

Introduction to the Sitka spruce series

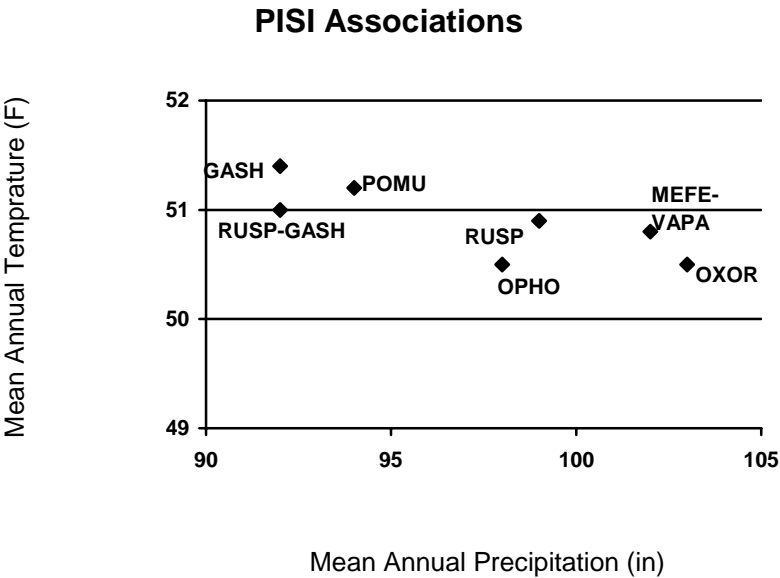
The Sitka spruce series occurs in the strongly maritime climate near the ocean and follows the coastal fog up river valleys. The spruce zone is typified by small annual temperature variation, minor summer plant moisture stress, and very high precipitation. The spruce zone extends much further inland toward the northern part of the Coast Range than in the south, where ridge systems intercept the fog layer.

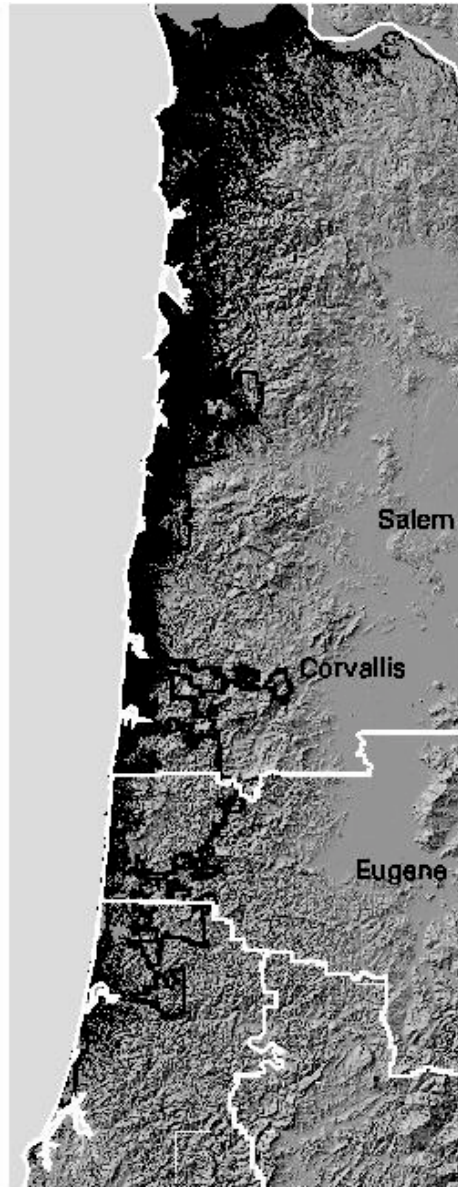
The Sitka spruce series is generally very productive, producing large trees relatively quickly. This series contains productive plant associations, which tend to develop and maintain late-successional characteristics that are important to a variety of wildlife species.

The average vascular plant diversity (number of species per plot) for the Sitka spruce series is 18, which is equivalent to the Coast Range western hemlock series (19 species/plot), but well below the diverse Douglas-fir series (32 species/plot), or grand fir series (29 species/plot).

Topographic position, microsite characteristics, and substrate are important in the distribution of the spruce associations. At the larger scale, mean annual temperature does not vary much, while some gradient along mean annual precipitation may influence the plant associations.

The graph below shows the relative distribution of the plant association plot averages for mean annual temperature versus total annual precipitation (data from Oregon Climate Service’s statewide GIS layers).





Sitka spruce series distribution

Series distribution (in black) from 2001 draft USFS R6 Potential Vegetation model (Henderson, in prep).

