Key to Forest Vegetation

1. Mountain hemlock (TSME) present and reproducing at greater than 5% of tree understory species . . . . . mountain hemlock plant associations (p. 229)

1. Mountain hemlock not indicated as the climax species 2

    2. Subalpine fir (ABLA2) present and reproducing at greater than 5% of tree understory species . . . . . subalpine fir (ABLA2) series (p. 236)

    2. Subalpine fir not indicated as the climax true fir . . 3

        3. Grand fir (ABGR) present and reproducing at greater than 5% of tree understory species . . . . . grand fir (ABGR) series (p. 277)

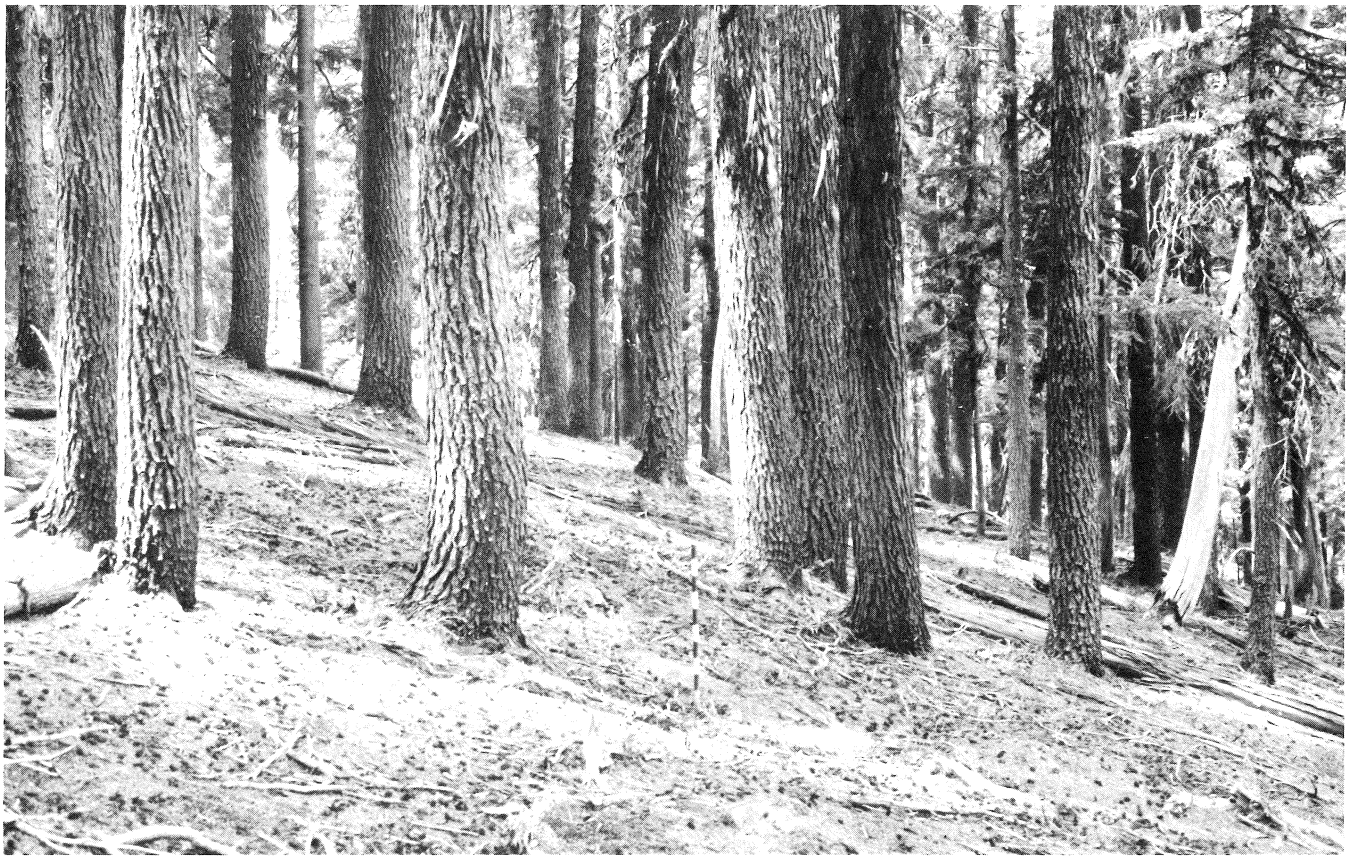
        3. Grand fir not indicated as the climax species . . 4

    4. Douglas-fir (PSME) present and reproducing at greater than 5% of tree understory species . . . . . Douglas-fir (PSME) series (p. 330)

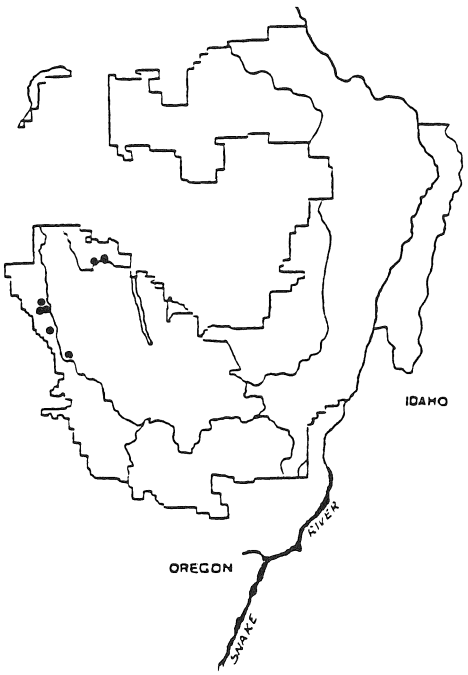
    4. Ponderosa pine present and reproducing at greater than 1% coverage . . . . ponderosa pine (PIPO) series (p. 370)

Mountain Hemlock Plant Associations

Tsuga mertensiana/Vaccinium membranaceum
(TSME/VAME) (CMS2 31) (n = 3)
Tsuga mertensiana/Vaccinium scoparium
(TSME/VASC) (CMS1 31) (n = 4)



43. Indian Creek Research Natural Area ***Plot 1342***
(La Grande Ranger District)



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: LGRD, ECRD	Parent Material: ash or ash and basalt colluvium over ash and colluvium
Elevation: (6500 ft.) 6000-7200 ft.	Solum depth: (44 in.) 40-50 in.
Aspect: North NE-NW	Ash depth: (24 in.) 16-33 in.
Slope (25%) 5-65%	Root conc: (21 in.) 12-30 in.
Position: brows, slopes and drainage headlands in plateau area	Depth to GT 35% rock frag./size: surface to 18 in./gravels, cobbles
Other: restricted to high snow zones, cold soils	Surface soil/subsoil texture: very fine sand, silt loam/very fine sand, silt loam

Table of Principal Species

TSME (n = 7)

Species	Code	Cov (%)/ Cons (%) TSME/VAME (n=4)	Range	Cov (%)/ Cons (%) TSME/VASC (n=3)	Range
Tree Overstory					
*mountain hemlock	TSME	61/100	50-70	60/100	40-90
subalpine fir	ABLA2	1/25	0-1	3/33	0-3
Engelmann spruce	PIEN	1/25	0-1	5/33	0-5
Tree Understory					
*mountain hemlock	TSME	8/100	4-10	22/100	15-35
subalpine fir	ABLA2	4/75	0-8	5/67	0-6
Engelmann spruce	PIEN	4/25	0-4	-	-
Shrubs					
*big huckleberry	VAME	3/100	1-5	1/33	0-1
*grouse huckleberry	VASC	2/75	0-3	6/67	0-10
prince's pine	CHUM	6/50	0-1	-	-
Utah honeysuckle	LOUT2	1/50	0-1	1/100	1-1
Herbaceous Plants					
sidebells pyrola	PYSE	1/50	0-1	3/33	0-3
*heart-leaved arnica	ARCO	-	-	2/100	1-5
Ross' sedge	CARO	1/50	0-1	1/33	0-1

* Principal Indicator Species

Stand Characteristics and Productivity

	TSME/VAME n = 5	TSME/VASC n = 2
Herbage production (lbs./acre dry wt.)	less than 100	
Average stand diameter/CI*	16.2/2.4	6.4/2.9
trees per acre greater than 4 in. DBH/CI	220/60	440/100
Total basal Area/CI	285/68	160-200/70
Average basal areaa by species in mid and late seral stands		
TSME	221	135
ABLA2	49	60
PIEN	12	15
LAOC	3	-
Average basal area in early seral stands		
PICO	-	160
Mean age/GBA by species		
TSME	295/275	210/195
ABLA2	130/215	-
PIEN	150/160	-
PICO	-	60/95

Productivity estimate

	No. of plots Sampled	Site Index* Mean	CI	GBA Mean	CI	Productivity Index **** Mean	CI
TSME	5	70	3	260	50	75	20
ABLA2	1	73(29)	#	215	#	60	#
PIEN	1	88(54)	#	155	#	55	#
PICO	1	65(36)	#	95	#	28	#

* CI = 95% confidence interval, mean plus or minus this value
** Site index base 100, base 50()
*** SI base 100 X GBA X .004
\# n value insufficient to calculate statistics

Vegetative Composition - Mountain hemlock dominates tree overstory levels to the virtual exclusion of other tree species. Understories are generally open with few shrubs, herbaceous plants, or tree vegetation due to the exclusion of light by the dense tree canopy coverage. Patches of mountain hemlock tree regeneration occur with spruce and sub-alpine fir seedlings generally occupying openings beneath canopy gaps. The hemlock communities are separated into two types based on the ability of big huckleberry (VAME) to persist on these high elevation cold sites. If the site cannot support big huckleberry, it is considered to be too cold and too droughty in summer for big huckleberry. Then, grouse huckleberry (VASC) is the principal shrub species most adapted to tolerate these environmental conditions. The understories are commonly so light poor that all shrub and herbaceous vegetation is usually present at less than 5% cover. In TSME/VAME communities, grouse huckleberry is usually present as are prince's pine (CHUM), Utah honeysuckle (LOUT2), sidebells pyrola (PYSE), and Ross' sedge (CARO). The TSME/VASC community usually lacks big huckleberry and prince's pine, but contains the other species that occur in the TSME/VAME type. Heartleaved arnica was always found in TSME/VASC stands where direct sunlight could enter the canopy. Fringed pinesap (HYMO), a saprophytic plant, was regularly found growing in these communities.

Distribution and Environmental Features - Mountain hemlock is a minor species in the Wallowa-Snake province. It occurs only in the northwestern quarter of the Wallowa-Snake uplift sporadically along the ridge crests of the Lostine-Bear Divide, Minam River ridges, and is prolific in the Point Prominence-Indian Creek vicinity between 6500-6700 feet elevation. Elevations of sample plots range from 6000 to 7200 feet and are among the highest of all forested plant communities in the province. Mountain hemlock communities may occur on broad plateau flats where slopes are less than 15% and on steep (45 to 65%) ridge brows or slopes below rocky bluffs. Sites are oriented from northeast to northwest.

The mountain hemlock zone is characterized by high precipitation, cold temperatures, and deep snowpacks lasting well into the summer months. Mountain hemlock appears to be the only tree species in this area that can withstand the cold soils, short growing seasons, and physical impact of heavy snowpacks and still maintain extensive long-lived communities. Henderson and Peter (1981) believe that temperature regime is probably the more significant environmental factor determining mountain hemlock distribution on the Olympic National Forest. Although soil temperatures are among the lowest of all communities in the Province, distribution of mountain hemlock communities in the Wallowa Mountains may be due as much to moisture levels dependent upon patterns of snowfall and longevity of snowpacks.

Soils - Soils are typically dark yellowish brown in color in surface layers and dark yellowish brown to dark reddish brown in subsoil layers. They are generally poorly developed. Surface soil layers have very fine sand to silt loam textures and are formed in ash or mixtures of ash and andesite colluvium. They overlay older buried soil materials. Buried soils have very fine sand texture, are also formed in ash or mixtures of ash and colluvium, and are 15 to 25 inches below the more recent soil material. These soil layers may be highly mottled. Solum depths usually do not exceed 45 inches, but highly weathered andesite may extend well below the soil material. Rock fragments tend to occupy less than 15% of the surface soil volume, but

greater than 35% of the subsoil volume. Rock fragments in surface layers are predominately gravel-sized while rock in subsoils is cobble and stone-sized. Surface rock seldom exceeds 10% cover.

Soil characteristics vary depending upon site and slope position. Gently sloping plateau flats or drainage headlands commonly have soils that are nearly rock free and consist of "recent" ash layers with silt loam and very fine sand textures over older buried ash layers with very fine sand textures. These ash layers cover weathered andesite bedrock and are typically highly mottled. Mottling in soils is due to periodic water saturation from deep snow accumulations that last for a period of time when soil temperature is above the biologic zero (41 degrees F.). Mottling was rather rare in soils sampled in other plant communities in the Wallowa-Snake Province. Steep slopes in ridge brow locations or below rocky bluffs more commonly have soils with mixed ash and colluvium in both buried and more recent layers. Mottling does not occur in these very well-drained soils.

Successional Relationship - Lodgepole pine pioneers following catastrophic burns where mountain hemlock stands are replaced. Grouse huckleberry is the frost-tolerant plant that associates with the pine in these stands. Subalpine fir and Engelmann spruce occupy a mid successional stage where understory species may be prolific; (i.e., Piper's anemone (ANPI), heartleaf arnica (ARCO), sidebells pyrola (PYSE), and sickleleaf lousewort (PERA)). Snow is deep and lingers long, providing a short growing season. As a result, succession advances very slowly, perhaps with the longest timeframe of any Wallowa-Snake plant association.

Role of Fire - Many old-growth stands have survived periodic fire due to their location and wetness late into the summer season. Mountain hemlock appears to be increasing in subalpine fir-Engelmann spruce communities at the higher elevations of the Wallowas. This may be a result of fire suppression. Mountain hemlock stands on gentle topography are subject to stand replacement fires late in the growing season. These sites may revert to lodgepole pine-dominated early seral stands.

Silvicultural Considerations - Mountain hemlock communities with high timber, wildlife, watershed, and recreational values present a real management challenge. Silvicultural opportunities may be very limiting due to cold soil and air temperatures, short growing seasons, heavy long-lasting snowpacks, and lack of knowledge concerning establishment and production timetables. Tree succession following disturbance and stand growth is generally quite slow and establishment of natural regeneration within five years of heavy overstory removal cannot be assured. Furthermore, diameter growth may be slow for the first 30 to 60 years due to snow. Clearcutting may create frost pockets or increase snow depths and thus further reduce the probability of stand re-establishment.

Range and Wildlife - These communities provide little forage for ungulates, but do provide the coolest mid-day cover for shading animals. Slopes are often steep, making many stands unattractive except to the transient animal.

Stand Structure and Productivity - Late seral mountain hemlock communities form all-aged forested stands. Dominant, codominant, and intermediate trees may range in age from 150 to over 300 years old with abundant 30 to 80 year old hemlock and subalpine fir seedlings and saplings commonly associated.

Dominant hemlock were often suppressed for up to 150 years before being released, presumably following periodic overstory mortality. Basal areas for these stands average 270 sq. ft./acre with a range from 200 to nearly 400 sq. ft./acre. Average stand diameters range from 16 to 18 inches.

In general, measured stand productivity in comparison to other forest communities in the Province was high in the mountain hemlock sample stands. Traditional growth index methods, however, may overestimate production in this type for the following reasons: (1) Site index curves used for mountain hemlock tend to flatten out around age 200, well below the mean age of sample trees, giving similar index values for trees of similar height, but very different ages. (2) Diameter growth slowed down for the last 100 years to a nearly constant rate on many sample trees and did not appear to correlate well with the surrounding basal area. Accurate reconstruction of 100 years of stand mortality in these stands where almost no downed logs exist is difficult. Therefore, stand basal area at the time of growth decline, an important component in GBA estimation, could not be determined. (3) The period required for mountain hemlock seedling establishment following disturbance is not known and once trees are established the time to reach breast height appears quite variable (measured seedlings ranged from 20 to 70 years old). Furthermore, height growth may be very suppressed for long periods of time, invalidating both site index and GBA assumptions. In conclusion, although mountain hemlock stands can be expected to produce substantial timber volumes, production time frames may be difficult to accurately determine.

Comparison With Other Investigators - Mountain hemlock forms a prominant high elevation zone in the Cascade and Olympic Mountains where most of the ecological study has been to date (Franklin, 1966; Hemstrom, 1982; Brockway, 1983; Atzet, 1984; Henderson, 1984). The Daubenmires (1968) described two habitat types in the northern Rockies dominated by either beargrass or fool's huckleberry. Pfister (1977) described the mountain hemlock/ Hitchcock's woodrush habitat type in Montana. Cooper, Neiman, and Steele (1985) describe four habitat types for northern Idaho. Volland (1976) and Hopkins (1979) typified (TSME/VASC) in the Klamath Mountains and Eastern Cascades of south central Oregon. There, Shasta red fir and subalpine fir were subordinate to mountain hemlock. The TSME/VAME plant association has been defined by Brockway (1983) and Henderson (1984) in the Cascades and Olympics as a distinct zone.

Summary of Soil and Site Characteristics (all samples) - TSME/VASC and TSME/VAME

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
40 in. to 50 in.	12 in. to 30 in.	16 in. to 33 in.	stable	37°F to 45°F	surface to 18 in.	0 to 10%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Key to Subalpine Fir (ABLA2) Series Vegetation

1. Fool's huckleberry (MEFE) dominates in the understory vegetation . . . . . ABLA2/MEFE (pg. 238)

1. Fool's huckleberry is not dominant in the understory 2

    2. Tall frobs dominate mesic sites (i.e., twisted stalk (STAM), tall bluebells (MEPA), valerian (VASI) . . . . . ABLA2/STAM (pg. 275)

    2. Tall forbs absent or not dominating understory layers . 3

        3. Queen's cup (CLUN) is always present ABLA2/CLUN (pg. 262)

        3. Queen's cup absent 4

            4. Twinflower (LIBO2) present throughout the stand . . . . . ABLA2/LIBO2 (pg. 268)

            4. Twinflower not present 5

    5. Big huckleberry (VAME) dominates in the understory . . . . . ABLA2/VAME (pg. 253)

    5a. Lodgepole pine (PICO) dominant in the overstory . . . . . PICO (ABLA2)/VAME (pg. 259)

    5. Big huckleberry does not dominate in understory 6

        6. Grouse huckleberry (VASC) dominates in the understory . . . . . ABLA2/VASC/POPU (p. 244)

            6a. Lodgepole pine (PICO) dominant in the overstory . . . . . PICO (ABLA2)/VASC/POPU (pg. 250)

        6. Grouse huckleberry does not dominate in the understory 7

            7. Pinegrass dominates in the understory . . . . . ABLA2/CARU (pg. 276)

            7. Pinegrass inconspicuous in the understory; depauperate understory of scattered cold-site forbs . . . . . ABLA2/POPU (pg. 274)

SUBALPINE FIR (ABLA2) SERIES

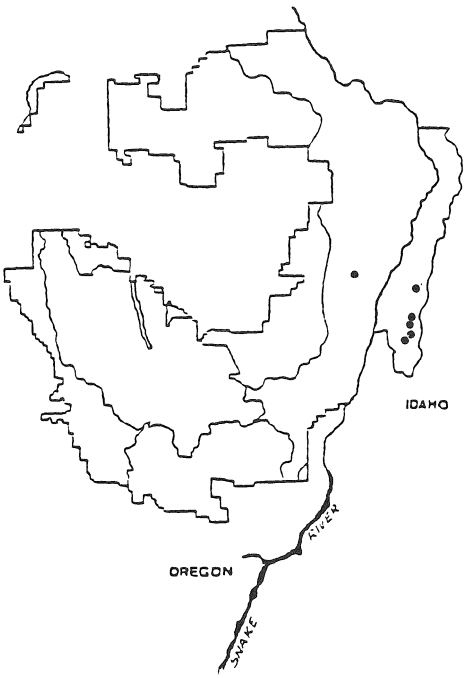
Summary of Plant Association and Community Type Characteristics 1/

Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	(3) Relative Cubic prod./ Stockability	(4) Forage (lbs./acre) dry
ABLA2/MEFE	6200-7500 (6850)	lower to upper slope	NE-NW	10-60% (42%)	Ash + metavolcanic colluvium	50-70 (60) 15-35 (21)	MEFE,PYSE VAME	Low/ Moderate	(100) est.
ABLA2/VASC/ POPU	5600-7500 (6500)	tops basins	all	3-45% (11%)	Ash + basalt(+) colluvium	30-47 (26) 14-23 (17)	VASC,LOUT2 POPU,VIOR2	moderate/ moderate	(100) est.
ABLA2/VAME	5000-7100 (6200)	lower to upper slope	NE-NW	10-70% (24%)	Ash + basalt(+) colluvium	45-80 (60) 14-33 (20)	VAME,RIBES PYSE,VIOR2	moderate/ moderate	(100) est.
ABLA2/CLUN	4600-5800 (5000)	bottoms, toeslopes	all	1-17% (7%)	Ash + mixed coll. alluvium	50-80 (64) 20-43 (27)	CLUN,TITRU SMST,OSCH	high/ mod. high	(100) est.
ABLA2/LIBO2	4200-6200 (5100)	footslope, toeslope	all	10-45% (25%)	Ash + mixed colluvium	35-50 (40) 15-26 (20)	LIBO2,PYSE GOOB,VIOR2	mod. high/ mod. high	(100) est.
ABLA2/POPU	6970-7260 (7100)	upper slope	NW	65-70% (68%)	Ash + mixed colluvium	40-60 (50) 16-32 (24)	POPU,VASI SEST2,ARMA3	moderate/ moderate	(100) est.
ABLA2/STAM	5800-7200 (6600)	drainages toeslope	all	10-42% (19%)	Ash + mixed coll. alluvium	26-43 (36) 16-26 (21)	STAM,SETR POPU,VASI	mod. high/ mod. high	(100) est.
ABLA2/CARU	6000-6950 (6500)	upper slope	S-W	20-40% (30%)	Ash + basalt colluvium	-----	CARU,CAGE	moderate/ moderate	----

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Comparison of relative cubic volume production/stockability for the primary species (from Appendices E & F)
4/ Forage production in all conditions sampled.

