock series.

Management Implications

Douglas-fir growth is moderate, with a site index of 129, reflecting favorable topographic positions under moist, cool conditions. TSHE/VAAL/COCA13 sites are intermediate in productivity for the TSHE/VAAL group, and similar to TSHE/RHMA3-VAAL/COCA13. The likelihood of cool temperatures should be taken into account when managing sites with this association. Winters are fairly severe with substantial snow accumulations. Occasional summer frost may occur on flat sites or in frost pockets. Noble fir grows well on cooler sites.

Silviculturists should consider using planting stock from the next highest elevations seed zone, particularly when this association is encountered at low elevations (<2,000 ft.). These sites should otherwise be able to respond favorably to most normal management. Moderate slash burns should not cause unacceptable nutrient loss.

	Site Index PSME
Mean	129
SE	2
Range	100-180
Age	216
n	58

**Western hemlock/Alaska huckleberry/Oregon oxalis-NWO
Cascades**

Tsuga heterophylla/Vaccinium alaskaense/Oxalis oregana

TSHE/VAAL/OXOR-NWO Cascades

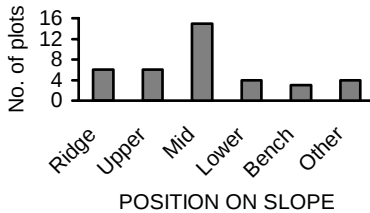
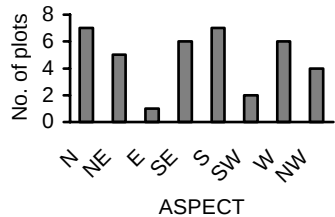
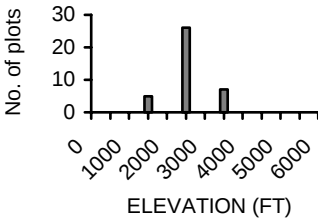
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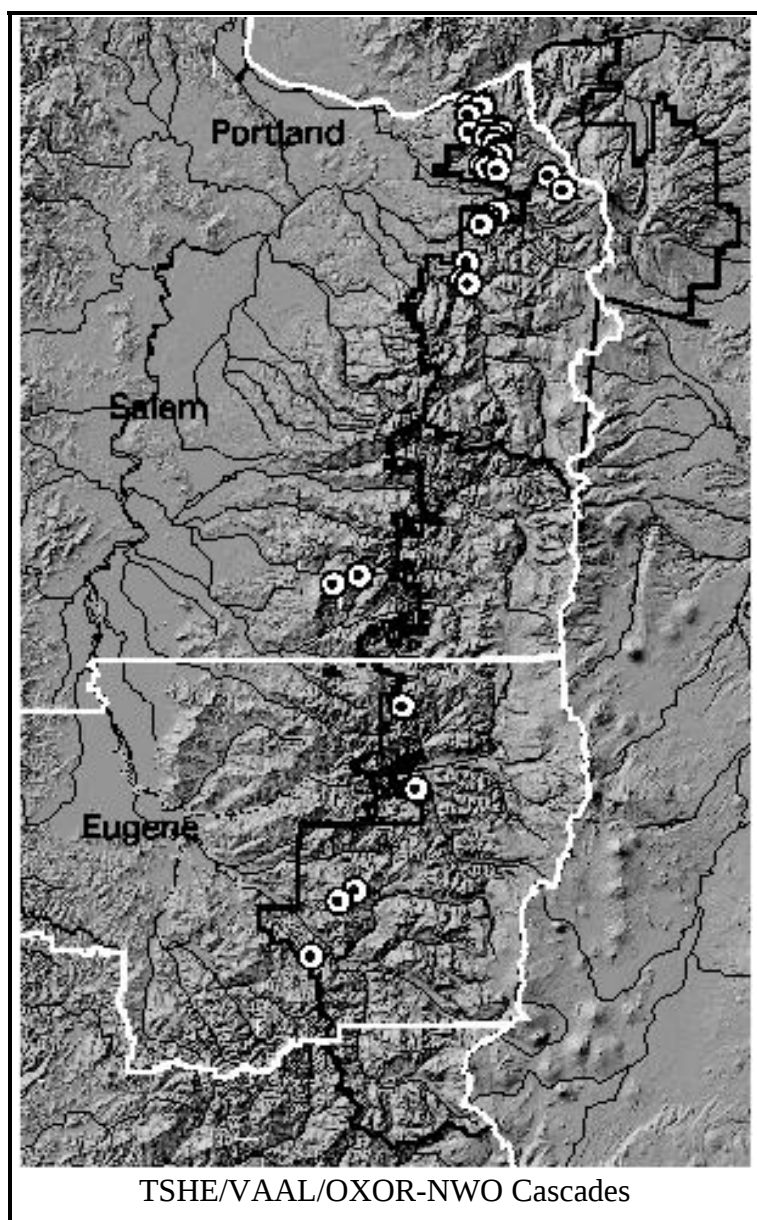
N=38 (MTH=29; WILL=7; SBLM=2)