Sitka spruce/salal

Picea sitchensis/*Gaultheria shallon*

PISI/GASH

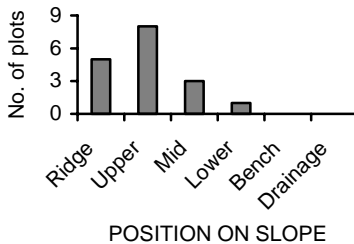
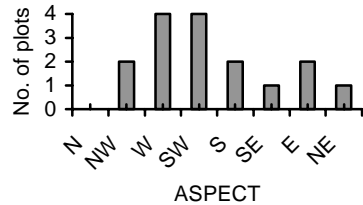
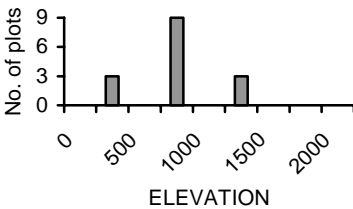
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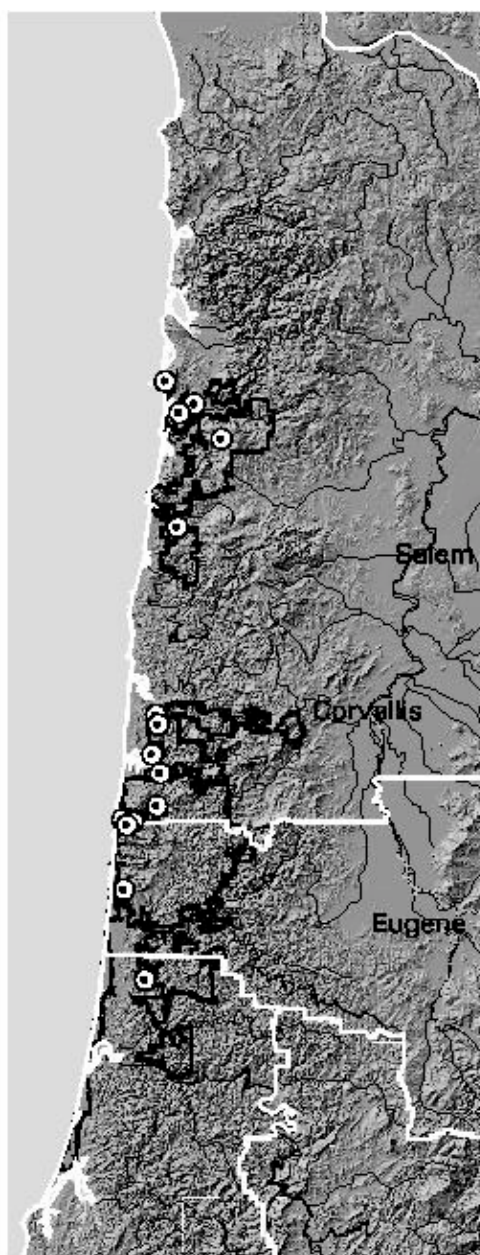
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Environment and Distribution

This is one of the driest plant associations in the Spruce series, with a mean annual precipitation of 92 inches. Most sites are on relatively dry ridges, stabilized sand, or in the salt-spray zone.

Soils are variable, ranging from moderately shallow to deep with abundant coarse fragments. Average effective rooting depth is 33 inches (range 16-58 inches).





PISI/GASH

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/GASH association is dominated by Sitka spruce, western hemlock, and Douglas-fir, often with red alder or western redcedar. Mature tree cover averages 78% and understory trees cover averages 5%. There is a dense shrub layer, with tall shrubs averaging 57% cover and low shrubs averaging 26% cover. Shrub layer dominants are salal and red huckleberry. Salmonberry is generally present at low cover. Herb cover on plots is relatively low, averaging 28% cover. Sword fern dominates the herb layer. Moss cover averages 19%.

PISI/GASH plots averages 94 years old (range 54 to 147 years). Stands are well stocked, with live basal area averaging 345 ft²/acre.

Plots average 14 vascular plant species, which is the lowest for the Sitka spruce series.

Common name	Code	Constancy	Cover
Overstory trees			
Sitka spruce	PISI	93	28
Western hemlock	TSHE	80	28
Douglas-fir	PSME	73	45
Red alder	ALRU2	47	4
Western redcedar	THPL	33	7
Understory trees			
Western hemlock	TSHE	60	5
Sitka spruce	PISI	53	2
Shrubs			
Salal	GASH	100	51
Red huckleberry	VAPA	93	15
Salmonberry	RUSP	80	5
Fool's huckleberry	MEFE	60	3
Trailing blackberry	RUUR	47	1
Herbaceous			
Sword fern	POMU	100	25
Miner's lettuce	CLSI2	53	2
Deer fern	BLSP	33	2
Bracken fern	PTAQ	33	1
Sweetscented bedstraw	GATR3	33	1
Pacific trillium	TROV2	33	1

Management Implications

Douglas-fir grows well, with an average site index of 175.

	Site Index PISI *	Site Index PSME	Site Index TSHE
Mean	115	175	167
SE	3	2	3
Range	82-143	145-236	141-198
Age	91	95	89
n	24	47	20

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

Conifers and red alder also grow well. Salmonberry does not respond rapidly to canopy removal. Soils are resilient or moderately sensitive to fire damage, depending on the depth and topography.

Sitka spruce/fool's huckleberry-red huckleberry

Picea sitchensis/*Menziesia ferruinea*-*Vaccinium parvifolium*

PISI/MEFE-VAPA

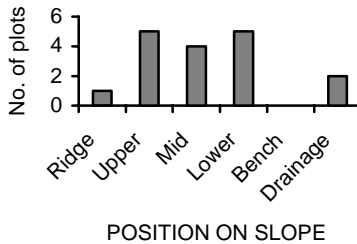
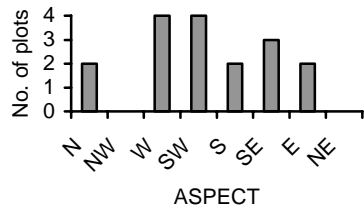
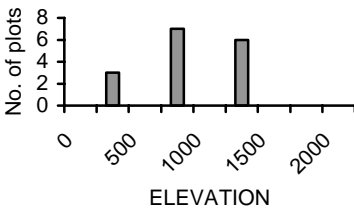
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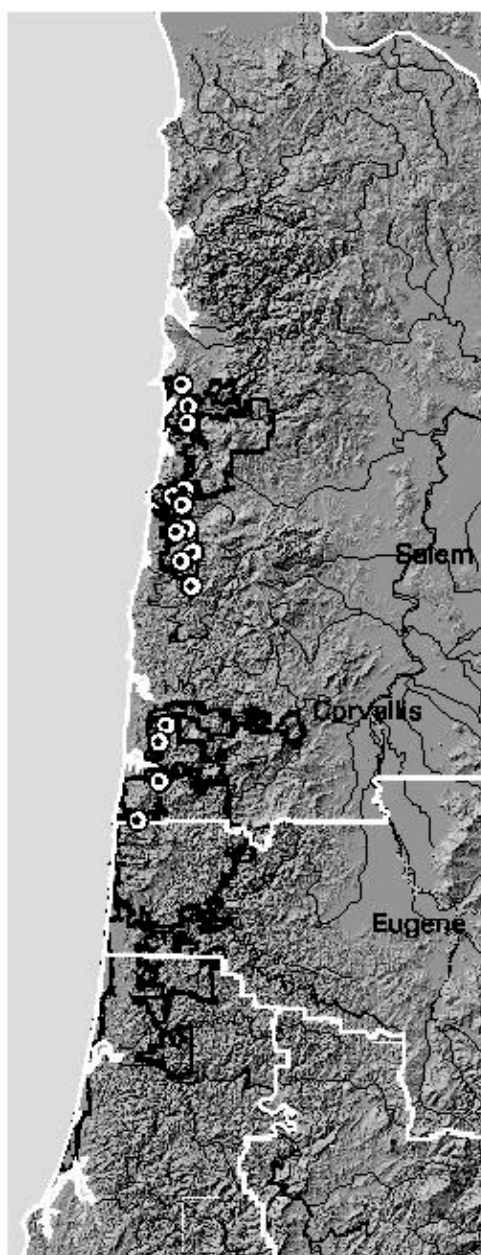
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Environment and Distribution