Subalpine fir/fool's huckleberry plant association
Abies lasiocarpa/Menziesia ferruginea (ABLA2/MEFE) (CES2 21)

44. Bridge Creek, Seven Devils (Hells Canyon NRA) *Plot 7001*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA (Idaho)	Parent Material: ash over meta-volcanic colluvium
Elevation: (6850 ft.) 6200-7500 ft.	Solum depth: (60 in.) 50-70 in.
Aspect: (North) NE-NW	Ash depth: ash always mixed with colluvium
Slope (42%) 5, 10-60%	Root conc: (21 in.) 15-35 in.
Position: lower to upper 1/3 slopes in drainage headlands	Depth to GT 35% rock frag./size: rock to surface/gravels, cobbles, stones
Other: confined mostly to Idaho observed only once in Oregon	Surface soil/subsoil texture: silt loam/loam

Table of Principal Species

ABLA2/MEFE (n = 6)

Species	Code	Mean Cover(%)	Constancy (%)	Range
Tree Overstory				
*Engelmann spruce	PIEN	24	83	0-35
*subalpine fir	ABLA2	14	100	5-30
lodgepole pine	PICO	15	67	0-25
Tree Understory				
Engelmann spruce	PIEN	8	50	0-11
*subalpine fir	ABLA2	13	100	5-25
Shrubs				
*fool's huckleberry	MEFE	63	100	25-90
*big huckleberry	VAME	16	83	0-60
grouse huckleberry	VASC	10	100	1-30
Sitka alder	ALSI	1	50	0-1
prince's pine	CHUM	2	50	0-5
Forbs				
heartleaf arnica	ARCO	1	67	0-1
*sidebells pyrola	PYSE	5	67	0-15
rattlesnake plantain	GOOB	3	67	0-10
sickletop lousewort	PERA	8	33	0-15
litter		44	100	20-60
moss		54	83	0-70
lichen		3	50	0-5
bare ground		2	50	0-3
gravel		1	67	0-1

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands n = 6
Herbage production (lbs/acre dry wt.)	less than 100
Average stand diameter/CI*	10.6/1.5
Number of trees per acre greater than 4 in. dbh/CI	250/50
Total basal area per acre/CI	175/30
Average basal area by species in all sampled stands	
ABLA2	48
PIEN	78
PICO	42
PSME	10
Mean Age/GBA by species	
ABLA2	160/150
PIEN	180/200
PICO	170/135

Productivity estimate

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
ABLA2	3	65(26)	10(4)	150	40	40	15
PIEN	4	95(58)	7(5)	200	5	80	8
PICO	5	75(41)	3(2)	135	20	45	8

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - This moist site community is dominated by an Engelmann spruce overstory on steep, north slopes and gentle benches where moisture is retained throughout the summer drought period. Subalpine fir is often codominant in the overstory, but always dominates the reproduction in the understory layer. Lodgepole pine is a frequent overstory component as a decadent old-growth member.

Fool's huckleberry (MEFE), a tall shrub, dominates the undergrowth (mean cover: 63%) with true huckleberries (VAME,VASC) always associated beneath Fool's huckleberry. Sitka alder is often present on these mesic sites. The shrub cover is so

dense that other plants are often unable to compete and persist. Only rattlesnake plantain (GOOB), sidebells pyrola (PYSE) and prince's pine (CHUM) are frequently found occurring beneath the shrubbery.

Beargrass (XETE) is found infrequently in the Seven Devils as a southward extension of larger populations from north central Idaho. The Bridge Creek crossing area south of Seven Devils Guard Station represents one of the few isolated occurrences of beargrass. Here it forms a significant stand beneath Fool's huckleberry. Pink wintergreen (PYAS) was found on some sites with high coverage, but sidebells pyrola (PYSE) was much more frequently encountered.

Successional Relationship - Engelmann spruce is very common in these stands due to its longevity, greater size, and affinity to moist sites. Infrequent fire, low temperatures, and more favorable site conditions resulting from high soil moisture retention provide the opportunity for spruce to establish and occupy these sites for long durations. It occurs as a seral stage indicated by the associated lodgepole pine and the abundance of subalpine fir seedlings in the understory.

This plant association is confined to steep, northerly aspects reflecting the lower elevational limits of the type in the Wallowa-Snake Province. Higher elevation sites were not encountered due to the scoured nature of the Seven Devils uplift.

Comparison with Other Investigators - Daubenmire (1968) described ABLA2/MEFE with beargrass as a frequent associate throughout central Idaho. Pfister, et al (1977); Steele, et al (1981); and Cooper, Neiman, and Steele (1985) described ABLA2/MEFE with phases. This Wallowa-Snake typification of ABLA2/MEFE incorporates a beargrass phase sample, but primarily defines the vegetation similar to their grouse huckleberry (VASC) phase.

Distribution and Environmental Features - This type is restricted to mesic, cold site locations at higher elevations in the Seven Devils of the Hells Canyon NRA. Only one other stand has been located outside the Seven Devils uplift. It is on a seep-influenced north slope above the head of Lightning Creek north of Memaloose Guard Station in Oregon.

The type is most common on steep north-facing slopes in drainage headland areas, but also occurs on gentle sloping cove sites. Elevations range from 6,200 to 7,500 feet (mean: 6,850 ft) the highest mean elevation of all forest plant associations in the Wallowa-Snake Province. Stands of ABLA2/MEFE are often located near ABLA2/VAME and ABLA2/VASC communities.

Soils - Soils are typically dark yellowish brown in color in surface layers, greater than 60 inches in depth, and formed in a mixture of ash and metavolcanic colluvium over older buried soil material. Buried soils are also developed in ash and colluvium and are 12 to 25 inches below the more recent soil material. Surface layers have silt loam textures and 15% to greater than 35% rock fragments by volume. Subsoils have loam textures and greater than 35% rock fragments by volume. Rock fragments are predominantly gravel-sized throughout, although stones and cobbles are not uncommon. Surface rock is generally absent, but may exceed 30% near rock outcrop areas.

These soils are fairly uniform. Their rocky ash-colluvium surface layers are distinctive for the ABLA2/MEFE type. Depth of surface layers may vary according to degree of accumulation of materials over the older residual soils. Lower slopes, especially toeslopes, will have the deepest soils. Clay concentrations are uncommon, but may be present in the buried surface layers.

Summary of Soil and Site Characteristics (all samples) - ABLA2/MEFE

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
45 in. to 80 in.	12 in. to 35 in.	0 in. to 19 in.	stable	43°F to 46°F	surface to 19 in.	occasional

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Stand Structure and Productivity - Stands in this association are predominantly even-aged, although a few of the mixed stands approach a multi-aged condition. Ages of dominant and codominant trees range from 120 to nearly 200 years in moderately dense stands (mean basal area: 175 sq ft/acre). Often, lodgepole pine, subalpine fir, and Engelmann spruce are close in age indicating their similar time of initial site occupancy.

Overall, productivity is low in stands belonging to this association. Growth basal area for subalpine fir and Engelmann spruce is the lowest of all forest associations in the Province. Lodgepole pine stockability is moderate in comparison to other types where the species is a seral dominant. Within the type, spruce maintains the most acceptable growth at typically moderate stocking levels.

Silvicultural Considerations - Lodgepole pine will be favored by tree overstory removal while spruce and subalpine fir respond more to overstory shading. Overstory removal will result in increases of both fool's huckleberry and big huckleberry. Without shrub control measures, extensive shrubfields may result and these will limit successful tree reproduction. Disturbance of soils coupled with overstory tree canopy removal may permit invasion by Sitka alder.

These cold sites will tend to favor lodgepole pine as the insulating tree layer is removed in clearcutting operations. Partial overstory removals, (i.e., shelterwood or uneven-aged management) will provide some thermal moderation to exposed sites with spruce and fir more likely to establish and persist.

Range and Wildlife Management - The weight of heavy snow on steep north exposures at high elevations for so much of the year has caused the fool's huckleberry branches to orient prostrate or downslope creating difficult transit for animals. Few signs were witnessed of domestic or wild ungulates in these stands. Enhancement for domestic livestock would not be cost effective. Elk probably make good use of these cool, shady north slopes for thermal cover, hiding cover, and some browse.

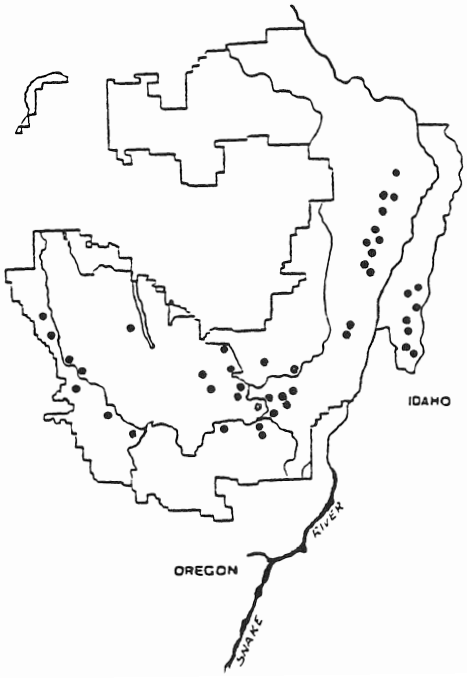
Role of Fire - Sites are too moist for ignition and adequate burning during much of the year. Steep clearcut slopes may be more easily consumed by fire as a result of greater solar radiation onto these more exposed sites. Lodgepole pine would be promoted by these burns.

Following fire, shrubs will regenerate more profusely. Wildlife habitat should be promoted, but silvicultural interests would probably be detrimentally affected by the ensuing vigorous competition from fire-responsive shrubs (i.e., true huckleberries, fool's huckleberry).

Subalpine fir is readily damaged by fire due to its thin bark and flammability of dry lower limbs. The infrequency of fire due to fire suppression in this type is demonstrated by the degree of dominance by subalpine fir. The role of spruce as a seral member is also a result of fire periodicity. Spruce often survive fires as relict islands where either site conditions or topographic features have protected them. Spruce therefore, become long-term occupants in ABLA2/MEFE as well as other moist-site subalpine fir and grand fir climax types.

Subalpine fir/grouse huckleberry/skunk-leaved polemonium plant association
Abies lasiocarpa/Vaccinium scoparium/Polemonium pulcherrimum (ABLA2/VASC/POPU) (CES4 15)

45. Aspen Creek Basin (Pine Ranger District) *Plot 1229*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: ash and colluvium from basalt, various geologies
Elevation: (6500 ft.) 5100, 5600-7500	Solum depth: (36 in.) 30-47 in.
Aspect: All	Ash depth: (17 in.) 14-23 in.
Slope (11%) 3-45%	Root conc: (17 in.) 14-23 in.
Position: plateau tops & brows mountain basins	Depth to GT 35% rock frag./size: (15 in.) 9-23 in./ gravel, cobbles, stones
Other: coldest subalpine fir sites	Surface soil/subsoil texture: silt loam/silty clay loam, clay loam

Table of Principal Species

ABLA2/VASC/POPU (n = 44)

Species	Code	Mean Cover (%)/Constancy (%) Late Seral (n=17)	Mid Seral (n=4)	Early Seral (n=19)	V.Early Seral (n=4)	Mid to Late Seral Range
Overstory						
*Engelmann spruce	PIEN	30/76	5/25	5/5	-	0-50
*subalpine fir	ABLA2	25/100	29/100	3/26	-	0-60
lodgepole pine	PICO	4/59	28/100	31/89	25/25	0-50
Understory						
Engelmann spruce	PIEN	4/59	3/50	5/53	4/75	0-13
subalpine fir	ABLA2	24/100	43/100	14/95	29/100	1-60
lodgepole pine	PICO	1/18	-	10/74	67/75	0-1
Shrubs						
*grouse huckleberry	VASC	14/88	26/75	60/100	1/25	0-75
big huckleberry	VAME	1/41	1/75	8/47	-	0-1
*Utah honeysuckle	LOUT2	3/76	2/75	2/68	1/100	0-10
prince's pine	CHUM	2/29	1/75	4/47	-	0-5
birchleaf spiraea	SPBE	-	-	1/32	-	-
Scouler willow	SASC	-	-	-	6/50	-
Forbs						
*round-leaved violet	VIOR2	5/59	8/100	6/53	1/50	0-30
heartleaf arnica	ARCO	7/76	4/100	8/42	6/75	0-25
sidebells pyrola	PYSE	4/59	1/50	-	-	0-15
Sitka valerian	VASI	2/65	1/25	-	-	0-10
sweet cicely	OSCH	3/35	1/75	1/32	1/25	0-10
*skunk-leaved polemonium	POPU	2/82	1/25	2/16	2/75	0-5
sickletop lousewort	PERA	2/47	1/25	-	-	0-5
western meadowrue	THOC	2/41	4/75	1/16	1/25	0-10
lupines	LUPIN	3/41	1/25	1/21	11/50	0-10
strawberries	FRVE,FRVI	-	-	3/37	15/25	0-1
white-flowered hawkweed	HIAL	5/24	-	2/53	1/50	0-15
Sedges and Grasses						
Ross' sedge	CARO	2/53	1/50	2/42	1/25	0-5
northwestern sedge	CACO	2/12	-	2/21	-	0-3
pinegrass	CARU	-	-	7/53	-	-
elk sedge	CAGE	-	-	4/21	-	-

* Principal Indicator Species

Stand Characteristics and Productivity

	Mid and Late Seral (n=10)	Early Seral (n=11)	V.Early Seral (n=3)
Forbage production (lbs./acre dry wt.)		less than 100	
Average stand diameter/CI*	10.0/1.8	8.6/1.7	4.3/1.6
Number of trees per acre greater than 4 in dbh/CI	340/100	400/100	650/165
Total basal area per acre/CI	220/28	170/14	213/40
Average basal area by species in all sampled stands			
ABLA2	133	12	23
PIEN	54	5	-
PICO	18	133	190
LAOC	-	19	-
PSME	12	1	-
ABGR	5	1	-
Mean Age/GBA by species			
ABLA2	120/190	-	-
PIEN	180/230	150/270	-
PICO	150/170	120/140	70/210
LAOC	-	160/160	-
PSME	130/235	-	-

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
ABLA2	10	78(31)	10(4)	190	16	60	6
PIEN	8	90(55)	10(6)	240	53	100	8
PICO	17	75(41)	5(3)	150	13	45	3
LAOC	5	80(45)	5(3)	160	24	60	14
PSME	3	68		235	41	71	7

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Spruce and subalpine fir codominate overstory positions in the old-growth stands of this type. Lodgepole pine is decadent in these stands. Understory regeneration is dominated by subalpine fir. Grouse huckleberry (VASC) usually covers the ground with only an occasional Utah honeysuckle (LOUT2) breaking the continuity of the huckleberry cover. Big huckleberry (VAME) may be present, but then sites are too cold for big huckleberry establishment.

Forbs are present, but usually at lower coverages. The most prominent in mid and late seral stands are heartleaf arnica (ARCO), Sitka valerian (VASI), sidebells pyrola (PYSE), and round-leaved violet (VIOR2). Skunk-leaved polemonium (POPU) has the highest constancy for the type in late seral stands. Ross' sedge is often present in limited coverage.

Successional Relationship - Lodgepole pine is successional to subalpine fir. At mid-seral stages a subalpine fir pole stand is present with emergent spruce. At the old-growth stage, spruce and subalpine fir codominate with decadent lodgepole pine. Grouse huckleberry (VASC) is present in high amounts through all stages of succession with cold-tolerant forbs: Sitka valerian (VASI), sidebells pyrola (PYSE), and round-leaved violet (VIOR2). Coverage by grouse huckleberry decreases from 60% in early seral stands to less than 15% in late seral communities. The presence of grouse huckleberry from early seral stages through climax appears to be based on maintenance of cold, moist conditions through frost and long snow cover periods. These sites are too cold for big huckleberry (VAME) to colonize and persist.

Comparison with Other Investigators - The ABLA2/VASC habitat type has been defined by Daubenmire (1968); Hall (1973); Pfister (1977); Steele (1981, 1983); Cooper, Neiman, and Steele (1985); Williams and Lillybridge (1983); and Lillybridge and Williams (1984) in the general proximity to the study area. The skunk-leaved polemonium modifier has been added to the Wallowa-Snake classification of ABLA2/VASC communities to help define its differences from other less productive vegetation similarly classified in the Pacific Northwest.

Distribution and Environmental Features - This association is the most widespread type in the ABLA2 series. Elevations range from 5,600 to 7,000 ft (ave.: 6,500 ft.). The type occurs on three distinct landforms: 1) plateau and ridge flats and brows, 2) high elevation mountain benches, and 3) slopes and flats in mountain basin areas.

Sites are very cold due to their exposure at high elevations, or at lower elevation positions where cold air often ponds. Microrelief on slopes greater than 10% is generally convex, while on plateau, ridge, and bench flats these stands occur on slightly undulating or concave topography. Stands in this association merge with the ABLA2/VAME type at all but the highest elevations. Distinct boundaries are evident throughout the series of mountain bench-sideslopes common below the Imnaha Divide where ABLA2/VAME dominates the slopes and ABLA2/VASC/POPU dominates the benches. Within the rolling topography of shallow broad plateaus, gradual community shifts may be noticeable as aspect changes. Grouse huckleberry tends to dominate the more westerly exposures and big huckleberry the more northeasterly exposures. Higher elevation mountain basins may contain ABLA2/VASC at all exposures on both flats and slopes.

This type also occurs in the High Wallowas. There, site characteristics and growth response are more similar to that described by other investigators classifying ABLA2/VASC in the Pacific Northwest and northern Rocky Mountains.

Soils - Soils are typically dark yellowish brown to dark brown in color in surface layers, less than 45 inches in depth, and formed in mixtures of ash with minor amounts of basalt or metavolcanic colluvium over older buried soil material. Buried soils are formed in loess, ash and basalt, metavolcanic or mixed colluvium, or overlie bedrock. They are 10 to 23 inches below the more recent soil material. Surface soil-ash layers have silt loam textures with less than 15% rock fragments by volume. Subsoils are often dense and clayey and have silty clay loam or clay loam textures with greater than 35% rock fragments by volume. Rock fragments tend to be gravel-sized in surface layers and stone or cobble-sized in subsoil layers. Surface rock is usually absent.