Environment and Distribution

This plant association occurs in high precipitation areas along the western side of the Old Cascades. TSHE/VAAL/OXOR-NWO Cascades sites are in middle to upper elevations of the western hemlock zone. Plots are on flat to steep slopes averaging 26% (range 0-85%), primarily on mid-slope positions. Plots occur on all aspects. Elevation averages 2,568 feet (range 1,160-3,900 ft.).

Soils are moderately deep and productive.





Vegetation Composition, Structure, and Diversity

The overstory in the TSHE/VAAL/OXOR-NWO Cascades association is dominated by Douglas-fir and western hemlock, often with a component of western redcedar. Canopy closure of mature trees averages 67%. Cover of understory trees averages 19%. This association has a moderate shrub layer, with tall shrubs averaging 27% cover and low shrubs averaging 19% cover. The shrub layer is dominated by Alaska huckleberry, often with significant amounts of vine maple and/or salal.

Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	100	34
Douglas-fir	PSME	97	37
Western redcedar	THPL	42	10
Understory trees			
Western hemlock	TSHE	92	17
Shrubs			
Alaska huckleberry	VAAL	95	18
Red huckleberry	VAPA	82	8
Dwarf Oregon grape	MANE2	74	9
Trailing blackberry	RUUR	74	2
Vine maple	ACCI	66	17
Salal	GASH	50	10
Herbaceous			
Oregon oxalis	OXOR	100	31
Sword fern	POMU	97	5
Bunchberry dogwood	COCA13	74	5
Coolwort foamflower	TITR	66	2
Deerfern	BLSP	63	3
Twinflower	LIBO3	58	7
Pacific trillium	TROV2	58	1
Starry false Solomon's seal	MAST4	55	6
Queencup beadlily	CLUN2	45	2

Herb cover averages 49% cover, and is dominated by Oregon oxalis. Other moist site indicators, such as deerfern or coolwort foamflower, may also be present. Moss cover averages 22%.

TSHE/VAAL/OXOR-NWO Cascades plots average 208 years old (range 51-500 years). Stands are well stocked, with live basal area averaging 284 ft²/acre.

Plots average 26 vascular plant species, near the mean for the western hemlock series.

Management Implications

TSHE/VAAL/OXOR-NWO Cascades sites are moderately productive. Douglas-fir growth is moderately good, with a site index of 145. The presence of this association generally indicates conditions favorable for most management activities.

Moisture is abundant, and soils tend to be deep, adequately drained, and fertile. An abundance of deerfern in stands with this association may indicate local areas of high water table, where the risk of soil erosion and compaction is greater than usual.

	Site Index PSME	Site Index TSHE
Mean	145	113
SE	2	4
Range	95-183	85-160
Age	266	191
n	57	17