This is one of the wettest plant associations in this series, with a mean annual precipitation of 102 inches. It occurs on middle to upper slope positions. Warm southerly to westerly aspects are most common.

Soils are well watered and well-drained. Average effective rooting depth is 49 inches (range 14-70 inches).





PISI/MEFE-VAPA

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/MEFE-VAPA association is dominated by western hemlock, Sitka spruce, and Douglas-fir, often with western redcedar. Mature tree cover averages 73%. Cover of understory trees is high, averaging 10%. Western hemlock is the most common regenerating species. This association has a moderate shrub layer with tall shrubs averaging 36% cover and low shrubs averaging 6% cover. Shrub layer dominants are red huckleberry and fool's huckleberry.

Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	100	46
Douglas-fir	PSME	94	31
Sitka spruce	PISI	56	21
Western redcedar	THPL	38	8
Understory trees			
Western hemlock	TSHE	94	11
Shrubs			
Red huckleberry	VAPA	100	16
Fool's huckleberry	MEFE	100	11
Salal	GASH	75	6
Salmonberry	RUSP	69	3
Trailing blackberry	RUUR	38	1
Herbaceous			
Sword fern	POMU	100	18
Deer fern	BLSP	94	5
Pacific trillium	TROV2	75	1
Oregon oxalis	OXOR	56	9
Miner's lettuce	CLS12	50	2
Fairybells	DIHO3	50	1
Redwoods violet	WISE3	38	2
Sweetscented bedstraw	GATR3	38	1
False lily-of-the-valley	MADI	31	10
Shield-fern	DRCA11	31	1
Graminoids			
Field woodrush	LUCA2	50	1

Herb cover on plots is relatively low, averaging 34% cover. Sword fern and deer fern dominate the herb layer, while false lily-of-the-valley can be abundant. Sword fern cover can be relatively high, but the average of 18% (range 5-50%) is the lowest for sword fern in this series. Moss cover averages 34%.

PISI/ MEFE-VAPA plots average 113 years old (range 69-207 years). Stands are well stocked; live basal area averages 347 ft²/acre.

Plots average 17 vascular plant species, near the mean for the Sitka spruce series.

Management Implications

Douglas-fir grows well with an average site index of 157. The potential for creating late successional structure is very good since Sitka spruce grows rapidly to large size.

	Site Index PISI *	Site Index PSME	Site Index TSHE
Mean SI	121	157	159
SE	2	4	3
Range	73-166	106-212	115-216
Mean age	67	102	110
n	49	30	39

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

Shrub development after canopy removal should not be as intense as in salmonberry associations. Soils are generally resilient to fire effects, depending on soil depth and topography.

Sitka spruce/devil's club

Picea sitchensis/*Oplopanax horridum*

PISI/OPHO

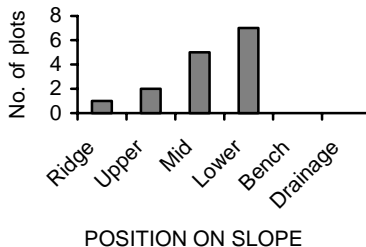
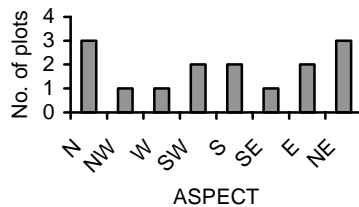
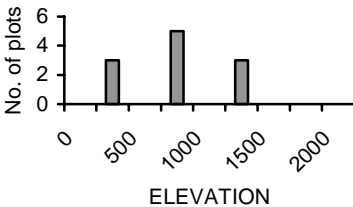
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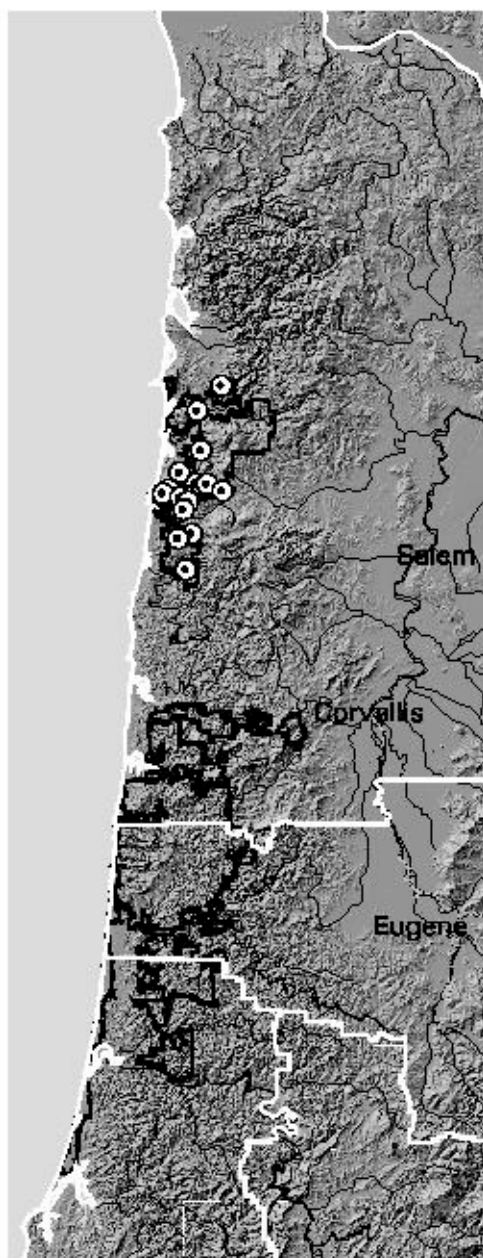
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Environment and Distribution