Forested communities in the ABLA2/VASC/POPU association may occur on many different soils and sites. The situation described above is most typical on basalt plateaus, metavolcanic ridges, and drainage headlands. Ash depth may vary considerably in these locations, however, and appears closely related to tree productivity (see productivity discussion below). Cold mountain basins may also contain this community. In these locations, rocky sideslopes, toeslopes of bouldery glacial till, and moraines can all support ABLA2/VASC/POPU communities. Soils are still ash-influenced but total depths and rock fragment content is quite variable. Mountain bench locations commonly have deeper colluvial accumulations, but not always deeper ash than plateau sites. In general, steeper slopes (greater than 25%) have shallower ash-caps and more mixing of rock material. Clay concentrations are more common on sites with slopes of less than 10% and elevations less than 6,500 feet.

Summary of Soil and Site Characteristics (all samples) - ABLA2/VASC/POPU

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
23 in. to 80 in.	12 in. to 35 in.	7 in. to 28 in.	very stable	40°F to 48°F	surface to 34 in.	0

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Silvicultural Considerations - Cold temperatures, long snow cover periods, and high frost potential due to ponding of cold air are major limitations to management in this type. However, the probability is high for lodgepole pine establishment from natural regeneration within five years of overstory removal if an adequate seed source is available and heat is sufficient to induce the serotinous cones to open.

Exposure of some mineral soil is especially beneficial to lodgepole pine seedling establishment. Sites are suitable for lodgepole pine plantations in most locations except in some shallow-soil ridge areas. On such exposed sites, windthrow may also be a problem. On wetter sites spruce should be favored. Douglas-fir and ponderosa pine are unsuitable on all sites. Larch may only be suitable at lower elevations on the warmer sites within this type. Harvest systems in old-growth PIEN-ABLA2 stands may require high density shelterwoods or small clearcuts to perpetuate these species in future stands. Overstory removals to release spruce and subalpine fir saplings and poles can be very successful. Clearcutting with site preparation in lodgepole pine stands has proven successful in maintaining well-stocked even-aged pine stands. Strip clearcuts up to 1-1/2 to 2 times the adjacent tree heights should be most successful. Based on sampled tree core data, thinning is recommended in these stands between 25 and 35 years of age when natural stands begin to close canopies. Although the incidence of pine beetle attacks is low, the potential is high in lodgepole pine stands under growth stress.

Role of Fire - Fires have historically modified these communities with lodgepole pine replacing the highly fire-sensitive subalpine fir and Englemann spruce. Grouse huckleberry is moderately susceptible to fire; stem budding occurs following burns. Heartleaf arnica may increase from underburning in this type.

Range and Wildlife Management - The grazing season is short and natural forage species few, if any. This is transitory livestock range. Elk and deer use the type essentially for escape cover. The fruits of grouse huckleberry are important for blue and Franklin's grouse.

Stand Structure and Productivity - A wide range in diameter/age distribution may occur in stands belonging to this association. Sampled stands varied according to their successional status. Both even-aged lodgepole pine or larch stands and multi-aged spruce-fir stands were sampled. The even-aged stands usually contain overtopped spruce and sub-alpine fir stems that are one-third to more than three-quarters the age of the lodgepole pine or larch overstory thereby forming a two-aged stand. A consistent reduction of diameter growth between ages 25 and 35 years was common in both lodgepole pine and larch overstories suggesting a period of crown closure and greater intra-specific competition.. Basal areas in mid and late seral stands range from 180 to 250 sq. ft./acre while in early seral stands from 100 to 200 sq. ft./acre.

Few if any spruce-fir stands exist in the Wallowa-Snake Province that are truly all-aged. Most all sub-alpine fir communities have developed under lodgepole pine overstories. It is likely that fires have been so common in the past that little opportunity for long-term domination by spruce and subalpine fir existed in stands in the ABLA2/VAME and ABLA2/VASC/POPU associations.

In general, growth is moderate to low in stands belonging to this association. However, growth of subalpine fir is among the highest for that species for all forested associations in the Province. Within the type, Engelmann spruce attains the greatest size and maintains acceptable diameter growth at the highest basal area stocking levels. Growth may be better in mixed communities where spruce mainly competes with larch and lodgepole pine. At elevations greater than 7,400 feet on granodiorite bedrock in the Eagle Cap Wilderness, growth for all species is substantially less than described in this study.

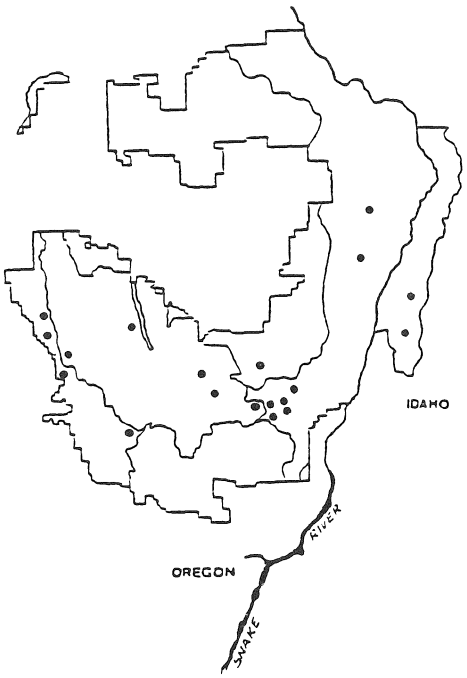
Ash depths on ABLA2/VASC/POPU sites may vary considerably and appear to have a strong influence on tree productivity. Growth basal area and cubic volume production at culmination may be 40-50% higher for spruce, subalpine fir, and lodgepole pine on soils with surface ash exceeding 25 inches in depth. Ash accumulation areas in toeslopes and depressions in drainage headlands often support the more productive ABLA2/VASC/POPU stands. Stand structure may also influence measured productivity. In overstocked, very early seral lodgepole pine stands, lodgepole pine GBA may be much greater than that described for more typical stand conditions. In these situations where tree mortality is high, and the large number of stems/acre increases the risk of measurement error, accurate productivity estimates are difficult. Growth basal area estimates may not truly represent the average growth in these stands because it is determined from mostly dominant trees. In overstocked stands, the few trees in dominant positions may perform very differently than those found in the majority of the stand.

Lodgepole pine/grouse huckleberry/skunk-leaved polemonium plant community type

Pinus contorta (Abies lasiocarpa)/Vaccinium scoparium/Polemonium pulcherrimum

PICO (ABLA2)/VASC/POPU (CLS4 15)

46. Pole Creek (La Grande Ranger District) *Plot 1353*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: ash and colluvium over buried soils
Elevation: (6300 ft.) 5100-7200 ft.	Solum depth: (39 in.) 23-51 in.
Aspect: All	Ash depth: (15 in.) 10-17 in.
Slope (11%) 3-35%	Root conc: (17 in.) 14-20 in.
Position: plateau tops brows,basins	Depth to GT 15% rock frag./size: (12 in.) 3-17 in./gravels,cobbles
Other: represents ABLA2 areas with stand replacement fires	Surface soil/subsoil texture: silt loam/silty clay loam

Table of Principal Species

PICO(ABLA2)/VASC/POPU (n = 19)

Species	Code	Early Seral Stage Mean Cover(%)	Early Seral Stage Constancy (%)	Range
Overstory				
*lodgepole pine	PICO	31	89	0-65
subalpine fir	ABLA2	3	26	0-5
Understory				
lodgepole pine	PICO	10	74	0-35
*subalpine fir	ABLA2	14	95	0-35
Engelmann spruce	PIEN	5	53	0-20
Shrubs				
*grouse huckleberry	VASC	60	100	10-85
big huckleberry	VAME	8	47	0-20
*Utah honeysuckle	LOUT2	2	68	0-10
birchleaf spiraea	SPBE	1	32	0-3
prince's pine	CHUM	4	47	0-10
Grasses and Sedges				
Ross' sedge	CARO	2	42	0-3
northwestern sedge	CACO	2	21	0-3
pinegrass	CARU	7	53	0-15
elk sedge	CAGE	4	21	0-5
Forbs				
*round-leaved violet	VIOR2	6	53	0-20
heartleaf arnica	ARCO	8	42	0-30
white flowered hawkweed	HIAL	2	53	0-5
sweet cicely	OSCH	1	32	0-3
strawberries	FRVE,FRVI	3	37	0-10

* Principal Indicator Species

See ABLA2/VASC/POPU for productivity estimates

Vegetative Composition - Lodgepole pine dominates the overstory tree canopy in these 120 year-old communities. Larch is sometimes present as an associate of equal stature. In the tree understory, subalpine fir is usually present in a pole-sized layer beneath the lodgepole pine overstory. Spruce seedlings and saplings are encountered in greatest profusion in those tree understories where lodgepole has ceased to regenerate and succession is at mid-seral levels. Douglas-fir and grand fir are occasional as seedlings and saplings in minor amounts and are successional to subalpine fir on some sites.

Grouse huckleberry (VASC) is the dominant understory plant with big huckleberry (VAME) either associated in lesser amounts or absent altogether. Prince's pine (CHUM) and Utah honeysuckle (LOUT2) are very common shrub associates at low levels of coverage.

In these early seral stands, pinegrass (CARU) occurs frequently and provides the highest coverage of herbaceous plants (7%). It is absent in late seral stages. Heartleaf arnica (ARCO) and round-leaved violet (VIOR2) (late seral associates of greatest abundance), strawberries (FRVI, FRVE), meadowrue (THOC), and white hawkweed (HIAL) are the most commonly found forbs in these stands. Ross' sedge is a consistent associate throughout the succession in ABLA2/VASC/POPU stands, but declines as shade increases in later seral communities.

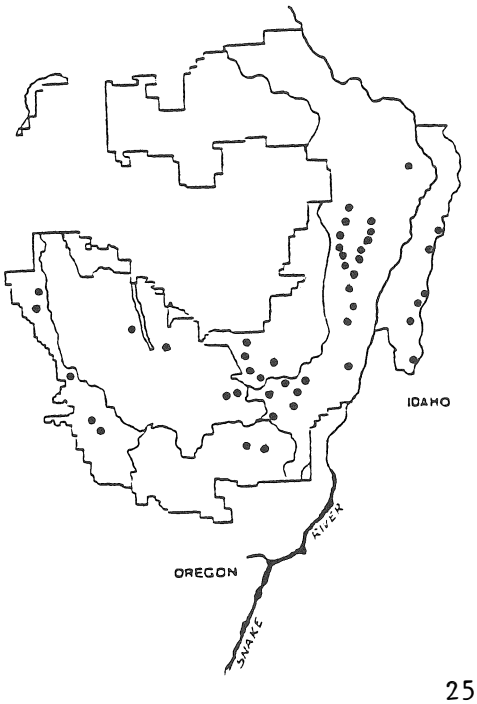
Long-stalked clover (TRLO) invades understories following heavy ungulate disturbance.

Successional Relationship - The high elevation and gentle topography of this lodgepole pine type ensures that grouse huckleberry will dominate and persist beyond early to mid-seral stages to provide an ABLA2/VASC plant association in late seral to climax stages. Grouse huckleberry is tolerant of cold air ponding and severe cold temperatures.

Lodgepole pine produces non-serotinous and serotinous cones in the Blue and Wallowa Mountains. Fire is not necessary to open the serotinous cones as heat from increased solar radiation may be sufficient. The best germination of the species is on mineral soil or disturbed duff (USDA-Forest Service, 1965). Low intensity fires tend to burn along the ground surface and result in an uneven-aged stand. High intensity crowning fires will destroy the stand and result in a dense even-aged stand from the heavy seeding by serotinous cones (Lotan and Perry, 1983). Regeneration is abundant, often resulting in stagnation at extremely early ages. The tendency of lodgepole pine to overstock and stagnate is probably the most extreme of any tree species in North America (USDA-Forest Service, 1965). Management should utilize patch clearcutting and rely on natural regeneration of lodgepole pine to re-forest areas with even-aged stands.

Subalpine fir/big huckleberry plant association
Abies lasiocarpa/Vaccinium membranaceum
(ABLA2/VAME) (CES3 15)

47. Sluice Creek Saddle on Summit Ridge (Hells Canyon NRA) *Plot 536*



ENVIRONMENT
(all plots)

Location:
All Districts

Elevation: (6200 ft.)
5000-7100 ft.

Aspect: (NE-NW)
SE-West

Slope (24%)
5, 10-70%

Position: lower 1/3 to upper 1/3 of slopes in drainage headlands

Other: one of the most extensive ABLA2 types

SOILS
(typical soils)

Parent Material: ash and colluvium over residual soils in basalt and metavolcanics

Solum depth: (60 in.)
45-80 in.

Ash depth: (20 in.)
11-28 in.

Root conc: (20 in.)
14-33 in.

Depth to GT 35% rock frag./size:
surface to 25 in./gravels, cobbles

Surface soil/subsoil texture:
silt loam/silty clay loam, loam, clay loam

Table of Principal Species

ABLA2/VAME (n = 46)

Species	Code	Mean Cover (%)/Constancy (%) Late Seral PIEN (n=4)	Late Seral PIEN-ABLA2 (n=15)	Mid Seral (n=15)	Early Seral (n=12)	Mid to Late Seral Range
Overstory						
*Engelmann spruce	PIEN	40/100	19/80	8/47	13/8	0-60
*subalpine fir	ABLA2	2/50	26/100	6/73	3/17	0-45
lodgepole pine	PICO	3/25	11/53	10/53	27/83	0-30
western larch	LAOC	-	1/7	10/47	3/33	0-20
Douglas-fir	PSME	1/25	10/7	29/60	1/8	0-50
Understory						
Engelmann spruce	PIEN	8/75	2/67	9/40	5/58	0-23
*subalpine fir	ABLA2	12/100	15/100	15/100	14/83	1-40
grand fir	ABGR	-	-	17/33	11/58	0-40
Douglas-fir	PSME	-	-	2/33	7/33	0-5
lodgepole pine	PICO	-	-	-	21/50	-
western larch	LAOC	-	-	-	5/33	-
Shrubs						
*big huckleberry	VAME	33/100	38/100	41/87	40/100	0-90
grouse huckleberry	VASC	5/25	11/73	15/27	25/83	0-45
*Utah honeysuckle	LOUT2	2/75	4/73	3/67	2/83	0-20
prince's pine	CHUM	1/50	3/73	4/80	5/92	0-10
Sitka alder	ALSI	1/50	-	-	-	0-1
Ribes spp.	RIBES	2/100	1/27	6/47	2/42	0-20
birchleaf spiraea	SPBE	-	-	5/33	4/75	0-15
Forbs						
*round-leaved violet	VIOR2	4/100	4/73	10/67	3/92	0-20
heartleaf arnica	ARCO	2/75	4/93	11/73	5/58	0-40
skunk-leaved polemonium	POPU	1/25	4/53	4/53	1/8	0-15
sickleleaf lousewort	PERA	1/50	5/47	-	1/8	0-25
Sitka valerian	VASI	1/25	4/40	2/33	-	0-10
*sidebells pyrola	PYSE	2/100	3/73	5/60	1/50	0-10
mountain sweetroot	OSCH	1/50	2/40	3/60	2/33	0-10
western meadowrue	THOC	1/75	3/53	13/80	4/42	0-25
rattlesnake plantain	GOOB	6/50	3/27	2/53	1/50	0-10
bigleaf sandwort	ARMA3	1/25	1/20	7/47	-	0-10
strawberries	FRVE,FRVI	-	-	2/33	5/42	0-3
Grasses and Sedges						
pinegrass	CARU	-	-	3/33	5/17	0-5
elk sedge	CAGE	-	-	8/13	5/8	0-15
Columbia brome	BRVU	-	-	2/33	1/25	0-5
Ross' sedge	CARO	-	-	1/40	1/17	0-1
northwestern sedge	CACO	-	-	2/13	-	0-3

* Principal Indicator Species

Stand Characteristics and Productivity

	Late Seral (n=10)	Mid Seral (n=4)	Early Seral (n=8)
Herbage production (lbs./acre dry wt.)	less than 100		
Average stand diameter/CI*	10.5/1.5	13.0/5.3	7.9/1.5
Number of trees per acre greater than 4 in dbh/CI	260/40	270/130	415/125
Total basal area/CI	190/25	225/40	185/35
Average bsal area by species in all sampled stands			
ABLA2	121	18	23
PIEN	49	8	12
PICO	20	37	107
LAOC	1	71	23
PSME	2	69	10
ABGR		22	10
Mean Age/GBA by species			
ABLA2	140/150		98/200
PIEN	160/200	180/243	100/265
PICO	150/145	160/160	100/150
LAOC		170/155	120/190
PSME	150/240	180/275	95/300

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
ABLA2	10	70(28)	6	160	15	45	7
PIEN	8	85(52)	9(6)	235	20	80	4
PICO	12	80(44)	7(4)	150	14	50	8
LAOC	4	100(57)	9(5)	170	25	65	8
PSME	4	70	9	275	36	88	15

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Overstory canopy coverage averages about 45% with spruce and subalpine fir associated in late seral stands. Decadent lodgepole pine is the only other principal overstory component. Tree understories are dominated by subalpine fir seedlings and poles with only occasional spruce. The open understory character is fairly homogenous with huckleberries (VAME, VASC) dominating. Principal forb components are round-leaved violet (VIOR2), sweet cicely (OSCH), sidebells pyrola (PYSE), sickle-leaf lousewort (PERA), western meadowrue (THOC), rattlesnake plantain (GOOB), and skunk-leaved polemonium (POPU). Utah honeysuckle (LOUT2) is consistently present.

A late seral stage Engelmann spruce-dominated stand occurs in this type persisting on pockets of shady, cool sites where litter is more abundant and understory plants less prevalent than in the old-growth spruce-fir co-dominant stands. Even in these, subalpine fir is regenerating and should succeed as fire frequency is restricted.

Distribution and Environmental Features - This association is one of the more widespread types in the ABLA2 series. It covers extensive, moderately steep to steep slopes at high elevations throughout the dissected plateau and mountain slopes of the Wallowas and Seven Devils. Elevations range from 5,000 to 7,100 ft. (ave. 6,200 ft.). The type occurs on three distinct landforms: 1) sideslopes and ridgebrows of the dissected plateau; 2) high elevation mountain sideslopes; and 3) steep sideslopes of drainage headlands. Position within these landforms varies from the lower to upper third of slopes. Throughout its distribution the type merges with ABLA2/VASC on flats and slopes. On the more gentle slopes the transition zone is broad, while distinct boundaries are recognizable only where slope and site breaks are abrupt.

Soils - Soils are typically dark brown to dark yellowish brown in color in surface layers, greater than 45 inches in depth and formed in ash and basalt or meta-volcanic colluvium over older buried soil material. Buried soils are developed in loess, ash, and colluvium and may be 16 to 35 inches below the more recent soil material. Surface soil-ash layers have silt loam textures with less than 15% rock fragments by volume. Rock fragments are much more common in subsoil layers where they may exceed 35% by volume. Clay concentrations are also common. Soil textures range from silty clay loam to clay loam or loam. Rock fragments tend to be gravel-sized in surface layers and gravel to cobble or stone-sized in subsoil layers. Surface rock is generally absent.

These soils vary mainly in depth of ash, amount of rock fragments, and presence of clayey layers. Slopes greater than 15% normally have soils with less surface ash and more rock fragments. Soils derived from metavolcanic parent material are also coarser textured and may have as much as 35% rock fragments in surface layers. Clay in soil layers appears more common on sites below 6,000 feet in elevation, perhaps indicating a warmer climate more conducive to soil formation. Although total soil depth is fairly uniform, shallower soils may occur on steeper mountain sideslopes or near ridgebrows. The deepest soils are more common at toeslope locations or above barriers to downward movement of colluvium. In general, these soils at all locations are more coarse textured than those supporting ABLA2/VASC communities, especially in subsoil layers.