Plots are located in the northern portion of the Coast Range.

Effective rooting depth averages 40 inches (range 18-61 inches) and soil moisture is abundant. On steep slopes, PISI/OPHO may indicate seeps or impeded drainage, while on gentle ground it may indicate poorly drained areas upslope leading to wet but well aerated soils. Hydrologic relationships with streams and ground water are important.





PISI/OPHO

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/OPHO association is dominated by western hemlock, Sitka spruce, and Douglas-fir, often with a component of western red cedar. Mature tree cover averages 78%. Cover of understory trees is relatively high, averaging 8%. Western hemlock and Sitka spruce are the regenerating tree species.

Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	100	37
Sitka spruce	PISI	90	19
Douglas-fir	PSME	80	40
Western redcedar	THPL	40	25
Red alder	ALRU2	30	8
Understory trees			
Western hemlock	TSHE	80	4
Sitka spruce	PISI	60	1
Shrubs			
Devil's club	OPHO	100	20
Red huckleberry	VAPA	100	7
Salmonberry	RUSP	90	10
Fool's huckleberry	MEFE	90	8
Salal	GASH	40	4
Alaska huckleberry	VAAL	40	4
Thimbleberry	RUPA	40	2
Herbaceous			
Sword fern	POMU	100	43
Oregon oxalis	OXOR	90	31
Deer fern	BLSP	80	4
Miner's lettuce	CLSI2	80	3
Shield-fern	DRCA11	80	1
Ladyfern	ATFI	70	2
Fairybells	DIHO3	70	2
Pacific trillium	TROV2	70	1
Sweetscented bedstraw	GATR3	60	2
Mexican betony	STME	50	3
Clasping leaved twisted stalk	STAM2	50	1
False lily-of-the-valley	MADI	40	2
Grasses			
Field woodrush	LUCA2	80	1

This association has a moderate shrub layer, with tall shrubs averaging 39% cover and low shrubs averaging 6% cover. The shrub layer includes devil's club and salmonberry as dominants, while red huckleberry and fool's huckleberry are generally present.

Herb cover is one of the highest in the PISI series, averaging 78%. Sword fern and Oregon oxalis dominate the herb layer. Moss cover averages 28%.

PISI/OPHO plots average 117 years old (range 78-241 years). Stands are moderately stocked, with live basal area averaging 289 ft²/acre.

Plots average 21 vascular plant species, which is the highest for the Sitka spruce series.

Management Implications

Douglas-fir grows well with an average site index of 165. The potential for creating late successional structures is very good since Sitka spruce grows rapidly to large size.

	Site Index PISI *	Site Index PSME	Site Index TSHE
Mean	121	165	177
SE	7	3	6
Range	104-142	131-191	171-183
Age	121	103	116
n	6	20	2

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

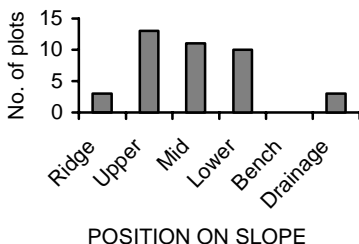
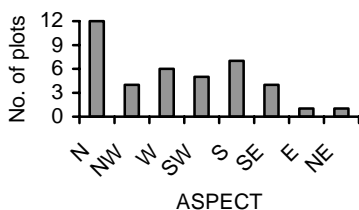
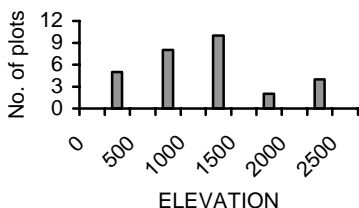
This type often occurs as small inclusions in other types. Conifers and red alder grow well. Red alder is present in most natural stands and dominates some. Competition from salmonberry after canopy removal can be intense. Abundant green fuels and typical slope position make slash burning difficult. Soils may be unstable due to abundant moisture, but are usually resilient to fire effects.