Summary of Soil and Site Characteristics (all samples) - ABLA2/VAME

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
36 in. to 80 in.	9 in. to 34 in.	9 in. to 32 in.	mod stable to stable	40°F to 45°F	surface to 32 in.	**LT 5%

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - Lodgepole pine stands precede the spruce and subalpine fir and are prevalent on ridgetops and dissected plateau slopes where fire has been catastrophic. Mid seral stands contain Douglas-fir and western larch with lodgepole pine in association with the spruce and subalpine fir. The lack of old-growth lodgepole ping or preponderance of lodgepole pine logs encountered on the ground reflects the mid-seral stage of this type. The cold-tolerant grouse huckleberry (VASC) appears to precede big huckleberry (VAME) and help moderate the early seral site for it. Where wetter sites occur within this type, Sitka alder (ALSI) often occurs as a mid-seral member prior to crown closure or

as a long-term occupant of seepages, springs, and riparian locations. Plants reflecting cooler, drier regimes within the type are skunk-leaved polemonium (POPU) and Sitka valerian (VASI). Ribes species, birchleaf spiraea (SPBE), meadowrue (THOC), heartleaf arnica (ARCO), strawberries (FRVI, FRVE), pinegrass, and elk sedge are more prevalent members of mid seral ABLA2/VAME stands.

Disturbance is reflected by increases in heartleaf arnica (ARCO), western meadowrue (THOC), and mitella (MIST2). Game use is more prevalent in these stands than domestic livestock use. Big huckleberry is so abundant that detrimental browsing has not been observed in this type. Long-stalked clover (TRLO) appears to be a minor increaser in ABLA2/VAME stands.

Series Relationship - The ABLA2/VAME type occupies steep slopes at the highest elevations of the Wallowa-Snake Province. Reflecting the high elevation are presence by meadowrue (THOC), Sitka valerian (VASI), and skunk-leaved polemonium (POPU).

Silvicultural Considerations - As in the ABLA2/VASC type, the major concern to management is cold temperatures. Snow cover periods are shorter, however, and ponding of cold air is not a problem on these typical mountain sideslope sites. The probability is high for lodgepole pine establishment from natural regeneration within five years of overstory removal if a seed source is available. Some site preparation to expose mineral soil, to benefit the lodgepole seedling establishment, and to reduce shrub competition may be needed. Serotinous cones of lodgepole require heat to open them for dispersal. Fire should be used to promote the lodgepole re-establishment. As with other forested communities where ash influences the soil, there is a risk of site productivity reduction due to displacement or loss of this important soil component. The ABLA2/VAME sites have comparitively thin ash layers and often occur on steep colluvial slopes increasing the possibility for site degradation. Sites are suitable for lodgepole pine plantation although the sloping topography reduces operability. Larch is suitable for all sites. Spruce and subalpine fir are more suitable on the wetter, cooler sites. Ponderosa pine and Douglas-fir are unsuitable on all sites. Harvest systems that do not expose sites too rapidly would be required to maintain spruce and subalpine fir in stands. Thinning in young (25 to 35 years) lodgepole and larch stands is highly recommended.

Role of Fire - Stand replacement fires have created lodgepole pine seral communities in this type. Western larch is also fire seral and often forms fairly homogeneous stands in the type. Subalpine fir and Englemann spruce are highly susceptible to fire. Big huckleberry is generally resistant to fire and sprouts vigorously and rapidly following a cool burn. A hot burn that consumes the duff will also injure big huckleberry rhizomes.

Range and Wildlife Management - The generally steep slopes, lack of desirable native forage, and distance of ABLA2/VAME communities away from desirable forage-providing areas limits the use by domestic livestock. Following logging, standard grass seed mixtures should provide successful short-term erosion control and forage prior to aggressive restocking by big huckleberry. Elk and deer use these sites for cover and forage. Huckleberry fruits are sought by bears, grouse, and people.

Stand Structure and Productivity - The diameter/age distribution for stands sampled in this association ranges from even-aged in early seral stands to multi-aged in late seral stands. Basal areas in late seral stands where sub-

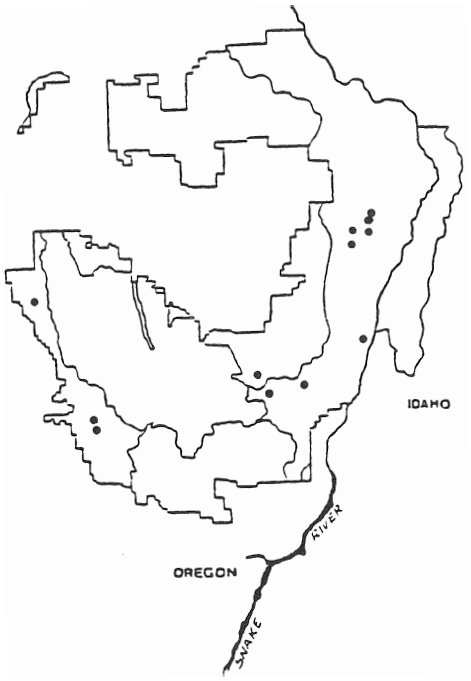
alpine fir and spruce are dominant members ranges from 160 to over 200 sq. ft./ acre (ave. 190). Mid seral stands where Douglas-fir, lodgepole pine and larch form mixtures in the overstory are more heavily stocked and range from 180 to 270 sq. ft./acre (ave. 225). Early seral stands of pure lodgepole or mixed lodgepole and larch are more moderately stocked at 150 to over 220 sq. ft/acre (ave. 185). Considering the amount of downed lodgepole stems and the ages of standing lodgepole pine, it is apparent that nearly all of the late seral uneven-aged spruce and subalpine fir-dominated stands developed under an even-aged canopy of lodgepole pine. In these situations, initial suppression for periods ranging from 60 to 100 years is common in the spruce and subalpine fir trees now in dominant and codominant positions. From observations in lodgepole pine-dominated stands, this appeared to be the age at which overstory stand structure normally begins to break up, releasing the understory spruce and fir saplings, poles, and seedlings. As in the ABLA2/ VASC type, lodgepole pine shows a consistent reduction of diameter growth below 10/20 in. per decade between 25 and 35 years of age.

Overall growth is moderate to low for stands in this association. Site index and GBA for subalpine fir and Engelmann spruce are among the lowest for all associations described. Larch maintains more acceptable diameter growth at higher stocking levels than in ABLA2/VASC while lodgepole pine stockability is roughly the same in both types. Within the ABLA2/VAME type, individual tree performance may vary in different seral stages. In general, all species show lower GBA's in late seral stands. This may be due in part to the age effect on GBA as reported by Hall (1985), although average tree ages in mid seral and late seral sample stands were very similar. It is suspected that the varying competitive pressures in stands of different species compositions plays a more important role. It seems likely that competition is more severe when the struggle for space is between trees of the same species or between ones with similar growth requirements. Although this is difficult to determine directly, on the average, individual tree growth appears better in mixed stands, especially where species of different shade tolerances exist. Thus, spruce in ABLA2/VAME communities may perform better in stands where competition is between lodgepole and larch, as is found in many mid seral situations, and worse in stands comprised entirely of subalpine fir and Engelmann spruce.

Comparison with Other Investigators - Hall (1973) described ABLA2/VAME in the Blue Mountains. Steele (1981, 1983) described a similar type with Vaccinium globulare, a morphologically similar tall huckleberry. Williams (1983) and Lillybridge (1984) have a somewhat similar type with multiple huckleberries associated (V.caespitosum, V.myrtillus, and V.membranaceum). Daubenmire (1968) did not classify a tall huckleberry type in northern Idaho, however.

Lodgepole pine/big huckleberry plant community type
Pinus contorta (Abies lasiocarpa)/Vaccinium membranaceum
PICO(ABLA2)/VAME (CLS5 15)

48. Sleepy Ridge (Hells Canyon NRA) *Plot 513*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: ash and basalt colluvium
Elevation: (6000 ft.) 5600-6500 ft.	Solum depth: (52 in.) 37-60 in.
Aspect: all	Ash depth: (18 in.) 9-30 in.
Slope (12%) 5-18%	Root conc: (16 in.) 9-24 in.
Position: lower to upper slopes	Depth to GT 35% rock frag./size: surface to 20 in./gravels,cobbles
Other: Represents ABLA2 sites with stand replacement fire	Surface soil/subsoil texture: silt loam/silty clay loam clay loam

Table of Principal Species

PICO(ABLA2)/VAME (n = 12)

Species	Code	Early Seral Stage Mean Cover(%)	Early Seral Stage Constancy (%)	Range
Overstory				
*lodgepole pine	PICO	27	83	0-65
western larch	LAOC	3	33	0-5
Understory				
lodgepole pine	PICO	21	50	0-40
*subalpine fir	ABLA2	14	83	0-45
Engelmann spruce	PIEN	5	58	0-18
grand fir	ABGR	11	58	0-50
Shrubs				
grouse huckleberry	VASC	25	83	0-80
*big huckleberry	VAME	40	100	1-90
*prince's pine	CHUM	5	92	0-15
*Utah honeysuckle	LOUT2	2	83	0-10
*spiraea	SPBE	4	75	0-15
Grasses and Sedges				
pinegrass	CARU	5	17	0-5
Forbs				
*round-leaved violet	VIOR2	3	92	0-15
rattlesnake plantain	GOOB	1	50	0-3
heartleaf arnica	ARCO	5	58	0-20
sidebells pyrola	PYSE	1	50	0-3
sweet cicely	OSCH	2	33	0-5
meadowrue	THOC	4	42	0-15
*strawberries	FRVE,FRVI	5	42	0-20

* Principal Indicator Species

See ABLA2/VAME for productivity estimates

Vegetative Composition - The early successional stage of the ABLA2/VAME association is exemplified by this plant community type. Lodgepole pine dominates with usually 10 to 40% canopy coverage. Douglas-fir and larch may also occur as seral components. Spruce and subalpine fir are generally not part of the overstory. Subalpine fir is clearly dominant at this stage in the understory with spruce less likely to enter until the sites have been further moderated at mid- and late-seral stages.

Shrub composition is equivalent to mid-seral ABLA2/VAME stands except for a significantly higher grouse huckleberry (VASC) cover and presence of spiraea (SPBE) not found in the more mature stands. Earlier seral stages were reflected by presence of pinegrass (CARU) and strawberries (FRVI, FRVE) not found in later seral stands and by a lack of Sitka valerian (VASI), sickle-leaf lousewort (PERA), and polemonium (POPU). Moss coverage is lower in this seral community type than in the more mature stands of ABLA2/VAME.

Use by ungulates appeared to be minimal owing to a lack of palatable plants and less desirable shading (thermal cover) and hiding cover.

Successional Relationship - This lodgepole-dominated community with spruce and subalpine fir seedlings and saplings represents the early seral stage of the ABLA2/VAME association.

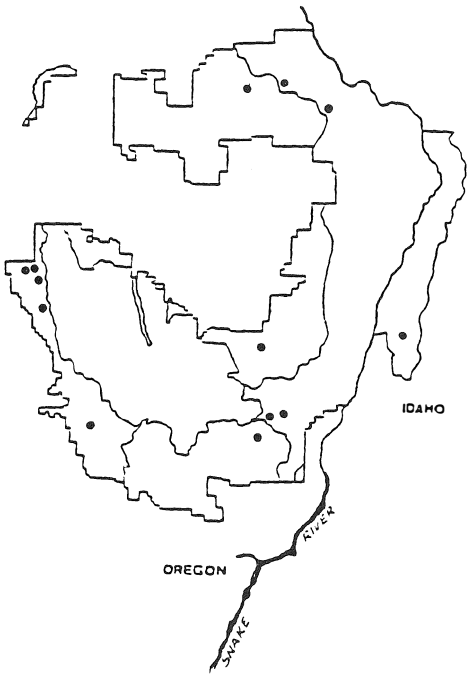
Lodgepole pine produces non-serotinous and serotinous cones in the Blue and Wallowa Mountains. Fire is not necessary to open the serotinous cones as heat from increased solar radiation may be sufficient. The best germination of the species is on mineral soil or disturbed duff (USDA-Forest Service, 1965). Low intensity fires tend to burn along the ground surface and result in an uneven-aged stand. High intensity crowning fires will destroy the stand and result in a dense even-aged stand from the heavy seeding by serotinous cones (Lotan and Perry, 1983). Regeneration is abundant, often resulting in stagnation at extremely early ages. The tendency of lodgepole pine to overstock and stagnate is probably the most extreme of any tree species in North America (USDA-Forest Service, 1965). Management should utilize patch clearcutting and rely on natural regeneration of lodgepole pine to re-forest areas with even-aged stands.

In mixed species stands, larch generally outgrows lodgepole pine at maturity. A typical 95 to 100-year old stand consisting of decadent lodgepole pine and vigorous larch of the same age would exhibit an average lodgepole pine height of 70 feet overtopped by 95 foot larch (Trappe amd Harris, 1958).

Series Relationship - Of the two lodgepole-dominated plant community types encountered in the ABLA2 zone, slopes are steeper in this type permitting big huckleberry to succeed over grouse huckleberry. Big huckleberry is less cold tolerant and assumes dominance as the montane slope becomes less "frosty" from protecting tree canopies in later successional stages. Big huckleberry attains its greatest coverage in the earlier seral stands (avg: 40%) with grouse huckleberry subordinate (avg: 15-25%). Litter is high (avg: 82%) with round-leaved violet (VIOR2), spiraea (SPBE), heartleaf arnica (ARCO, strawberries (FRVI, FRVE), and meadowrue (THOC) all frequently present. Moss/lichen levels are exceedingly low (avg: 9%).

Subalpine fir/queen's cup plant association
Abies lasiocarpa/Clintonia uniflora (ABLA2/CLUN) (CES1 31)

49. Moss Springs (La Grande Ranger District) *Plot 1334*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: ash and colluvium/ alluvium from basalt, various geologies
Elevation: (5000 ft.) 4600-5800, 6100 ft.	Solum depth: (64 in.) 50-80 in.
Aspect: All	Ash depth: (28 in.) 20-33 in.
Slope (7%) 1-17%	Root conc: (27 in.) 20-43 in.
Position: toeslope and btms in mid-elevation drainages + plateaus	Depth to GT 35% rock frag./size: (32 in.) 30-37 in./gravels
Other: occurs in ABGR zone	Surface soil/subsoil texture: silt loam/sand loam, silty clay loam

Table of Principal Species

ABLA2/CLUN (n = 11)

Species	Code	Mean Cover(%)	Constancy (%)	Range
Overstory				
*Engelmann spruce	PIEN	40	100	15-75
subalpine fir	ABLA2	14	54	0-30
western larch	LAOC	5	36	0-10
Understory				
Engelmann spruce	PIEN	5	82	0-20
*subalpine fir	ABLA2	10	100	1-30
grand fir	ABGR	11	73	0-15
Shrubs				
prince's pine	CHUM	5	36	0-8
twinflower	LIBO2	19	54	0-70
Utah honeysuckle	LOUT2	1	36	0-1
mountain-ash	SOSC2	1	18	0-1
swamp gooseberry	RILA	2	64	0-5
big huckleberry	VAME	13	73	0-30
Grasses and Sedges				
*Columbia brome	BRVU	4	91	0-20
Ross' sedge	CARO	1	45	0-1
Forbs				
*tiarella	TITRU	28	25	0-35
*queen's cup	CLUN	14	82	0-30
meadowrue	THOC	6	91	0-20
*sweet cicely	OSCH	2	82	0-5
*round-leaved violet	VIOR2	6	64	0-15
Piper's anenome	ANPI	1	36	0-2
*sidebells pyrola	PYSE	3	82	0-10
*starry Solomon's seal	SMST	4	64	0-15
heartleaf arnica	ARCO	11	91	0-40
fragrant bedstraw	GATR	6	45	0-20
woods strawberry	FRVE	1	45	0-3
rattlesnake plantain	GOOB	3	54	0-5
white-flowered hawkweed	HIAL	4	54	0-15

* Principal Indicator Species

Stand Characteristics and Productivity

	(n=10)
Herbage production (lbs./acre dry wt.)	less than 100
Average stand diameter/CI*	16.7/3.4
Number of trees per acre greater than 4 in dbh/CI	220/70
Total basal area/CI	233/65
Average basal area by species in all sampled stands	
ABLA2	42
PIEN	157
PICO	2
LAOC	14
PSME	6
ABGR	12
PIPO	1
Mean Age/GBA by species	
ABLA2	120/180
PIEN	160/290
LAOC	170/180
ABGR	120/255
PIPO	155/175

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
ABLA2	5	90(36)	10(4)	180	30	70	8
PIEN	10	110(68)	8(5)	290	27	130	23
LAOC	4	118(67)	17(10)	180	18	90	15
ABGR	2	95(51)	3(1)	255	39	105	20
PIPO	2	118	1	175	15	90	7

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Overstory canopy coverage ranging from 15% to 75% contains Engelmann spruce that dominates cool, moist basins or drainage bottoms and toe-of-slope locations in the grand fir zone. Subalpine fir seedlings are usually prolific, but spruce dominates the upper size categories and understory pole size categories reflecting the greater longevity of the spruce on these sites. Only occasional grand fir is present from adjacent stands.

Twinflower (LIBO2) is a dominant sub-shrub in heavily shaded areas while big huckleberry (VAME) occupies patches within the stand where sunlight can enter. Queen's cup (CLUN), Columbia brome (BRVU), starry Solomon's seal (SMST), sweet cicely (OSCH), sidebells pyrola (PYSE), and round-leaved violet (VIOR2) are plants helping to define the type. Queen's cup (CLUN) and tiarella (TITRU) are especially indicative of cool, moist, spruce-dominated bottoms in undisturbed condition.

Distribution and Environmental Features - This association occurs throughout the dissected plateau region but is confined to bands along perennial stream bottoms or to moist depressions in gentle sloping plateau areas. Lying within cold air pockets, stands in this type typically form finger-like projections in the more extensive mid-elevation grand fir zone. Elevations range from 4,500 to 5,600 feet in drainage bottoms and 5,800 to above 6,000 feet on sloping plateaus (ave: 5,000 feet). This association and the ABLA2/LIBO2 type represent the lowest elevational limit of stands sampled in the ABLA2 series. On gentle sloping bottom lands and toeslopes the type merges with ABLA2/LIBO2, ABGR/CLUN, or ABGR/VAME slopes. On plateau areas the type is usually an inclusion within the lower elevation extension of ABLA2/VAME and ABLA2/VASC/POPU communities. Although the soils are well drained, water tables may be high with water probably available to most plants throughout the year.

Soils - Soils are typically dark yellowish brown to dark reddish brown in color in the surface layers, greater than 50 inches in depth, and formed in ash over colluvium/alluvium from basalt, metavolcanic, or mixed parent material. Surface soil-ash layers have silt loam textures and less than 15% rock fragments by volume. Subsoils have sandy loam or occasionally silty clay loam textures with greater than 35% rock fragments by volume. Rock fragments are predominantly gravel-sized throughout all surface layers. Surface rock is generally absent.

Soil characteristics vary depending on depositional history and site position. Surface soils on toeslopes are nearly pure ash while those in bottom positions near stream channels may be mixed ash, loess, and colluvium/alluvium. Subsoils are formed in different depositional sequences and may be formed in buried soils. Rock fragments may vary from gravel to stone-sizes in these soil layers. Clay layers tend to be more common on stable toeslopes where colluvial influence is greatest and are usually absent on more recent alluvial deposits in bottoms. All soils are well-drained, but may remain saturated during spring and early summer.

Summary of Soil and Site Characteristics (all samples) - ABLA2/CLUN

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
40 in. to 80 in.	16 in. to 60 in.	Mixed to 33 in.	very stable	44°F to 48°F	surface to 37 in.	0

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - Engelmann spruce is always present owing to its longevity, greater size, and affinity to moist sites. As these moist bottoms are protected from infrequent fire and more favorable site conditions occur as a result of high soil moisture retention, there is an opportunity for spruce to establish and occupy these sites for long durations. Big huckleberry (VAME) probably precedes a twinflower-dominated undergrowth with the queen's cup (CLUN) becoming more prevalent toward climax.

Disturbance is indicated by long-stalked clover (TRLO), bigleaf sandwort (ARMA3), and increasing patches of heartleaf arnica (ARCO). Animal use influences the condition and amount of big huckleberry as does closure of the tree overstory canopy.

Pacific yew (TABR) is found associated with spruce and subalpine fir as an inclusion in the ABLA2/CLUN type. These communities are reflecting springs and rivulet sites where water is visible or just beneath the surface. Associated with the yew as examples of a wetter, cooler environment are: oak fern (GYDR), woodland violet (VIGL), pink wintergreen (PYAS), and tiarella (TITRU). The indicative plants of the ABLA2/CLUN plant association are also present: queen's cup (CLUN), round-leaved violet (VIOR2), and sidebells pyrola (PYSE). The orientation of these wet-site communities within ABLA2/CLUN plant communities indicates the close orientation of ABLA2/CLUN plants to a moist, cool environment.

Series Relationship - Mesic species are more common in this type than any other since the vegetation responds to a combination of cool, moist, microclimate and a rich, deep soil for growing medium. Good indicators of this type are Columbia brome (BRVU), queen's cup (CLUN), and starry Solomon's seal (SMST). The type contains the greatest abundance of fragrant bedstraw (GATR), Columbia brome (BRVU), queen's cup (CLUN), tiarella (TITRU), and white hawkweed (HIAL) of any type within the subalpine fir series. Moss/lichen levels are among the highest of any type in the series.

Role of Fire - Subalpine fir and Engelmann spruce are highly susceptible to fire. The ABLA2/CLUN type is probably the most resistant to fire based on locations adjacent to streamcourses and in mesic bottoms. Big huckleberry would probably increase on these sites following fire disturbance.

Silvicultural Considerations - The major concerns to management are raised water tables following heavy overstory removals, and heavy animal use during the growing season. Small clearcuts, high density shelterwoods, or, more preferably, management under an uneven-aged system would both reduce the severity of high water tables and help in maintaining spruce as a major stand component. Partial overstory removals may reduce the overall damage due to animal use by increasing the diversity of tree age classes. Although there has been little silvicultural activity to date in this type, the affinity of lodgepole pine, spruce, and larch for wet sites would suggest that they are the most suitable species for artificial regeneration.

High use by ungulates due to the proximity of streams would require that there be some protection of planted growing stock during initial establishment periods. Heart rots are common in old-growth stands and windthrow of spruce may be a problem where depth to coarse alluvium is shallow.

Stand Structure and Productivity - The diameter/age distribution for mid and late seral stands in this association will normally approach a multi-aged condition. Engelmann spruce in the dominant crown class makes up the bulk of the overstory basal area, and probably became established under a different and more even-aged condition than found in the sample stands. The more seral species such as Douglas-fir and larch occur only in overstory positions. Standing basal area may exceed 400 sq. ft./acre (ave. 233).

Productivity is among the highest of all forested types in the Wallowa-Snake Province. ABLA2/CLUN is clearly the most productive type in the ABLA2 series. No other association has higher site index values for subalpine fir and larch and only ABGR/VAME-ALSI shows greater spruce site index. Growth basal area for spruce is also high, but is exceeded in the more productive grand fir types (i.e., ABGR/CLUN, ABGR/VAME-ALSI). Only grand fir has moderate-to-low height and diameter growth in this type. Within the type, spruce maintains excellent diameter growth at high stocking levels while larch will outperform all species at lower stocking levels.

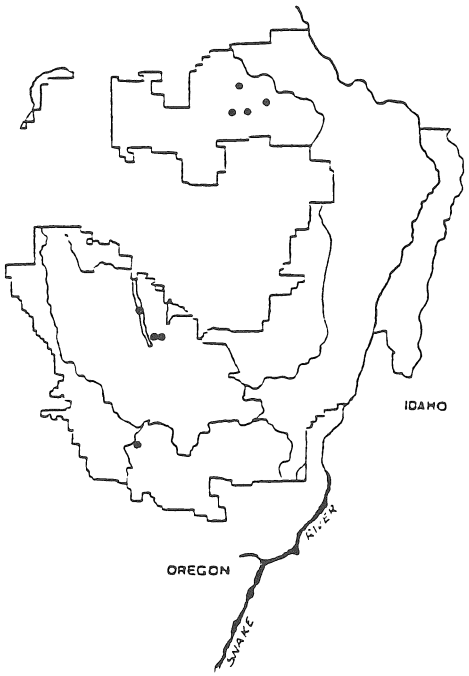
Range and Wildlife Management - Livestock utilize these cool, moist sites for late summer shading and often do severe damage to understory vegetation by trampling. Little native forage is available except on adjacent areas which may have been logged and seeded to exotic grasses. Big huckleberry and gooseberry fruits may be important to grouse and bear. The primary resource value of the type may be in the protection of watersheds and water quality.

Comparison with Other Investigators - This type is similar to R. & J. Daubenmire's ABLA2/PAMY habitat type of northern Idaho (1968) and Steele's ABLA2/CLUN habitat type of central Idaho (1981). Pfister (1977) identified ABLA2/CLUN in Montana as a new type with similarities to the ABLA2/PAMY habitat type of the Daubenmires. Cooper, Neiman, and Steele (1985) basically replace ABLA2/PAMY with ABLA2/CLUN as a typal label in the re-working of northern Idaho habitat types.

Subalpine fir/twinflower plant association
Abies lasiocarpa/Linnaea borealis (ABLA2/LIBO2) (CEF2 21)

50. Main Fork Broady Creek
(Wallowa Valley Ranger District)

Plot 265



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: WVRD, LGRD	Parent Material: ash and colluvium from basalt or mixed geologies
Elevation: (5100 ft.) 4200-6200 ft.	Solum depth: (40 in.) 35-50 in.
Aspect: All	Ash depth: (17 in.) 10-22 in.
Slope (25%) 10-45%	Root conc: (20 in.) 15-26 in.
Position: footslope and toeslopes of mid-elev. drainage btms.	Depth to GT 35% rock frag./size: (12 in.) 4-17 in./ gravels, cobbles, stones, boulders
Other: occurs in ABGR zone	Surface soil/subsoil texture: silt loam/silt loam, loam, silty clay loams

Table of Principal Species

ABLA2/LIBO2 (n = 8)

Species	Code	Mean Cover (%)/Constancy (%) Mid Seral	Early Seral	Mid Seral Range
Overstory				
*Engelmann spruce	PIEN	32/100	-	15-45
*subalpine fir	ABLA2	9/100	-	1-20
western larch	LAOC	12/50	-	0-15
Douglas-fir	PSME	10/50	-	0-20
lodgepole pine	PICO	10/50	20/100	0-15
Understory				
Engelmann spruce	PIEN	14/100	1/100	5-35
*subalpine fir	ABLA2	21/100	5/50	1-45
grand fir	ABGR	18/67	1/100	0-40
lodgepole pine	PICO	-	20/100	-
Shrubs				
*twinflower	LIBO2	24/100	5/50	10-40
big huckleberry	VAME	28/67	6/100	0-30
grouse huckleberry	VASC	-	80/100	-
prince's pine	CHUM	3/67	1/100	0-5
Utah honeysuckle	LOUT2	3/83	1/50	0-5
swamp gooseberry	RILA	1/83	-	0-1
serviceberry	AMAL	-	2/100	-
birchleaf spiraea	SPBE	-	10/50	-
Oregon boxwood	PAMY	-	10/50	-
Grasses and Sedges				
Ross' sedge	CARO	5/50	-	0-10
pinegrass	CARU	1/17	28/100	0-1
elk sedge	CAGE	2/50	-	0-5
Columbia brome	BRVU	1/50	-	0-1
Forbs				
heartleaf arnica	ARCO	13/100	-	1-40
*round-leaved violet	VIOR2	7/67	7/100	0-15
sweet cicely	OSCH	3/67	-	0-5
*sidebells pyrola	PYSE	9/67	-	0-15
pink wintergreen	PYAS	9/50	-	0-20
meadowrue	THOC	15/83	-	0-65
fragrant bedstraw	GATR	1/67	-	0-1
*rattlesnake plantain	GOOB	4/67	-	0-10
starry f.solomon's seal	SMST	2/50	1/50	0-5
woods strawberry	FRVE	2/50	4/100	0-5
long-stalked clover	TRLO	8/50		0-20

* Principal Indicator Species

Stand Characteristics and Productivity

	Mid Seral (n=4)	Early Seral (n=2)
Herbage production (lbs./acre dry wt.)	less than 100	
Average stand diameter/CI*	7.0/1.9	6.7/1.2
Number of trees per acre greater than 4 in dbh/CI	230/68	670/370
Total basal area/CI	160/44	185/10
Average bsal area by species in all sampled stands		
ABLA2	36	-
PIEN	92	-
PICO	1	170
LAOC	10	15
PSME	14	-
ABGR	5	-
Mean Age/GBA by species		
ABLA2	115/190	-
PIEN	155/240	-
PICO	-	77/150
LAOC	150/140	-

Productivity estimate

	No. of Trees Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	GBA Cubes *** Mean	GBA Cubes *** CI
ABLA2	4	76(31)	15(6)	190	35	62	22
PIEN	4	100(61)	3(2)	240	31	100	19
PICO	3	95(53)	25(14)	150	14	64	22
LAOC	1	109(62)	3(2)	140	#	65	#

* CI = 95% confidence interval, mean plus or minus this value

** Site Index Base 100, Base 50 ()

*** SI Base 100 X GBA x .004

\# n value insufficient to calculate statistics

Vegetative Composition - Overstory canopy coverage is high with this twinflower-dominated type (approx. 60%). Spruce dominates over subalpine fir in a 3:1 ratio. Earlier seral overstory members in late seral stands are larch, Douglas-fir, and lodgepole pine. Subalpine fir seedlings are prolific with spruce and subalpine fir accounting for about 75% of the understory tree coverage. Grand fir is the only other tree species of consequence to occur in the understory, reflecting the proximity of adjacent grand fir stands that provide seed sources to these sites.

Codominant in the understory are twinflower and big huckleberry reflecting the mid seral nature of sampled stands. Prince's pine (CHUM), Utah honeysuckle (LOUT2), swamp gooseberry (RILA), and baldhip rose (ROGY) are other principal shrub associates. Ross' sedge (CARO), Columbia brome (BRVU), and elk sedge (CAGE) are common in the cool, moist, shady understory. Other principal forb components are sidebells pyrola (PYSE), round-leaved violet (VIOR2), fragrant bedstraw (GATR), sweet cicely (OSCH), meadowrue (THOC), and rattlesnake plantain (GOOB).

Distribution and Environmental Features - Communities in the ABLA2/LIBO2 type are confined to bands along perennial streams within cold air pockets and represent the lowest elevational extension (4,240 to 6,200 ft; ave: 5,100 ft.) of the ABLA2 series. The type is typically located in the ABGR zone and occurs on moderate to steep footslopes (10-45%, ave: 25%) at all aspects. Stands in this association merge below with the drainage bottoms and toeslopes where ABLA2/CLUN dominates, and above with steep slopes where ABGR/VAME communities occur. Footslope positions receive additional water and nutrients from the slopes above creating a favorable moisture regime for spruce and subalpine fir.

Soils - Soils are typically dark yellowish brown to dark brown in color in surface layers, less than 50 inches in depth, and formed in ash and colluvium over older buried soil materials. Buried soils are formed in loess, ash, and colluvium from basalt or mixed parent materials. Surface soil-ash layers have silt loam textures with less than 15% rock fragments by volume. Subsoils have silt loam, silty clay loam, and loam textures. Rock fragments tend to increase with depth to greater than 35% by volume. Rock fragments in surface layers are predominantly gravel-sized while those in subsoils are cobble to boulder-sized.

These soils vary considerably in clay and rock fragment content. Surface ash may be well-mixed with rock in some toeslope areas where colluvium or even alluvium has strongly influenced the sites. Hummocky, bouldery areas along drainage margins may support this type at mid to upper elevations if ash mixing has been sufficient. Clay concentrations in subsoils tend to occur only on slopes less than 25%.

Summary of Soil and Site Characteristics (all samples) - ABLA2/LIBO2

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
35 in. to 50 in.	15 in. to 26 in.	10 in. to 22 in.	stable	48°F to 50°F	4 in. to 17 in.	uncommon

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - The longer-lived spruce initially co-dominate with fir. With stand development, subalpine fir will succeed replacing spruce on these sites. Occurrence of larch, Douglas-fir, grand fir, and lodgepole pine in the stands is a reflection of the mid-seral stage of the type. Big huckleberry, requiring open growing stands, is present as a seral component but declines as overstory canopy closure increases and stand structure reaches later seral levels.

Early seral stands on gentle slopes (10%) are dominated by lodgepole pine over high coverage by grouse huckleberry. Twinflower (LIBO2), big huckleberry (VAME), and prince's pine (CHUM) are shrubs usually associated in both early and mid seral stages. Other shrubs present only in early seral stages are serviceberry (AMAL), spiraea (SPBE), and Oregon boxwood (PAMY). Always present in these early seral stands are pinegrass (CARU), woods strawberry (FRVE), and round-leaved violet (VIOR2).

In stands with good thermal cover, big huckleberry is heavily browsed and weakened by ungulate use resulting in plants of reduced stature. Vigorous big huckleberry of greater stature is often found beneath downed logs where grazing is lessened and moisture retained through drip and shading. Long-stalked clover (TRLO) and heartleaf arnica (ARCO) increase with disturbance.

Series Relationship - Big huckleberry and twinflower are dominant species with twinflower prevailing due to its cold air and shade-tolerance advantage. Indicative of the type are twinflower (LIBO2) alone or present with big huckleberry (VAME); presence of cold, shade tolerant sedges (CAGE and CARO), round-leaved violet (VIOR2), prince's pine (CHUM), and sidebells pyrola (PYSE). Ross' sedge (CARO) and sidebells pyrola (PYSE), pink wintergreen (PYAS), and meadowrue (THOC) are more abundant in this type than in any of the other subalpine fir series types.

Role of Fire - Subalpine fir and Engelmann spruce are both highly suscep- tible to fire. Location of ABLA2/LIBO2 communities adjacent to streambottoms, where moisture and humidity levels are high, help prevent frequent fire occurrence. Lodgepole pine, western larch, and Douglas-fir are all fire seral members of the type gaining prominence when fire destroys the true fir and spruce.

Silvicultural Considerations - The major concerns to management are heavy animal use by domestic stock and elk during growing seasons with the close proximity of these stands to sensitive streambottom environments. High natural regeneration success is expected on these moist sites. Lodgepole pine, spruce, and western larch are suitable species for planting. High use by ungulates would require that there be some protection during establishment of new stands. As in ABLA2/CLUN, small clearcuts, high density shelterwoods, or uneven-aged management systems are recommended to reduce site exposure and to maintain high value species with intermediate shade tolerance.

Range and Wildlife Management - Cattle congregate along perennial stream courses in late summer. Major impact to the type is from trampling by bedding and shading livestock. Forage value of the type is minimal. Big huckleberry fruits are important for grouse and bear.

Stand Structure and Productivity - The diameter/age distribution for mid seral stands sampled in this association is all-aged with three age classes well represented (less than 50, 100, and 200 years old). Seral species such as

Douglas-fir and larch codominate the overstory with spruce and decadent subalpine fir. Both spruce and subalpine fir, and minor amounts of grand fir are common in the pole, sapling, and seedling size classes. The standing basal area of 130 to 210 sq.ft./acre (ave. 160) is well below that found in ABLA2/CLUN. Height and diameter suppression of many intermediate and codominant trees is common.

Stands have an overall moderate to high productivity within the ABLA2 series. Spruce site index and GBA-volume growth index were less than that measured in ABLA2/CLUN. Within the type, spruce performs best overall; however, lodgepole pine site index is higher than in all other forested types in the Wallowa-Snake Province.

Comparison With Other Investigators - Pfister (1977) and Steele (1981) report this type in Montana and central Idaho, respectively. It is also reported in eastern Idaho and western Wyoming (Steele, 1983) and in northern Washington (Williams, 1983; Lillybridge, 1984).

Subalpine fir/skunk-leaved polemonium plant community type
Abies lasiocarpa/Polemonium pulcherrimum
(ABLA2/POPU) (CEF4 11) (n = 2)

At the upper elevational levels of the subalpine fir zone on northerly aspects in the Seven Devils, ABLA2-dominated stands occur with a very depauperate understory consisting largely of a scattering of forbs over a heavily littered surface. Cold-site herbaceous species most frequently found are skunk-leaved polemonium (POPU), Sitka valerian (VASI), heartleaf arnica (ARCO), Rocky Mountain butterweed (SEST2), and bigleaf sandwort (ARMA3). Shrubs are infrequent and uncommon on these sites. Utah honeysuckle (LOUT2), prince's pine (CHUM), and sticky currant (RIVI) may be present. Similar depauperate stands were sampled in the high Wallowas portraying the upper limits of subalpine fir in that area. Occasional whitebark pine occurring as opportunists from the PIAL zone are usually found on southerly, more droughty exposures.

These steep, cold sites have unstable surface soils with frequent colluvial movement. This type approaches the limits of tree growth in the Seven Devils. Seral to subalpine fir at those elevations is drought-hardy Douglas-fir.

In general, stand productivity is most similar to ABLA2/VASC/POPU communities occurring at their limits of elevation and slope steepness. Productivity levels are typically low and some sites may be judged non-commercial.

Heavy ungulate usage was noted by extensive trailing and browsed shrub leaders. With less impact and more canopy openings, elk sedge and/or Hitchcock's woodrush could be type indicators of ABLA2/CAGE or ABLA2/LUHI plant associations described by Steele (1981). Vestiges of these species were not found however. Steele (per communication) believes similar ABLA2/POPU stands may be present in Washington County, Idaho.

The short growing season, cold soils, and steep, unstable slopes make tree regeneration following harvest difficult. The type is probably most important for watershed protection, wildlife thermal cover, and as part of the subalpine wilderness recreational landscape.

Subalpine fir/twisted stalk plant community type
Abies lasiocarpa/Streptopus amplexifolius
(ABLA2/STAM) (CEF3 11) (n = 4)

High water table spruce bottoms and headwater plateau seepages containing Engelmann spruce old-growth with subalpine fir associated are often found as small, highly productive stands adjacent to ABLA2/VAME communities. Twisted stalk (STAM), arrowleaf groundsel (SETR), meadowrue (THOC), skunk-leaved polemonium (POPU), sweet cicely (OSCH), Sitka valerian (VASI), and tall bluebells (MEPA) are tall forbs often occurring on these sites. False bugbane (TRCA3) is an occasional member of this type. Often open streams and seepage rivulets course through these stands. This abundance of moisture permits seral spruce to occupy these sites long into later successional stages as large old-growth dominants. Lodgepole pine is often decadent on these sites.

This type was also recognized by Henderson, et al (1977); and Mauk and Henderson (1984) in Utah; Steele, et al (1981, 1983) in central Idaho and western Wyoming; and Cooper, Neiman, and Steele (1985) in northern Idaho. Mauk and Henderson (1984) considered twisted stalk and arrowleaf groundsel to be joint indicators with groundsel the more abundant in open, seral stands. Groundsel is also more abundant under open stands of this type in the Wallowa-Snake Province. Reconnaissance samples from the Eagle Cap Wilderness also provide documentation of this type along major drainages between 6,000 to 6,500 foot elevation. The sample areas in the Seven Devils and at the head of Lightning Creek north of Memaloose in Hells Canyon NRA occurred at 7,200 feet and 6,500 feet respectively.

Soils are most similar to those found supporting ABLA2/CLUN communities. Mean ash depth, total solum depth, and depth to buried soils are shallower in the ABLA2/STAM sites, perhaps due to the constant erosive influence by running water.

Stand productivity is also very similar to ABLA2/CLUN. Spruce site index and GBA are slightly lower in ABLA2/STAM, but subalpine fir stockability and height growth is nearly identical. In general, stands in the ABLA2/STAM type can be expected to perform like the wettest ABLA2/CLUN types.

The high water table always present in these stands prohibits use of these stands for timber management. The greatest value of these communities is in the protection of watersheds and adjacent riparian areas. Animals are often attracted to these cool, moist sites in the late summer period seeking thermal cover. Elk and cattle usage is high. The heavy occupancy of these sites by animals often results in weedy patches of heartleaf arnica (ARCO) and long-stalked clover (TRLO).