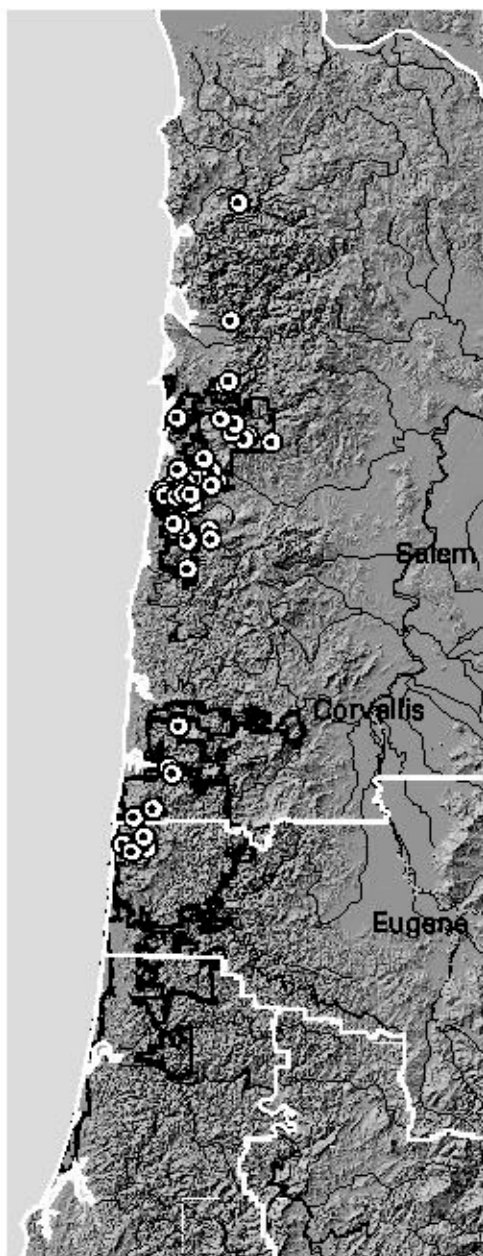
Sitka spruce/Oregon oxalis
Picea sitchensis/Oxalis oregana
 PISI/OXOR
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 N=40

Environment and Distribution

This is the wettest plant association in this series with an annual precipitation of 103 inches. It is well distributed north to south, but seems more common in the north. It occurs on lower to upper slope positions. Aspects vary, but northerly aspects are most common.

Soils are variable, but are generally deep, well-watered, well-drained, low in coarse fragments and high in organic matter. Average effective rooting depth is 52 inches (range 32-65inches).





PISI/OXOR

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/OXOR association is dominated by western hemlock, Sitka spruce, and Douglas-fir, often with a component of red alder. Mature tree canopy cover is high, averaging 81%. Cover of understory trees is relatively low, averaging 4%.

Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	90	39
Sitka spruce	PISI	90	28
Douglas-fir	PSME	77	32
Red alder	ALRU2	32	16
Understory trees			
Western hemlock	TSHE	71	5
Sitka spruce	PISI	35	1
Shrubs			
Red huckleberry	VAPA	90	10
Fool's huckleberry	MEFE	74	8
Salmonberry	RUSP	61	4
Red elderberry	SARA2	35	7
Herbaceous			
Oregon oxalis	OXOR	100	42
Sword fern	POMU	100	35
Miner's lettuce	CLSI2	90	4
False lily-of-the-valley	MADI	74	3
Fairybells	DIHO3	71	2
Pacific trillium	TROV2	68	1
Mexican betony	STME	65	5
Deer fern	BLSP	65	3
Ladyfern	ATFI	61	3
Shield-fern	DRCA11	52	2
Sweetscented bedstraw	GATR3	48	1
Graminoids			
Field woodrush	LUCA2	42	1
California fescue	FECA	35	1
Bromus vulgaris	BRVU	32	6

This association has a relatively sparse shrub layer with tall shrubs averaging 23% cover and low shrubs averaging only 2% cover. The shrub layer includes red huckleberry and fool's huckleberry as

dominants. Herb cover is one of the highest in the series, averaging 78% cover. Oregon oxalis and sword fern dominate the rich herb layer. Miner’s lettuce, false lily-of-the-valley, and fairybells are very common. Moss cover averages 35%.

PISI/OXOR plots average 110 years old (range 55 to >250 years). Stands are moderately stocked, with live basal area averaging 289 ft²/acre.

Plots average 14 vascular plant species, which is the lowest for the Sitka spruce series.

Management Implications

Douglas-fir grows well with an average site index of 168. The potential for creating late successional structures is very good since Sitka spruce grows rapidly to large size.

	Site Index PISI *	Site Index PSME	Site Index TSHE
Mean	119	168	167
SE	3	3	4
Range	74-174	107-261	131-294
Age	102	93	87
n	46	56	47

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

Conifers and red alder grow very well. Salmonberry competition following canopy removal is not as intense as in the salmonberry associations, but is more severe than in the salal association. Red alder will often become dense on exposed mineral soil, so ground disturbance during treatment is of concern.

Soils are resilient to fire effects. This type often occurs on well-drained alluvial terraces and can be an important component of the riparian system.