Subalpine fir/pinegrass plant community type
Abies lasiocarpa/Calamagrostis rubescens
(ABLA2/CARU) (CEG3 12) (n = 2)

These seral communities occur on moderate slopes near ridgetops above 6,000 feet in elevation in the Wallowa and Seven Devils Mountains. They may contain old-growth Douglas-fir with lodgepole pine and western larch associated over an understory dominated by pinegrass. These communities have historically been fire-maintained and are free of fire intolerant species. Resulting from fire protection is a succeeding forest of subalpine fir and grand fir. Forbs are few in the pinegrass-dominated mat which has formed beneath the trees. Those communities with overgrazed pinegrass tend to contain patches of tailcup lupine (LUCA), Rocky Mountain butterweed (SEST2), sweet cicely (OSCH), and white hawkweed (HIAL). When the pinegrass mat is continuous, only traces of other plants are commonly found: corral-roots (COME, COMA3), elk sedge (CAGE), and Ross' sedge (CARO). Domestic sheep use these communities for summer trailing, bedding, and access to higher elevation grassland vegetation. Very heavy usage of these communities may cause soil loss and forbfields dominated by lupine, pokeweed, buckwheat, or penstemon.

Other investigators have described similar communities. Steele (1981) also found ABLA2/CARU dominated by seral Douglas-fir on warmer sites in the subalpine fir zone where lodgepole pine was a principal seral component. Pfister (1977) described a similar vegetation where wildfires had periodically eliminated spruce and true firs, but Douglas-fir had persisted. Other ABLA2/CARU plant associations have been described by Williams (1983) on the Okanogan National Forest, Lillybridge (1984) on the Colville National Forest, and Steele (1983) in southeast Idaho and western Wyoming.

Key to the Grand Fir (ABGR) Series Vegetation

1. Pacific yew is present . . . . . ABGR/TABR/CLUN (pg. 286)

1. Pacific yew absent 2

    2. Queen's cup (CLUN) present throughout the stand . . . . . ABGR/CLUN (pg. 279)

    2. Queen's cup not present throughout the stand 3

        3. Goldthread (COOC2) dominates the herbaceous understory . . . . . ABGR/COOC2 (pg. 308)

        3. Goldthread not dominating the understory herbaceous cover 4

            4. Twinflower cover greater than 5% . ABGR/LIBO2 (pg. 298)

                4a. Lodgepole pine dominant in the overstory . . . . . PICO(ABGR)/LIBO2 (pg. 305)

            4. Twinflower cover is less than 5% 5

    5. Big huckleberry (VAME) cover greater than 10% . . . . . ABGR/VAME (pg. 290)

        5a. Lodgepole pine dominant in the overstory . . . . . PICO(ABGR)/VAME (pg. 294)

        5b. Sitka alder present . . . . . ABGR/VAME-ALSI (pg. 295)

    5. Big huckleberry cover less than 10% 6

        6. Ninebark associated with maple . . ABGR/ACGL-PHMA (pg. 325)

        6. Ninebark absent 7

            7. Rocky Mountain maple present . . . ABGR/ACGL (pg. 310)

            7. Rocky Mountain maple absent 8

                8. Spiraea coverage greater than 5% . . . . . ABGR/SPBE (pg. 315)

                8. Spiraea cover is less than 5%, pinegrass and/or elk sedge conspicuous . ABGR/CARU (pg. 320)

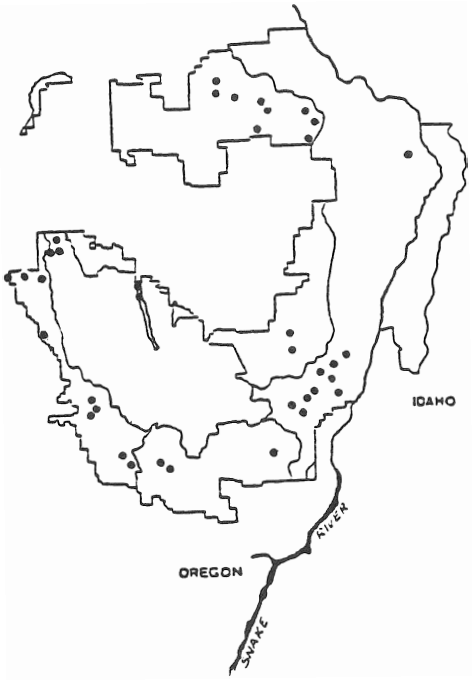
Summary of Plant Association and Community Type Characteristics 1/

Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	(3) Relative Cubic prod./ Stockability	(4) Forage (lbs./acre) dry
ABGR/CLUN	3900-5700 (4900)	tops, footslope	all	1-40% (19%)	Ash + basalt colluvium	40-80 (65) 16-32 (25)	CLUN,DITR BRVU,ADBI	High-V.High/ High-V.High	(100) est.
ABGR/TABR/ CLUN	4000-5300 (4600)	lower slope	NE-NW	3-35% (26%)	Ash + basalt coll. alluvium	40-80 (60) 20-33 (24)	TABR,CLUN LIBO2,GOOB	High-V.High/ High-V.High	(100) est.
ABGR/VAME	4000-6400 (5200)	tops, lower slope	all	10-75% (35%)	Ash + basalt(+) colluvium	35-60 (50) 15-46 (27)	VAME,CHUM LOUT2,PYSE	Mod./ Mod.-High	50-650 (160)
ABGR/LIBO2	4200-5800 (4950)	tops, lower slope	all	2-40% (28%)	Ash + basalt colluvium	40-70 (60) 21-32 (26)	LIBO2,BRVU GOOB,CHUM	High/High	(200) est.
ABGR/COOC2	5200-5400 (5300)	mid to upper slope	N	55-57% (56%)	Ash+ basalt	----	COOC2,VAME CLUN,SMST	High/Mod.	----
ABGR/ACGL	4600-6100 (5300)	bench to lower slope	S	25-70% (52%)	Ash-Loess + mixed geol. colluvium	51-80 (61) 26-40 (31)	ACGL,DITR GATR	High-V.High/ High-V.High	(100) est.
ABGR/SBPE	3200-4600 (3800)	lower slope	NE-NW S-SW	10-50% (29%)	Loess-Ash + basalt colluvium	43-52 (48) 18-24 (22)	SPBE,CARU AMAL,SYAL	High/High	(100) est.
ABGR/CARU	4100-4800 (4400)	mid to upper slope	all	3-30% (15%)	Loess-Ash + mixed geol. colluvium	30-60 (45) 17-22 (20)	CARU,CAGE ARCO,LATHY	Mod./Mod.	300-900 (530)
ABGR/ACGL PHMA	3700-5600 (4900)	upper to lower slope	N-SSE	40-90% (55%)	Loess-Ash + basalt colluvium	----	ACGL,PHMA LOUT2,SMRA	Mod./Mod	(100) est.

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Comparison of relative cubic volume production/stockability for the primary species (from Appendices E & F)
4/ Forage production in all conditions sampled.

Grand fir/queen's cup plant association
Abies grandis/Clintonia uniflora (ABGR/CLUN) (CWF4 21)

51. Imnaha River Canyon above Skookum Creek *Plot 1031*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: ash and basalt or mixed colluvium
Elevation: (4900 ft.) 3000, 3900-5700 ft.	Solum depth: (65 in.) 40-80 in.
Aspect: All	Ash depth: (24 in) 16-34 in.
Slope (19%) 1-40%	Root conc: (25 in.) 16-32 in.
Position: foot and toe-slopes, coves, tops, drainages, and benches	Depth to GT 15% rock frag./size:(28 in.) 20-60 in./gravel
Other: most productive forest site in Wallowa-Snake.	Surface soil/subsoil texture: silt loam/silt loam, silty clay loam, clay loam

Table of Principal Species

ABGR/CLUN (n = 38)

Species	Code	Mean Coverage (%)/Constancy (%) Late Seral (n=13)	Mid Seral (n=18)	Early Seral (n=7)	Late-Mid Seral Range
Overstory					
Engelmann spruce	PIEN	16/69	18/67	21/71	0-50
*grand fir	ABGR	37/100	30/100	-	5-70
Douglas-fir	PSME	12/54	14/56	18/43	0-30
western larch	LAOC	5/31	8/33	16/86	0-25
Understory					
Engelmann spruce	PIEN	6/62	10/44	10/71	0-25
*grand fir	ABGR	31/100	24/100	23/71	1-75
Douglas-fir	PSME	5/8	7/28	13/43	0-15
Shrubs					
*big huckleberry	VAME	24/77	33/83	48/100	0-85
twinflower	LIBO2	31/77	32/56	30/71	0-70
prince's pine	CHUM	5/69	3/83	9/71	0-25
*Utah honeysuckle	LOUT2	4/77	2/56	2/57	0-20
*baldhip rose	ROGY	4/92	2/72	2/100	0-10
mountain-ash	SOSC	1/54	1/28	1/14	0-3
currants, gooseberries	RIBES	1/62	1/50	7/57	0-3
Oregon-grape	BERE	2/46	5/28	1/57	0-20
spiraea	SPBE	2/31	4/39	4/57	0-10
Oregon boxwood	PAMY	1/23	2/22	5/43	0-5
Grasses and Sedges					
*Columbia brome	BRVU	3/77	6/72	2/43	0-20
*Ross' sedge	CARO	2/62	3/56	2/57	0-10
pinegrass	CARU	1/15	5/17	3/29	0-20
elk sedge	CAGE	1/8	1/17	2/43	0-1
Forbs					
heartleaf arnica	ARCO	7/38	10/61	13/57	0-45
*sidebells pyrola	PYSE	2/69	4/72	2/86	0-10
*Queen's cup; beadlily	CLUN	14/85	10/83	13/57	0-30
*fairy bells	DITR	2/77	2/33	3/29	0-5
*sweet cicely	OSCH	4/85	3/83	5/71	0-20
*round-leaved violet	VIOR2	7/69	5/72	5/100	0-20
woods strawberry	FRVE	2/92	4/67	4/86	0-15
meadowrue	THOC	6/92	8/89	10/71	0-40
*trail plant	ADBI	7/69	7/39	21/29	0-25
*rattlesnake plantain	GOOB	2/100	2/78	2/86	0-10
fragrant bedstraw	GATR	2/69	1/56	5/57	0-10
starry f.Solomon's seal	SMST	7/46	2/28	1/29	0-15
bigleaf sandwort	ARMA3	2/31	2/39	1/29	0-5
white hawkweed	HIAL	1/46	2/56	2/29	0-5

* Principal Indicator Species

Stand Characteristics and Productivity

	Late Seral (n=17)	Early & Mid Seral (n=13)
Herbage production (lbs./acre dry wt.)	less than 100	
Average stand diameter/CI*	14.2/2.3	11.6/3.3
Number of trees per acre greater than 4 in dbh/CI	173/30	237/56
Total basal area/CI	225/26	244/34

Average basal area by species in all sampled stands

ABGR	120	120
PIEN	47	45
PSME	34	30
LAOC	15	22
PICO	-	15
PIPO	9	12

Mean Age/GBA by species

ABGR	155/285	105/375
PIEN	180/260	115/350
PSME	210/250	130/290
LAOC	210/205	100/180
PICO		110/170
PIPO	190/240	230/220

Productivity estimates

(V.early seral excluded)

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
ABGR	20	108(57)	5(3)	325	27	150	20
PIEN	15	104(63)	6(4)	290	26	130	17
PSME	14	94	5	260	25	108	20
LAOC	9	113(65)	8(5)	190	20	92	14
PICO	3	81(44)	6(3)	170	40	60	15
PIPO	4	98	8	230	50	95	30

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Old-growth stands are dominated in both the overstory and understory by grand fir (ABGR). Engelmann spruce is generally present in overstory canopies and is usually found reproducing in the understory. Larch and Douglas-fir are often present as remnants from earlier seral stages.

Big huckleberry (VAME) and twinflower (LIBO2) are usually abundant in these stands. Big huckleberry attains its greatest stature and biomass on the Wallowa-Snake Province in this association. The separation of this type from other grand fir types containing big huckleberry and twinflower is based on a more mesic assemblage of plants in ABGR/CLUN. These moist site indicators are Columbia brome (BRVU), queen's cup (CLUN), trail plant (ADBI), and fairybells (DITR). This mesic group of plants indicates sites with high production potential.

Baldhip rose (ROGY), Utah honeysuckle (LOUT2) and prince's pine (CHUM) are the most common shrubs in addition to big huckleberry and twinflower. Other herbaceous components of high constancy are Ross' sedge (CARO), meadowrue (THOC), sidebells pyrola (PYSE), sweet cicely (OSCH), round-leaved violet (VIOR2), fragrant bedstraw (GATR), woods strawberry (FRVE), and rattlesnake plantain (GOOB). All of these plants persist well in the moist, deep soil, and dark, cool conditions found in this plant association. Also the presence of goldthread (COOC2), pink wintergreen (PYAS), and false mitrewort (TITRU) further defines the cool, moist site conditions present in this association.

Distribution and Environmental Features - This association is widespread throughout the mid and upper elevations in the Wallowa-Snake Province. Elevations typically range from 3,900 to 5,700 feet (ave: 4,900) although some stands may extend as low as 3,000 feet in sheltered north-facing footslope positions of upper canyon bottoms. This association overlaps in elevational distribution with both ABGR/VAME and ABGR/LIBO2. It occurs more commonly where moisture, temperature and, to some degree, exposure favors regeneration and development of spruce. Sites vary with elevation, creating pockets of ABGR/CLUN at high elevations in the ABLA2 zone and in fingers along protected drainages within ABGR/LIBO2 plateau areas and ABGR/VAME slopes. The type was sampled on three distinct landforms: 1) high elevation rolling plateaus and ridges on slopes less than 15%; 2) throughout its elevational range in coves of upper drainage headlands on slopes less than 40%; and 3) mid-elevation toeslopes and bottoms on slopes less than 20%. The most common sites were upper drainage coves and lower to mid-third slope positions along drainage headlands. All sites have concave to undulating surface relief, very deep ash soils, and receive additional moisture and nutrients from the surrounding, more elevated landscape.

Soils - Soils are typically dark brown to dark yellowish brown in color in surface layers, greater than 40 inches in depth, and formed in ash over older buried soil materials. In general, they may be rather poorly developed. Buried soils are formed in ash-loess and colluvium from basalt or mixed parent materials and are 16 to 32 inches below the more recent soil material. Surface ash-soils have silt loam textures with less than 15% to less than 5% rock fragments by volume. Subsoils have silt loam, silty clay loam, and clay loam textures. Rock fragments vary from 15 to 35% by volume. Rock fragments are predominantly gravel-sized throughout all soil layers although cobbles tend to increase in subsoils. Surface rock is usually absent.

These soils are fairly uniform in regard to ash and total depth. Soil depths are greatest in accumulation areas at toeslope and cove positions. Ash occasionally exceeds 40 inches in depth in these areas and may consist of numerous depositional sequences. Rock fragments in soil layers tend to increase on steeper foot and toeslopes. Many soils on slopes less than 15% are virtually rock-free. Clayey subsoils appear more common at elevations of 4,900 feet and above, perhaps reflecting greater soil water movement at the higher precipitation zone. Soils supporting ABGR/CLUN communities are among the deepest and most ash-influenced in the Wallowa-Snake Province.

Summary of Soil and Site Characteristics (all samples) - ABGR/CLUN

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
40 in. to 80 in.	35 in. to 80 in.	8 in. to 60 in.	very stable	44°F to 50°F	8 to 80 in.	0

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - These mesic stands are generally not replaced by catastrophic fire. As a result, lodgepole pine is infrequent. Earlier seral stages are represented by Douglas-fir and larch overstories. Engelmann spruce is usually present in all stages of succession in this type.

Mid seral stands generally reflect greater solar radiation in the higher coverages by big huckleberry, Columbia brome, pinegrass, and heartleaf arnica. Early seral stands contain the highest coverage by Douglas-fir in both tree layers and by larch in the tree overstory layer. Big huckleberry is twice as abundant in early seral stands. Notably more abundant are spiraea (SPBE), Oregon boxwood (PAMY), and Ribes species. Late seral plant members less prevalent in this stage are Rocky Mountain maple (ACGL), false Solomon's seal (SMST), queen's cup (CLUN), and fairy bells (DITR).

Heavy grazing, browsing, and use of these sites by game and livestock may result in increases by heartleaf arnica (ARCO), meadowrue (THOC), and woods strawberry (FRVE). Long-stalked clover (TRLO) is a common invader in heavily used drainage bottom locations within this type.

Series Relationship - The ABGR/CLUN plant association is the most mesic of the types in the grand fir series. Species restricted to this type, or having their greatest abundance in this type, are queen's cup (CLUN), fairy bells (DITR), trail plant (ADBI), and false mitrewort (TITRU). These plant species best tolerate shady, cool, moist conditions found in old-growth stands of this association. Moss/lichen cover averaged 30% in mid and late seral stands.

Role of Fire - Severe disturbance by fire may result in dense homogeneous stands of lodgepole pine, Douglas-fir, and larch. More frequently, Douglas-fir and larch invade disturbed sites as small fire seral communities within a relict grand fir stand. Stand replacement fires are uncommon in the ABGR/CLUN type. Spruce and Douglas-fir often form a fire sere prior to grand fir dominance. Big huckle- berry, spiraea, pinegrass, elk sedge, and strawberries will all increase on these sites following fire. These rhizomatous plants may compete with regenerating trees though not detrimentally in this type.

Silvicultural Considerations - Sites vary from wet bottoms to cold and moist high elevation coves. Silvicultural considerations will depend upon what position and site is occupied by stands belonging to this association. On wet bottoms, heavy overstory removals may raise water tables to levels that reduce regeneration success. At high elevations, cold intolerant species, (i.e. PIPO), are unsuitable. There is a risk of frost cracking if grand fir and Douglas-fir are planted. Lodgepole pine and spruce would have a high potential for natural regeneration on wet sites and should be favored there. Moist to drier sites would be more suitable for ponderosa pine, Douglas-fir, grand fire, and western larch regeneration and management. Site preparation is not an overriding concern in this type due to lack of rhizomatous grasses and shrubs; however, big huckleberry may require control in some higher elevation areas. Care should be taken to reduce the amount of the productive ash soil layer that is compacted and especially displaced during logging operations. High density shelterwoods, small clearcuts, or group selection would be appropriate silvicultural practices. Ungulate use is high near stream bottom areas and in stands on slopes used for thermal cover. Defoliators are minor, but Indian paint fungus may be very common on grand fir within this type.

Range and Wildlife Management - Little available livestock forage occurs in native old-growth stands. These stands are often used for thermal cover and shading near watering sources. Seral stands containing elk sedge and pinegrass are more valuable to livestock. Moist site exotic grasses should perform well following seedings in disturbed sites (i.e., orchardgrass, hard fescue, and timothy). Earlier successional stages containing big huckleberry and spiraea should provide browse to deer and elk. Big huckleberry fruits are used by bear, grouse, and people.

Stand Structure and Productivity - Stands in this association are predominantly uneven-aged. Both all-aged and multi-aged stands are represented. Typically, old-growth stands contain spruce and grand fir in virtually all age classes. Basal areas range from 180 to over 400 sq. ft./acre (ave: 225). Ages of larch and Douglas-fir (150 to 300 yrs.) rarely exceed that of the oldest grand fir or spruce. Larch is in nearly all sample stands and commonly forms a canopy layer above the majority of more shade tolerant species. Mid seral stands are also typically mixed. Ages of dominant and codominant trees range from 100 to 130 years old with scattered larch or ponderosa pine occasionally exceeding 200 years old. Basal areas in these stands range from 160 to over 300 square feet/acre. Lodgepole pine stands in this association are early seral and range in age from 100 to 135 years with basal areas ranging from 200 to 250 sq. ft./acre (ave 230). Stocking levels are higher than in all other associations in the ABGR series.