Sitka spruce/sword fern

Picea sitchensis/*Polystichum munitum*

PISI/POMU

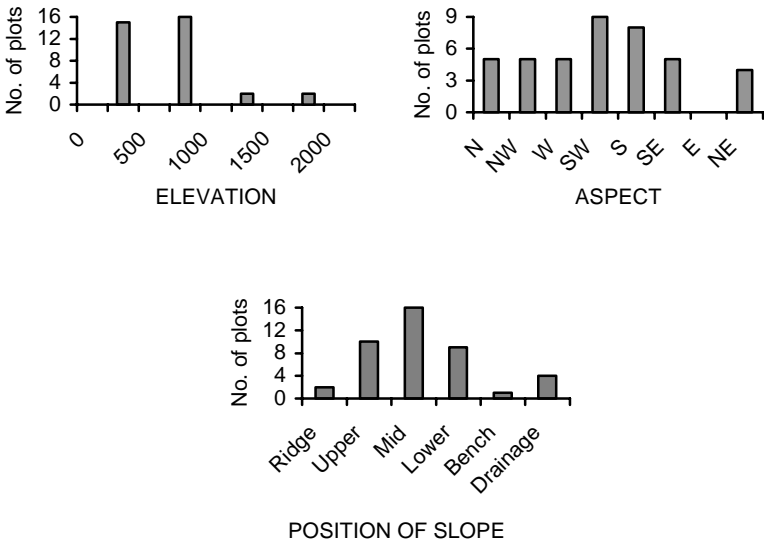
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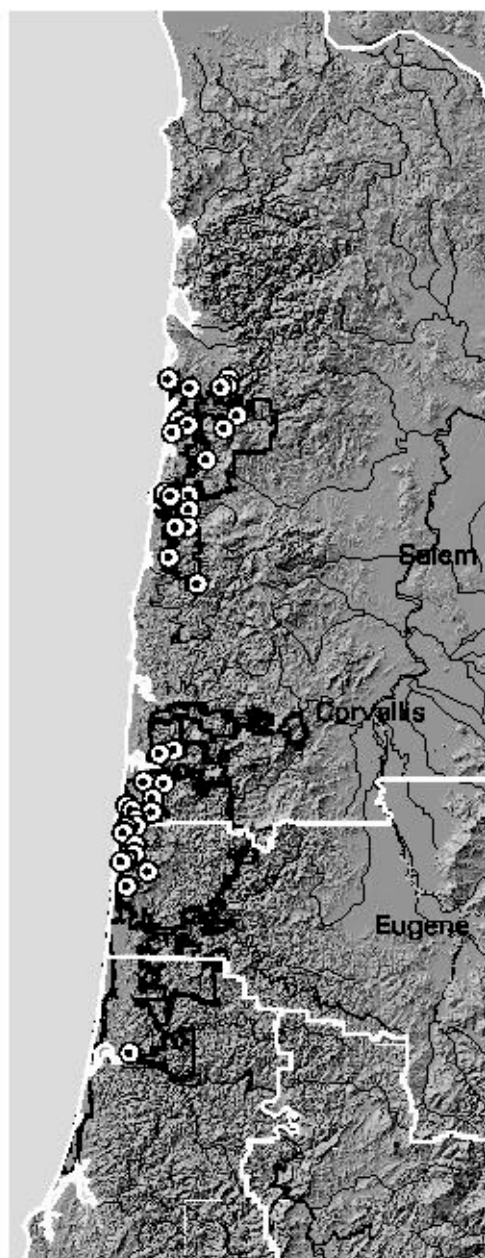
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Environment and Distribution

This association is well distributed along the coast. Plots are on lower to upper slope positions, but mid slopes are most common, often just above salmonberry communities or on northerly-facing slopes.

Soils are deep and high in organic matter, while low on coarse fragments. Effective rooting depths average 55 inches (range 36-65 inches).





PISI/POMU

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/POMU association is dominated by western hemlock, Sitka spruce, and Douglas-fir, often with minor red alder or western redcedar. Mature canopy cover is the highest in the series, averaging 82%. Cover of understory trees is relatively low, averaging 3%. This association has the lowest shrub cover for the series, with tall shrubs averaging 18% cover and low shrubs averaging 4%. The shrub layer includes red huckleberry, salmonberry, fool's huckleberry, and salal.

Common name	Code	Constancy	Cover
Overstory trees			
Sitka spruce	PISI	97	31
Western hemlock	TSHE	91	29
Douglas-fir	PSME	66	42
Red alder	ALRU2	40	8
Western redcedar	THPL	29	11
Understory trees			
Western hemlock	TSHE	71	7
Sitka spruce	PISI	37	2
Cascara buckthorn	RHPU	26	1
Shrubs			
Red huckleberry	VAPA	94	8
Salmonberry	RUSP	71	4
Fool's huckleberry	MEFE	71	3
Salal	GASH	63	3
Evergreen huckleberry	VAOV2	51	4
Red elderberry	SARA2	40	2
Herbaceous			
Sword fern	POMU	100	49
Miner's lettuce	CLSI2	91	2
Deer fern	BLSP	69	2
Sweet-scented bedstraw	GATR3	60	2
Fairybells	DIHO3	60	1
False lily-of-the-valley	MADI	57	4
Oregon oxalis	OXOR	54	4
Redwoods violet	VISE3	51	2
Ladyfern	ATFI	51	1
Pacific trillium	TROV2	46	1
Mexican betony	STME	37	2
Graminoids			
Field woodrush	LUCA2	37	1

Herb cover is intermediate for this series, averaging 58% cover. Sword fern and miner's lettuce dominate the herb layer. Moss cover averages 20%.

PISI/POMU plots average 109 years old (range 53 to 266 years old). Stands are moderately stocked, with live basal area averaging 299 ft²/acre. Plots average 18 vascular plant species, which is near the mean for the Sitka spruce series.

The characteristic to look for in this plant association is the dominance of sword fern, the absence of devil's club and salmonberry, while salal, fool's huckleberry, and Oregon oxalis are minor or absent. Red huckleberry, with a constancy of 94%, is generally present.

Management Implications

The potential for creating late successional structures is very good since Sitka spruce grows rapidly to large size.

	Site Index PISI *	Site Index PSME	Site Index TSHE
Mean SI	116	177	159
SE	2	4	5
Range	94-140	123-218	110-223
Mean age	88	98	112
n	33	37	24

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

Conifers and red alder grow very well. Salmonberry competition following canopy removal is not as intense as in the salmonberry associations. Red alder will often become dense on exposed mineral soil.

Soils are resilient to fire effects. This type may occur on well-drained alluvial terraces and contribute to large woody debris and sediment regulation.