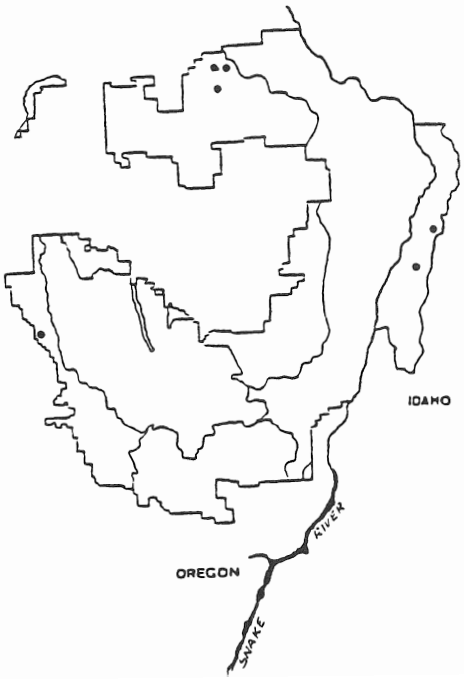
Timber production in stands of the ABGR/CLUN association may be greater than in all other forested types in the Province. Larch, grand fir, and lodgepole pine maintain good diameter and height growth at higher stocking levels in this type than in all other types. However, spruce and ponderosa pine site index may be exceeded in ABLA2/CLUN, although stockability for these species is less. Within the type, grand fir has the highest stockability followed by spruce, Douglas-fir, ponderosa pine, larch, and lodgepole pine in order of decreasing growth response. Stands located on coves and toeslopes in upper drainage headlands appear the most productive.

Some production differences are evident between late seral stands and those in early to mid-seral condition. Growth basal area appears to decline in the older, late seral stands as the bole area changes with increasing diameter and tree height (Hall 1986). Most trees in these stands are over 150 years in age and well beyond culmination of mean annual increment. Although age effects on GBA are considered in adjusting this index to age 100, true estimates may only be possible in younger stands.

Comparison with Other Investigators - Daubenmire's (1968) ABGR/PAMY habitat type is similar to the ABGR/CLUN plant association described for the Wallowa-Snake Province. Pfister (1977) split ABGR/CLUN in Montana into three phases. Steele (1985) described ABGR/CLUN in west central Idaho. Cooper, Neiman, and Steele (1983) describe this plant association as the dominant mid-montane habitat type south of the Middle Fork of the Clearwater River in Idaho. They place Pacific yew (TABR) in the type as a phase.

Grand fir/Pacific yew/queen's cup plant association
Abies grandis/Taxus brevifolia/Clintonia uniflora
(ABGR/TABR/CLUN) (CWF4 22)

52. Green Mountain (La Grande Ranger District)



ENVIRONMENT
(all plots)

Location:
HCNRA,WVRD,LGRD

Elevation: (4600 ft.)
4000-5300 ft.

Aspect: NE-NW

Slope (26%)
3-35%

Position: lower 1/3
slopes, toeslopes

Other: represents the
wet end of ABGR/CLUN

SOILS
(typical soils)

Parent Material: Ash
over colluvium-alluvium

Solum depth: (60 in.)
40-80 in.

Ash depth: (24 in.)
16-28 in.

Root conc: (24 in.)
20-33 in.

Depth to GT 35%
rock frag./size: (35 in.)
16-60 in./gravel

Surface soil/subsoil
texture: silt loam/
silt loam, silty clay loam,

Table of Principal Species

ABGR/TABR/CLUN (n = 6)

Species	Code	Mean Cover(%)	Const.(%)	Range
Tree Overstory				
*Engelmann spruce	PIEN	19	67	0-30
*grand fir	ABGR	31	100	10-55
Douglas-fir	PSME	19	83	0-30
Tree Understory				
Engelmann spruce	PIEN	7	67	0-15
*grand fir	ABGR	24	100	5-60
Douglas-fir	PSME	3	33	0-5
Shrubs				
*Pacific yew	TABR	26	100	1-70
Rocky Mountain maple	ACGL	6	50	0-10
currants, gooseberries	RIBES	2	83	0-3
baldhip rose	ROGY	1	83	0-1
Utah honeysuckle	LOUT2	5	67	0-10
big huckleberry	VAME	12	100	1-40
prince's pine	CHUM	3	67	0-5
*twinflower	LIBO2	18	100	1-30
Forbs and Grasses				
round-leaved violet	VIOR2	12	67	0-20
sidebells pyrola	PYSE	2	83	0-5
fragrant bedstraw	GATR	1	67	0-1
starry f.Solomon's seal	SMST	6	83	0-15
trail plant	ADBI	4	83	0-10
*Queen's cup/beadlily	CLUN	7	100	1-15
heartleaf arnica	ARCO	11	83	0-20
sweet cicely	OSCH	2	100	1-5
woods strawberry	FRVE	1	67	0-1
meadowrue	THOC	6	67	0-15
*rattlesnake plantain	GOOB	1	100	1-3
Columbia brome	BRVU	3	83	0-10

* Principal Indicator Species
See ABGR/CLUN for productivity estimates

Vegetative Composition - Pacific yew (TABR) is only occasionally found in the Wallowa-Snake Province. It occurs as a riparian member interfingering below the ABGR zone, but also forms a plant association beneath grand fir and Engelmann spruce-dominated old-growth on seepages and near springs as an inclusion in ABGR/CLUN, ABGR/LIBO2, or ABGR/VAME communities. Western larch and Douglas-fir are often present as old-growth seral members.

Yew totally dominates the understory in a dense tall shrub layer. Rocky Mountain maple is often part of this tall shrub layer. The mid- and low-shrub layers always contain big huckleberry (VAME) and twinflower (LIBO2). Other prominant shrubs are baldhip rose (ROGY), Ribes species, Utah honeysuckle (LOUT2), and prince's pine (CHUM). Oregon boxwood (PAMY) was found in minor amounts in this type. Columbia brome (BRVU) is usually present. Forbs common to ABGR/CLUN are also present as frequent associates beneath the yew (i.e., sidebells pyrola (PYSE), queen's cup (CLUN), round-leaf violet (VIOR2), sweet cicely (OSCH), rattlesnake plantain (GOOB), trail plant (ABDI), fragrant bedstraw (GATR), meadowrue (THOC), starry false Solomon's seal (SMST), and fairy bells (DITR)).

Ungulate disturbance may result in severe hedging and possible elimination of yew from spring and seepage sites. Reduced ungulate pressure on many ABGR/CLUN communities may promote shrub understories of yew and Oregon boxwood. Forbs increasing from ungulate disturbance are long-stalked clover (TRLO), heartleaf arnica (ARCO), and bigleaf sandwort (ARMA3).

Role of Fire - These sites are probably relict from past fires owing to their moist microenvironment. When fire enters these stands, yew is almost always eliminated (Zamora, 1975). Grand fir is damaged by ground fire when duff is burned deep enough to injure the root system. Prescribed fire should be avoided in this type. Even though a light underburn may not be injurious to the duff layer, the risk is great that yew will be adversely affected.

Management Considerations - Timber management should follow an uneven-aged system of individual tree removal or group selection to promote maintenance of the tree-shrub community and preservation of the riparian water source. Yew is sensitive to light and temperature change and will be threatened by increased exposure to desiccating heat resulting from tree canopy loss. Other resource values, however, may exceed the value of timber harvest. These communities occur only occasionally and indicate a high water table. The protection of ABGR/TABR/ CLUN sites should promote good water quality and more stable watersheds. Animal use is high. Yew provides excellent hiding cover and thermal cover for large ungulates. The proximity to streams, rivulets, or springs within these communities generally provides for a high concentration of birds and smaller mammals. Songbirds (i.e., Townsend's solitaire, varied thrush, hermit thrush) utilize arils of yew shrubbery, which incidentally, are toxic to humans!

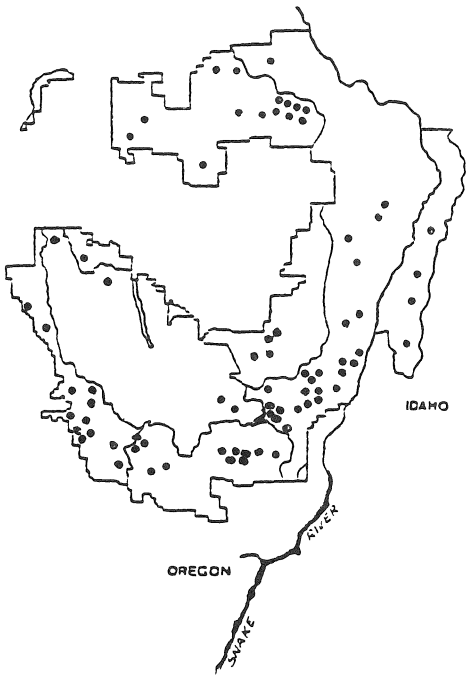
Comparison with Other Investigators - Other investigators have generally not defined a forest type segregating yew from other understories. The Daubenmires (1968) incorporated yew vegetation in their Thuja and Tsuga types; Hall (1973) included yew in his ABGR/VAME type; and Cooper, Neiman, and Steele (1985) included yew as a phase in their ABGR/CLUN habitat type, but did phase yew in Nez Perce National Forest samples along the South Fork of the Clearwater River in Idaho. Yew is probably the most tolerant of our northwestern forest trees (Harlow, 1969). Mature yew is considered to be 250-350 years old. Crawford and Johnson (1985) hypothesize that coniferous tree seedlings may be eliminated by the dense yew competition and that these sites could succeed to an ultimate

yew-dominated climax community. They described two grand fir/Pacific yew habitat types interpreted by ginger (ASCA3) or queen's cup (CLUN).

Grand fir/big huckleberry plant association
Abies grandis/Vaccinium membranaceum
(ABGR/VAME) (CWS2 11)

53. Below Kirby Point on Summit Ridge (Hells Canyon NRA)

Plot 1053



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: ash and basalt or metavolcanic colluvium
Elevation: (5200 ft.) 4000-6400 ft.	Solum depth: (50 in.) 35-60 in.
Aspect: N. below 5500 ft. all aspects above 5500 ft.	Ash depth: mixed
Slope (35%) 2, 10-75%	Root conc: (27 in.) 15-46 in.
Position:(mid to upper 1/3 slopes)ridge brows to lower 1/3 slopes	Depth to GT 35% rock frag./size: rock to surface/ gravels, cobbles, stones
Other: most widespread forested type in Wallowa-Snake	Surface soil/subsoil texture: silt loam/silt loam, silty clay loam, clay loam

Table of Principal Species

ABGR/VAME (n = 69)

Mean Coverage (%)/Constancy (%)

Species	Code	Late Seral (n=14)	Mid Seral (n=21)	Early Seral PIPO-PSME (n=22)	Early PICO-LAOC (n=12)	Late-Mid Seral Range
Overstory						
*grand fir	ABGR	42/100	16/76	18/9	35/17	0-60
Douglas-fir	PSME	12/36	31/90	30/68	8/33	0-60
*western larch	LAOC	4/29	20/33	3/36	19/50	0-50
Englemann spruce	PIEN	3/24	16/29	-	-	0-45
ponderosa pine	PIPO	-	14/14	17/59	-	0-20
lodgepole pine	PICO	-	13/19	4/23	30/92	0-35
Understory						
grand fir	ABGR	17/100	26/90	16/86	14/83	0-60
Engelmann spruce	PIEN	2/29	6/24	3/23	-	0-20
Douglas-fir	PSME	-	7/57	11/73	13/67	0-15
ponderosa pine	PIPO	-	1/5	-	-	0-1
lodgepole pine	PICO	-	1/10	1/14	15/58	0-1
western larch	LAOC	-	1/10	6/9	5/42	0-3
Shrubs						
*big huckleberry	VAME	39/100	35/95	22/82	44/92	0-85
*Utah honeysuckle	LOUT2	3/71	2/48	3/45	1/42	0-5
*prince's pine	CHUM	3/82	5/62	2/59	7/92	0-20
gooseberries, currants	RIBES	2/47	3/10	7/18	1/33	0-5
Oregon-grape	BERE	1/18	4/38	3/27	2/42	0-20
baldhip rose	ROGY	3/50	2/62	2/50	4/33	0-10
spiraea	SPBE	2/43	5/43	12/86	4/67	0-25
common snowberry	SYAL	-	11/14	7/18	-	0-30
Oregon boxwood	PAMY	-	2/24	1/14	2/42	0-5
serviceberry	AMAL	1/36	1/19	12/45	1/17	0-3
ninebark	PHMA	-	-	8/27	-	-
Scouler willow	SASC	-	2/10	13/41	8/33	0-5
redstem ceanothus	CESA	-	-	15/5	15/50	-
Rocky Mountain maple	ACGL	1/41	1/14	2/18	-	0-3
Grasses and Sedges						
Columbia brome	BRVU	2/76	1/5	2/18	-	0-5
Ross sedge	CARO	2/59	2/57	3/37	8/17	0-10
northwestern sedge	CACO	1/12	2/29	4/18	5/25	0-5
pinegrass	CARU	8/24	11/57	25/73	14/58	0-35
elk sedge	CAGE	2/18	2/33	11/32	2/25	0-5
Forbs						
*sidebells pyrolla	PYSE	3/88	3/71	3/23	1/33	0-10
fairy bells	DITR	1/35	1/33	1/9	-	0-3
*rattlesnake plantain	GOOB	3/59	3/71	2/36	1/58	0-15
*sweet cicely	OSCH	2/79	2/67	1/82	3/42	0-10
*round-leaved violet	VIOR2	7/50	4/57	3/23	16/50	0-15
W.false Solomon's seal	SMRA	1/35	1/19	2/36	-	0-3
Woods strawberry	FRVE	2/57	4/57	6/68	3/58	0-15
fragrant bedstraw	GATR	1/59	2/29	1/27	-	0-5
mitella	MIST2	3/35	4/29	5/23	-	0-10
heartleaf arnica	ARCO	6/76	10/67	15/55	15/58	0-30
bigleaf sandwort	ARMA3	3/65	3/62	4/55	8/17	0-10
trail plant	ADBI	10/47	18/10	1/14	-	0-35
meadowrue	THOC	3/79	7/71	7/73	11/42	0-20
hawkweeds	HIAL,HIAL2	1/59	1/57	3/82	3/67	0-10
showy aster	ASCO	1/12	5/19	6/41	-	0-10
Cusick's peavine	LANEC	1/6	3/5	13/32	1/17	0-3

* Principal Indicator Species

Stand Characteristics and Productivity

	Late Seral (n=5)	Early Mid Seral (n=5)	Early Seral PIPO-PSME (n=3)	Early Seral PICO-LAOC (n=7)
Herbage production (lbs./acre dry wt.)	less than 100			
Total	50-100(80)	100-350(210)	200-650(380)	50-100(80)
pinegrass - CARU	-	50-200(130)	50-550(300)	-
Average stand diameter/CI*	14.4/2.8	19.8/3.5	12.0/4.7	7.0/1.3
Number of trees per acre greater than 4 in dbh/CI	162/63	128/52	94/44	385/100
Total basal area/CI	205/45	240/22	160/60	170/30
Average basal area by species in all sampled stands				
ABGR	170	25	4	18
PIEN	4	-	-	-
PSME	28	75	66	18
LAOC	-	50	6	45
PICO	3	-	-	90
PIPO	-	90	84	-
Mean Age/GBA by species				
ABGR	140/270	-	-	-
PIEN	140/270	-	-	-
PSME	250/198	170/260	140/160	-
LAOC	240/160	190/200	225/140	98/120
PICO	-	-	-	86/160
PIPO	-	180/209	200/118	-

Productivity estimates

	#No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
ABGR	12	96(5	8(4)	270	36	110	21
PIEN	1	107(66)	#	270	#	125	#
PSME	13	95	4	212	15	86	7
LAOC	11	99(56)	4(2)	170	18	70	7
PICO	7	72(40)	4(3)	120	11	38	3
PIPO	9	92	5	160	17	62	6

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004
\# n value insufficient to calculate statistics

Vegetative Composition - Grand fir (ABGR) dominates all structural classes and levels in old-growth stands of the ABGR/VAME plant association. Western larch (LAOC) and Douglas-fir (PSME) are frequent associates on the steep side slopes which characterize the topographic affinities of this type.

Big huckleberry is always present while twinflower is either absent or very scarce in stands of this type. Other regularly associated shrubs of low coverage are baldhip rose (ROGY), Utah honeysuckle (LOUT2), prince's pine (CHUM), and thimbleberry (RUPA).

Principal herbaceous layer plants are Columbia brome (BRVU), sidebells pyrola (PYSE), strawberry (FRVE), sweet cicely (OSCH), round-leaved violet (VIOR2), meadowrue (THOC), fragrant bedstraw (GATR), rattlesnake plantain (GOOB), hawkweeds (HIAL, HIAL2), and heartleaf arnica (ARCO).

Old-growth stands occurring on ash-dominated soils generally contain high coverage by big huckleberry. Engelmann spruce is a much more frequent species on these soils than on the mixed ash-colluvial soils. The colluvial soils are occupied by forbs which respond to droughtier conditions (i.e, woods strawberry).

This type is common on dissected plateau slopes in the Hells Canyon NRA. On the Wallowa Valley Ranger District, the type is more preva- lent across the north face of the Wallowa Mountain uplift. On that part of the District north of Enterprise, ABGR/VAME is restricted to northerly slopes. When on gentle slopes north of Enterprise, twinflower persists later in succession as big huckleberry declines with canopy closure of the overstory trees. Twinflower is basically absent in Hells Canyon NRA and Wallowa Valley Ranger District east and south of Joseph. Therefore, the ABGR/LIBO2 communities tend to be north of Enterprise on Wallowa Valley Ranger District while plant communities pertaining to the ABGR/ VAME plant association predominantly occur immediately north and southeast of the Wallowa Mountain uplift east of Joseph.

Ground disturbance in this type may result in gooseberries (RILA, RIVA) and Ross' sedge (CARO) invading the community with a decrease in abundance by big huckle- berry. Big huckleberry generally occupies 20-50% of the stands in lesser dis- turbed understories. When ungulate disturbance is pronounced, big huckleberry coverage drops to 5-15% cover. Herbaceous plants that increase with ungulate disturbance are northwestern sedge (CACO), long-stalked clover (TRLO), woods strawberry (FRVE), meadowrue (THOC), heartleaf arnica (ARCO), and bigleaf sandwort (ARMA3).

Distribution and Environmental Features - This association is the most widespread forest type in the Wallowa-Snake Province. Sites occur on moderately steep to steep slopes at elevations ranging from 4,000 to 6,400 ft. (ave: 5,200); the largest range of all communities in the grand fir and subalpine fir series. The type occurs on three major landforms: 1) high elevation sideslopes of drainage headlands with northerly aspects and slopes greater than 15% (ave: 30%), 2) high elevation canyon sideslopes with northerly aspects on slopes greater than 35% (ave: 50%), and 3) footslopes and site complexes above drainage bottoms with variable aspects on 20-50% (ave. 30%) slopes. Microrelief varies from convex to undulating. Sites are commonly in the lower to upper third slope position. On slopes less than 25%, merging with ABGR/LIBO2 is common while on steeper slopes, especially where moisture becomes more limited, this type merges with PSME/CARU.

Soils - Soils are typically dark brown to dark reddish brown in color in surface layers, greater than 35 inches in depth, and formed in ash-loess and basalt colluvium over older buried soil materials. Buried soils are formed in loess and basalt colluvium and are 14 to 20 inches below the more recent soil material. Surface soil layers have silt loam textures with greater than 15%, to greater than 35%, rock fragments by volume. Subsoils have silt loam, silty clay loam, and clay loam textures with commonly 35 to 65% rock fragments by volume. Rock fragments are predominantly gravel and cobble-sized in surface layers and cobble and stone-sized in subsoils. Surface rock rarely exceeds 15% cover.

Soil depth, thickness, type of surface soil, and rock fragment content vary according to landscape position. Soil depths vary depending on proximity to rim outcrops. Ridge brow locations may have the shallowest soils (less than 40 inches) while accumulation areas well above rims or at footslope areas have the deepest soils (greater than 60 inches). Occasionally, the surface soil layer is

a nearly rock-free ash similar to that found in ABGR/LIBO2 and ABGR/CLUN. Gentle sloping coves and toeslopes supporting the most productive ABGR/VAME stands commonly have such ash layers over deep soils. The more typical situation of ash-loess with basalt colluvium mixing in surface layers occurs on moderately steep to steep mountain and drainage sideslopes. Rock fragment size and content tend to increase on these steeper slopes. The ABGR/VAME type occurs on a variety of parent materials, although it is most common on basalt. Soils developed in areas of granitic (granodiorite) rock are among the shallowest and may consist of only a weakly developed ashy surface over deep weathered rock. In general, colluvial soils supporting ABGR/VAME communities are transitional to those supporting communities in the Douglas-fir series in similar landscape positions. These similar positions include the driest, rockiest sites ABGR/VAME communities can occupy. They have greater loess and less ash influence than the typical grand fir sites. Many sites in undulating slope and bench topography may contain complexes where the entire range of soil conditions exist.