Sitka spruce/salmonberry

Picea sitchensis/*Rubus spectabilis*

PISI/RUSP

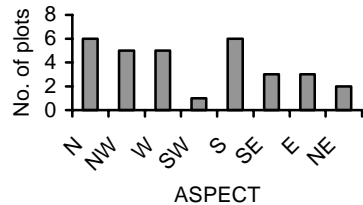
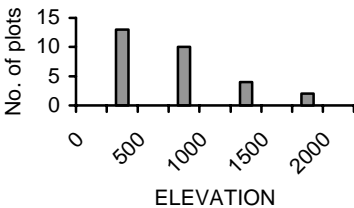
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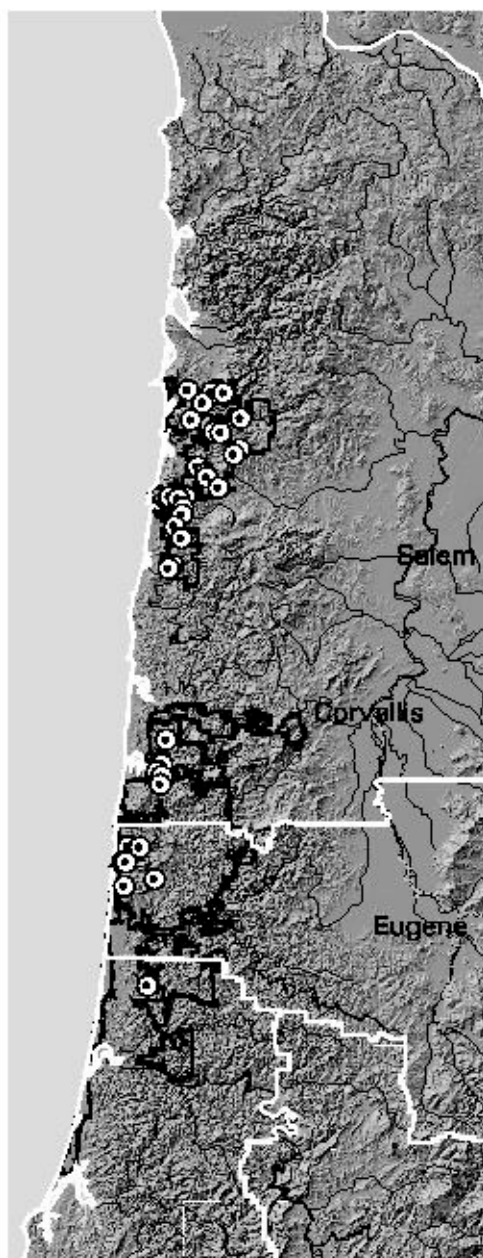
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Environment and Distribution

The Sitka spruce/salmonberry association is well distributed north to south, reaching higher elevations in the north. The association occurs on all aspects, most commonly on lower slopes and near streams.

Soils are moist, moderately deep, and rich in organics. Samples soils are generally developed on colluvium. Total average depth is 46 inches (range 30-61 inches), and average effective rooting depth is 37 inches (range 17-56 inches).





PISI/RUSP

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/RUSP association is dominated by Sitka spruce, western hemlock, and Douglas-fir. Red alder is frequently a major component of the canopy. Canopy closure of mature trees averages 76%. Tree regeneration is the most limited of the series; understory tree cover averages only 2%. Intense competition from red alder and salmonberry can result in nearly pure red alder canopies.

Common name	Code	Constancy	Cover
Overstory trees			
Sitka spruce	PISI	100	26
Western hemlock	TSHE	78	19
Douglas-fir	PSME	74	41
Red alder	ALRU2	70	29
Western redcedar	THPL	30	9
Understory trees			
Western hemlock	TSHE	48	7
Sitka spruce	PISI	30	1
Shrubs			
Salmonberry	RUSP	100	39
Red huckleberry	VAPA	96	7
Fool's huckleberry	MEFE	63	6
Vine maple	ACCI	59	18
Red elderberry	SARA2	44	5
Salal	GASH	33	4
Herbaceous			
Sword fern	POMU	96	43
Miner's lettuce	CLSI2	85	2
Fairybells	DIHO3	78	1
Oregon oxalis	OXOR	63	22
Deer fern	BLSP	63	3
Ladyfern	ATFI	59	2
Pacific trillium	TROV2	56	1
Mexican betony	STME	52	7
False lily-of-the-valley	MADI	48	3
Sweetscented bedstraw	GATR3	48	1
Shield-fern	DRCA11	33	1
Graminoids			
Field woodrush	LUCA2	52	1

This association has a relatively high shrub layer, with tall shrubs averaging 56% cover and low shrubs averaging 8% cover. Salmonberry is typically dense.

Herb cover is high, averaging 58% cover. Sword fern and Oregon oxalis generally dominate the rich herb layer, often with miner's lettuce, fairybells, and deer fern. Ladyfern and Mexican betony are other moist-site indicators. Moss cover averages 36%.

PISI/RUSP plots average 95 years (range 53-156 years). Stands are moderately stocked, with live basal area averaging 238 ft²/acre. Plots average 19 vascular plant species, which is above the mean for the Sitka spruce series.

Management Implications

Douglas-fir grows well with an average site index of 174. The potential for creating late successional structures is very good since Sitka spruce grows rapidly to large size.

	Site Index PISI	Site Index PSME	Site Index TSHE
Mean SI	122	174	157
SE	3	2	7
Range	90-151	145-206	141-173
Mean age	100	90	102
n	23	48	4

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

Conifers and red alder grow very well. Salmonberry responds to canopy removal very quickly, often reaching 3 to 4 feet tall. Alder and salmonberry competition can be very severe, so conifer establishment must be prompt to be successful. Abundant green fuels often make slash burning difficult, although soils are resilient to fire effects. Many stands occur in riparian areas and are important in contributing woody debris and regulating sediment input.

Sitka spruce/salmonberry-salal

Picea sitchensis/*Rubus spectabilis*-*Gaultheria shallon*

PISI/RUSP-GASH

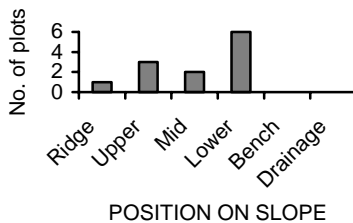
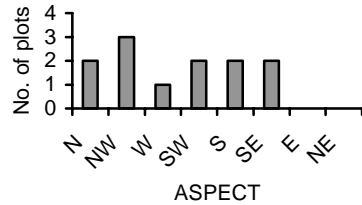
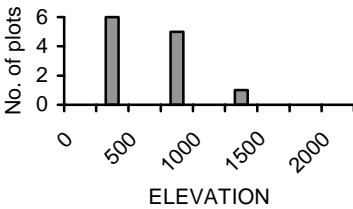
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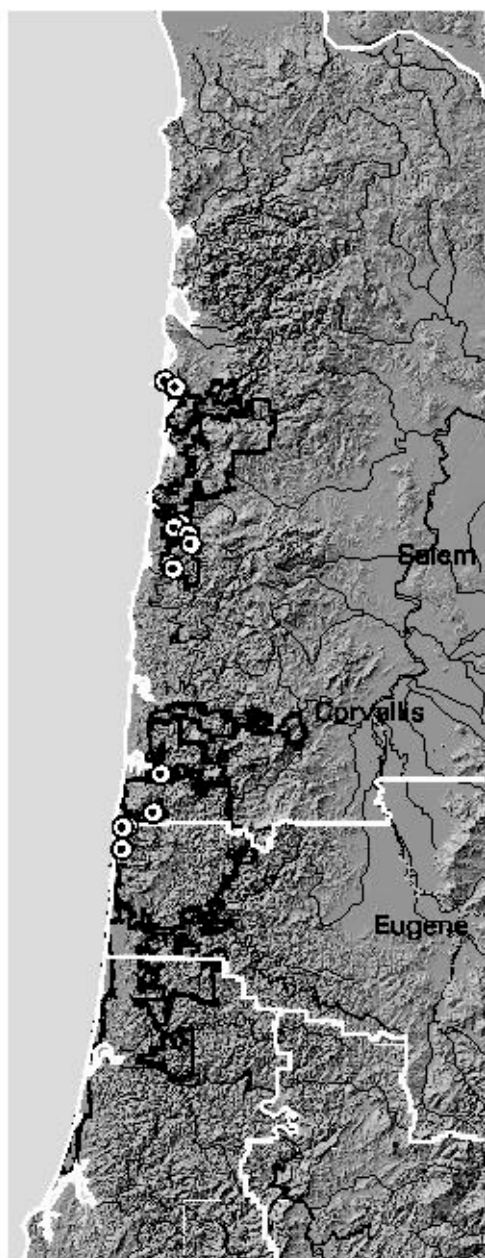
N=12

Environment and Distribution

This is one of the less common associations but is well distributed north to south. PISI/RUSP-GASH is one of the driest plant associations in the Sitka spruce series, with a mean annual precipitation of 92 inches. This plant association occurs on all slope positions.

It is not as well drained as the Sitka spruce/salal association. This association has the shallowest soil of the series, averaging 30 inches, with an effective rooting depth of 26 inches (range 21-31 inches).





PISI/RUSP-GASH

Vegetation Composition, Structure, and Diversity

The overstory in the PISI/RUSP-GASH association is dominated by western hemlock, Sitka spruce, and Douglas-fir. Red alder is often present, but minor. Canopy closure of mature trees averages 75%. Cover of understory trees averages 4%.

This association has a dense shrub layer, with tall shrubs averaging 61% cover and low shrubs averaging 16% cover. The shrub layer includes salal, salmonberry, and red huckleberry as dominants, while fool's huckleberry and evergreen huckleberry are generally present.

Herb cover is relatively low for the series, averaging 33%. Sword fern is the dominant herb, though small amounts of miner's lettuce, deer fern, shield fern, and trillium are common. Moss cover averages 28%.

Common name	Code	Constancy	Cover
Overstory trees			
Western hemlock	TSHE	100	26
Sitka spruce	PISI	100	24
Douglas-fir	PSME	83	35
Western redcedar	THPL	25	18
Red alder	ALRU2	25	7
Understory trees			
Western hemlock	TSHE	67	5
Cascara buckthorn	RHPU	25	2
Shrubs			
Salal	GASH	100	23
Salmonberry	RUSP	100	20
Red huckleberry	VAPA	92	11
Fool's huckleberry	MEFE	67	6
Evergreen huckleberry	VAOV2	50	8
Trailing blackberry	RUUR	33	2
Herbaceous			
Sword fern	POMU	100	29
Deer fern	BLSP	92	3
Pacific trillium	TROV2	67	1
Shield-fern	DRCA11	58	1
Miner's lettuce	CLSI2	50	2

PISI/RUSP-GASH plots average 127 years old (range 62 to >250 years). Stands are well stocked, with live basal area averaging 322 ft²/acre. Plots average 15 vascular plant species, which is below average for the Sitka spruce series.

Management Implications

Douglas-fir grows very well, with an average site index of 179. This is the highest average site index for Douglas-fir in the Sitka spruce series. The potential for creating late successional structures is very good since Sitka spruce grows rapidly to large size.

	Site Index PISI	Site Index PSME	Site Index TSHE
Mean SI	109	179	144
SE	4	4	4
Range	88-136	135-229	120-166
Mean age	120	89	110
n	13	32	14

* SI for PISI is calculated for base age 50; PSME & TSHE SI is calculated for base age 100.

Conifers and red alder all grow well. Sitka spruce may be more susceptible to weevil damage than in other Sitka spruce types. Salmonberry and red alder competition with conifers can be moderately severe but not as intense in the Sitka spruce/salmonberry association.

This type generally occurs on ridges or raised areas where salal becomes common in salmonberry communities. Sites with thin soils on ridges can be moderately sensitive to fire damage.

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