Summary of Soil and Site Characteristics (all samples) - ABGR/VAME

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
20 in. to 80 in.	10 in. to 49 in.	Ash mixed with Colluvium	stable to locally unstable	46°F to 54°F	rock to surface	occasional to locally common

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - Principal seral trees of the ABGR/VAME type are western larch (LAOC), lodgepole pine (PICO), Douglas-fir (PSME), and ponderosa pine (PIPO). Following conflagration, fire stand replacement often is by lodgepole pine and/or larch. In stands dominated by lodgepole pine, larch and Douglas-fir usually are present indicating a mid-seral stage where those species will dominate before climax ABGR/VAME. Often a grand fir presence has not yet become apparent at this early seral stage. Generally, shrubs are frequent and at higher coverages than in later seral stages. These are big huckleberry (VAME), prince's pine (CHUM), spiraea (SPBE), and redstem ceanothus (CESA). Forbs occurring in lodgepole-dominated stands in high abundance are round-leaf violet (VIOR2), meadowrue (THOC), heartleaf arnica (ARCO), and lupine. Pinegrass (CARU) and kinnickinnick (ARUV) are very abundant as early fire seral species.

Another very early seral stage results when adjacent seed sources provide a grand fir replacement stand without the normal succession of intermediate tree species. These are even-aged "doghair" grand fir with low presence by forbs, sedges, and grasses. Scouler willow (SASC) is the most common associate in these dense stands. Redstem ceanothus (CESA), heartleaf arnica (ARCO), serviceberry (AMAL), spiraea (SPBE), and common snowberry (SYAL) are other plants commonly associated in very early fire seres.

Early seral stages of ABGR/VAME may be dominated by ponderosa pine and Douglas-fir in the overstory with codominance by Douglas-fir and grand fir in the tree understory. Grand fir has not yet achieved stature to the tree overstory at this successional stage. This stage contains a tall shrub layer consisting of serviceberry (AMAL) and Scouler willow (SASC) above a low shrub layer dominated by spiraea (SPBE) and big huckleberry. Pinegrass (CARU) and elk sedge (CAGE) are present at highest coverage for the type. The forb group contains species that are at their highest levels for the type (woods strawberry, heartleaf arnica, meadowrue, showy aster, American vetch, and Cusick's peavine).

The mid seral stage occurs when grand fir begins to co-habitate the tree overstory layer. Douglas-fir is still dominant or co-dominant with grand fir. Larch is often associated. Tree understory regeneration is dominated by grand fir with Douglas-fir less commonly occurring. Big huckleberry is the dominant shrub. Light intolerant species increase in presence and coverage as succession advances.

Ungulate use by cattle, elk, and deer create dramatic increases in heartleaf arnica (ARCO), round-leaved violet (VIOR2), bigleaf sandwort (ARMA3), and long-stalked clover (TRLO). Swamp gooseberry (RILA) is found on highly disturbed sites.

Sitka alder (ALSI) occurs in ABGR/VAME as a seral opportunist near seepages and other high water table locations. With crown closure of the tree overstory, alder wanes until either fire or logging again opens up the stand. Alder then proliferates as a shrub field. Big huckleberry is especially rank and prolific where alder is associated. Due to the higher water availability, Engelmann spruce is often present with grand fir in the old-growth overstory and is reproducing in the understory with grand fir. Often accompanying alder as tall shrub members are Rocky Mountain maple (ACGL) and mountain-ash (SOSC2). The open, seral nature of the stands coupled with high moisture availability provides dense, rank big huckleberry as a low shrub layer. Reflecting the cold, wet nature of these sites, Columbia brome (BRVU), fairy bells (DITR), Sitka valerian (VASI), sickleleaf lousewort (PERA), and Alaska oniongrass (MESU) all are frequent associates.

Although ABGR/VAME tends to occupy steeper slopes, some gentle ridgetop slopes in the Wallowa-Snake Province are succeeding from open ponderosa pine/pinegrass communities toward a grand fir/big huckleberry community. These stands need further study as to their classification in the ABGR/VAME plant association.

Series Relationship - Whereas ABGR/CLUN and ABGR/LIBO2 are plant associa- tions generally occurring on gentle slopes, ABGR/VAME is most often found on slopes greater than 25% (avg: 33%). Twinflower is generally absent from the type or at its lowest levels of occurrence within the ABGR series.

Role of Fire - Fire has been a frequent modifier of this type. Lodgepole pine replaces the fire-susceptible grand fir on gentle slopes where duff is burned deeply and intensely. On the steeper slopes, old-growth grand fir can persist with its thick bark, but more susceptible thinner-barked younger trees are often consumed. Replacement is often by larch, Douglas-fir and even ponderosa pine as scattered seral groups within the grand fir community rather than as total stand replacement members. Larch may form large homogeneous stands on intensively burned slopes.

Silvicultural Considerations - Steep slopes, drier sites, and competing understory vegetation may pose problems to management. In addition, slopes where seeps are common may create potential erosion hazards following heavy overstory removals. The opportunity is good for regeneration of Douglas-fir, larch, ponderosa pine, and grand fir within five years of overstory removal. However, patchy stand conditions may prevail unless there is some site preparation to control big huckleberry and pinegrass and to prevent overexposure on the drier sites. These same considerations will be important in artificial regeneration of sites. Ponderosa pine and Douglas-fir are most suitable on the drier sites while

grand fir and larch are suitable on moist sites where conditions and ash surface layers are similar to those in the ABGR/LIBO2 type. Management for mixed-species stands, especially larch, Douglas-fir, and grand fir may better utilize growing space and ensure long-term yields in site complexes. Shelterwoods may be more successful than clearcutting to regenerate stands. Due to the patchiness of many natural stands, the less suppressed advanced regeneration has a better chance of release than in stands of the ABGR/LIBO2 type. Insects and disease problems are similar to those in ABGR/LIBO2 stands, although stands on the drier sites are highly susceptible to defoliators.

Range and Wildlife Management - The ABGR/VAME type provides little available forage for livestock unless modified by seeding of exotic grass species. Short-term grass forage can be readily provided using moist site species such as orchardgrass, timothy, and hard fescue. The huckleberry is relished by bear, grouse, and people. Prime deer habitat and browse is afforded by this type. Bluebirds, crossbills, flickers, and tanagers are common in these plant communities.

Stand Structure and Productivity - Stands in this association are predominantly multi-aged. Stands are both layered and clumped by groups of similar-aged trees; the result of periodic or cyclical regeneration periods. Douglas-fir, larch, and ponderosa pine form the oldest and tallest members in the canopy with domination by grand fir less common than that found in ABGR/LIBO2. The relatively open canopy and patchy stand structure enables Douglas-fir to regenerate and compete with the sporadic grand fir seedlings creating stands where Douglas-fir nearly shares codominance with grand fir. These conditions are more common at the dry end of ABGR/VAME distribution. Stand structure in cooler, more moist sites is similar to ABGR/LIBO2. Basal areas in late seral sample stands range from 150 to 250 sq. ft./acre (ave. 205). The even-aged to two-aged lodgepole pine, larch, and Douglas-fir-ponderosa pine-dominated stands range from 90 to over 200 sq. ft/acre (ave. 165). Early mid-seral stands consist of old-growth Douglas-fir, larch, and ponderosa pine with overtopped grand fir saplings and poles. Basal areas are high (mean: 240 sq. ft/acre) and composition is typically mixed.

In general, production is moderate to moderately high for communities in the ABGR series. Lodgepole pine growth (site index, GBA, and GBA volume growth index) is the poorest among all types described. Growth is more similar to the most productive stands in communities of the PSME series (i.e., PSME/SPBE and PSME/CARU). Within the type, Douglas-fir has the highest site index, a moderately high GBA and appears to be the best suited species for the typical ABGR/VAME site.

Sites with considerable subsurface water, indicated by frequent Sitka alder patches, have a 25% to 50% greater stockability, and volume growth for all tree species. Cove sites with deep ash accumulations may also have significantly greater (20-25%) stand production than typical sites. Both Sitka alder and deep ash in the ABGR/VAME type indicate the wetter end of the environmental range. Engelmann spruce is common on these sites and productivity is similar to that observed for spruce in the ABGR/CLUN type.

Rates of growth and stockability for Douglas-fir and larch may vary considerably in different stand composition mixtures. Pure stands and stand mixtures of Douglas-fir and ponderosa pine showed lower GBA's and volume growth than did stands where at least 10% of the composition was made up by larch or grand fir. These species may only be indicating better sites within the ABGR/VAME association. It appears that on site complexes where undulating topography allows

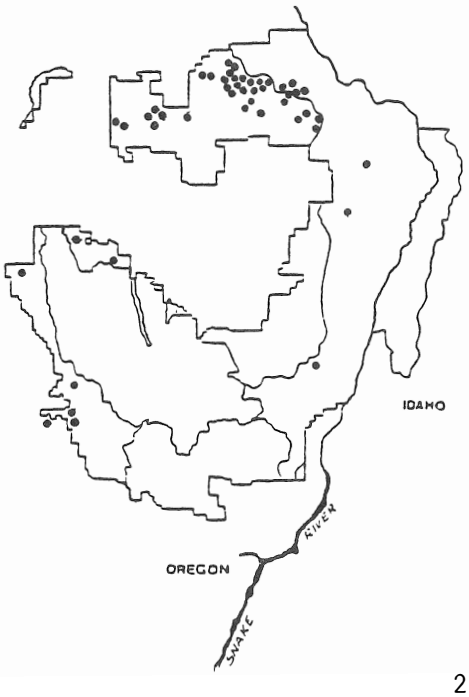
microsites of different productive potential to lie within close proximity, mixed species stands are probably better suited than pure stands to capitalize on all available resources. It is evident that Douglas-fir competes more strongly with other Douglas-fir or ponderosa pine and less strongly with larch and grand fir.

Comparison with Other Investigators - The ABGR/VAME plant association has been described by Hall (1973) in the Blue Mountains; Steele (1985) in central Idaho; and Cooper, Neiman, and Steele (1985) in northern Idaho. The Idaho investigators have determined that the tall huckleberry there is V. globulare and have so labelled their habitat types.

Grand fir/twinflower plant association
Abies grandis/Linnaea borealis (ABGR/LIBO2) (CWF3 11)

54. Deer Creek Basin, Powwatka Ridge (Wallowa Valley Ranger District)

Plot 916



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: ash and basalt colluvium
Elevation: (4950 ft.) 4200-5800 ft.	Solum depth: (60 in.) 40-70 in.
Aspect: NNW + NNE all aspects	Ash depth: (20 in.) 15-30 in.
Slope (28%) 2-40, 70%	Root conc: (26 in.) 21-32 in.
Position: plateau & ridge flats, brows, lower 1/3 slopes in coves	Depth to GT 15% rock frag./size: (23 in.) 13-34 in./gravels
Other: intermediate between ABGR/CLUN and ABGR/VAME	Surface soil/subsoil texture: silt loam/loam, clay loam, silt loam

Table of Principal Species

ABGR/LIBO2 (n = 49)

Species	Code	Mean Coverage (%)/Constancy (%) Late Seral (n=18)	Mid Seral (n=20)	Early Seral (n=11)	Late-Mid Seral Range
Tree Overstory					
Engelmann spruce	PIEN	17/28	20/10	-	0-45
*grand fir	ABGR	45/100	30/80	30/9	0-85
Douglas-fir	PSME	13/56	24/90	17/27	0-60
*western larch	LAOC	8/50	22/50	14/55	0-60
lodgepole pine	PICO	7/28	11/30	45/100	0-25
ponderosa pine	PIPO	12/22	25/10	15/18	0-40
Tree Understory					
Engelmann spruce	PIEN	2/33	5/20	-	0-10
grand fir	ABGR	42/100	34/100	19/73	1-90
Douglas-fir	PSME	5/33	16/65	19/100	0-45
western larch	LAOC	-	-	5/27	-
lodgepole pine	PICO	-	-	20/55	-
ponderosa pine	PIPO	-	-	-	-
Shrubs					
*twinflower	LIBO2	22/100	23/100	37/100	1-70
big huckleberry	VAME	8/78	10/100	43/91	0-45
*prince's pine	CHUM	2/72	3/70	10/91	0-15
baldhip rose	ROGY	3/61	2/70	5/64	0-10
Utah honeysuckle	LOUT2	2/50	3/45	4/73	0-10
Oregon-grape	BERE	2/33	1/60	5/55	0-5
spiraea	SPBE	2/33	3/45	5/100	0-10
kinnickinnick	ARUV	-	-	12/45	-
Grasses and Sedges					
*Columbia brome	BRVU	2/67	2/75	7/36	0-10
elk sedge	CAGE	2/22	2/40	7/36	0-5
pinegrass	CARU	1/33	4/40	16/82	0-15
northwestern sedge	CACO	1/39	4/60	2/55	0-10
Ross' sedge	CARO	1/11	4/25	5/55	0-5
western fescue	FEOC	1/22	2/45	1/36	0-5
Forbs					
*sidebells pyrola	PYSE	2/67	3/55	2/64	0-5
*sweet cicely	OSCH	2/72	4/75	2/91	0-30
round-leaved violet	VIOR2	4/94	4/75	8/91	0-10
meadowrue	THOC	6/50	6/75	27/27	0-20
fragrant bedstraw	GATR	2/44	1/20	1/9	0-5
fairybells	DITR	1/39	1/40	-	0-1
strawberries	FRVE,FRVI	1/67	3/82	7/82	0-10
*rattlesnake plantain	GOOB	1/100	2/60	4/55	0-5
starry false Solomon's seal	SMST	3/28	1/20	1/18	0-10
trail plant	ADBI	3/22	1/20	1/9	0-10
heartleaf arnica	ARCO	5/39	4/35	3/36	0-20
white hawkweed	HIAL	1/61	1/40	3/55	0-1

* Principal Indicator Species

Stand Characteristics and Productivity

	Late Seral (n=6)	Mixed Mid Seral (n=5)	Pure Mid Seral (n=5)	Early Seral (n=7)
Herbage production (lbs./acre dry wt.)	less than 200			
Average stand diameter/CI*	9.2/2.4	10.5/2.1	11.2/2.4	5.5/1.4
Number of trees per acre greater than 4 in. dbh/CI	280/96	250/50	290/82	303/45
Total basal area/CI	250/50	215/32	270/32	220/63
Average basal area by species in all sampled stands				
ABGR	108	112	245	11
PIEN	8	-	2	1
PSME	60	70	10	31
LAOC	63	31	9	4
PICO	1	1	2	174
PIPO	10	-	-	-
Mean Age/GBA by species				
ABGR	170/300	100/320	100/360	-
PSME	150/250	170/250	100/230	100/230
LAOC	215/180	180/180	-	100/150
PICO	-	-	-	100/135

Productivity estimates

	#No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Indes *** Mean	CI
ABGR	13	96(51)	5(3)	325	24	120	12
PSME	10	87	4	245	23	90	12
LAOC	6	95(54)	5(3)	180	15	70	11
PICO	7	77(42)	8(4)	135	20	41	8

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Grand fir (ABGR) dominates all size classes of the late-seral stands sampled in this type. Engelmann spruce is often present, but sub-alpine fir is only occasional or absent. Douglas-fir is the most common associate and is very frequently a part of the tree overstory layer. In late seral stands, shrub composition is dominated by twinflower (LIBO2). Big huckleberry (VAME) only occurs where canopy openings permit light to filter to the forest floor. Baldhip rose (ROGY), Utah honeysuckle (LOUT2), and prince's pine (CHUM) are other shrubs of high constancy. Columbia brome (BRVU) is usually found in these stands. The most common forbs are anemone (ANPI), sidebells pyrola (PYSE), meadowrue (THOC), rattlesnake plantain (GOOB), round-leaved violet (VIOR2), white hawkweed (HIAL), and sweet cicely (OSCH).

Long-stalked clover (TRLO) and meadowrue (THOC) are the primary increasing forbs which follow disturbance to the understory. Bigleaf sandwort (ARMA3), enchanter's nightshade (CIAL), strawberries (FRVE, FRVI), and western fescue (FEOC) are other herbaceous species increasing with disturbance. Houndstongue (CYOF) and stinging nettle (URDI) are found when sites are heavily degraded.

Distribution and Environmental Features - This association represents one of the most widespread types in the ABGR series and is especially common in the dissected plateau areas around Billy Meadows and Sled Springs. In that vicinity, extensive plateau, ridge top, and drainage headland forests are occupied by stands of this association at elevations between 4,400 and 5,400 ft. (ave. 4,850 ft.). Distribution becomes more limited on the plateau and ridges near Lick Creek and on the south flank of the Wallowas where ABGR/CLUN communities occupy similar, although wetter, sites. The type is common also on the west flank of the Wallowas where it occupies footslopes and undulating plateau tops. Elevations of all sample plots range from 4,200 to 5,800 feet (mean: 4,950 ft.). The type was sampled on four major landforms: 1) undulating ridge and plateau flats with slopes less than 12%; 2) undulating to straight ridges, brows, and coves with northerly aspects and slopes of less than 20%; 3) footslopes of ephemeral stream drainages with northwest aspects on slopes less than 20%; and less commonly on 4) sideslopes of perennial stream drainages with northerly aspects on slopes of up to 40%. Collectively these sites are cool and moist and usually receive at least some added water and nutrients from surrounding areas. Merging with the ABGR/CLUN communities occurs where temperature and moisture favor spruce along stream courses or coves at higher elevations. Merging with ABGR/VAME communities occurs where- ever slopes exceed 25%. The ABGR/LIBO2 type rarely occurs on slopes exceeding 30%.

Soils - Soils are typically dark brown to dark yellowish brown in color in surface layers, greater than 40 inches in depth, and formed in ash and minor amounts of basalt colluvium over older buried materials. Subsoils are formed in loess, ash, and basalt colluvium and are 15 to 30 inches in thickness below the surface ash. Surface ash-soils have silt loam textures with commonly less than 5% rock fragments by volume. Subsoils have loam, silt loam, and clay loam textures with greater than 15% rock fragments. Rock fragments are predominantly gravel-sized in all soil layers. Surface rock is generally absent.

Soil characteristics vary more in subsoils than in surface soils, although surface ash can range widely in depth depending upon position of site. Subsoils may or may not have clayey layers and when present are usually in the deeper soil zone. Rock fragments in subsoils often are minor soil constituents, but tend to increase beyond 35% by volume in the layers above bedrock. Soil accumulation areas at cove and toeslope locations often have deep ash deposits more similar to those found in ABGR/CLUN communities. Ridge and plateau sites have the shallowest mean solum depth (40 inches) and most poorly developed subsoils.

Summary of Soil and Site Characteristics (all samples) - ABGR/LIBO2

Solum Depth*	Rooting Depth**	Ash Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
40 in. to 80 in.	14 in. to 49 in.	13 in. to 30 in.	very stable	46°F to 50°F	---	0

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - Early seral stands are dominated by lodgepole and treated in the PICO(ABGR)/LIBO2 section which follows.

The mid seral successional stage can be further segregated into recognizable seral stages as follows:

1. Early mid sere - Tree overstory dominated by larch and Douglas-fir; tree understory dominated by grand fir and Douglas-fir regeneration. Spiraea is common in a big huckleberry-dominated shrub layer. Pinegrass, northwestern sedge, and western fescue are frequent gramineous associates. Forbs which are more prominant in this early mid seral stage are strawberries (FRVE, FRVI), meadowrue (THOC), and sweet cicely (OSCH).

2. Two-aged mixed species mid sere - Tree overstory dominated by Douglas-fir and grand fir; understory dominated by grand fir regeneration. Big huckleberry and twinflower tend to co-dominate shrub and sub-shrub layers.

3. Grand fir-dominated mid sere - The climax species virtually dominates overstory and understory layers in young stands following catastrophic fires. Few plants are present beneath the dense tree canopy. Twinflower dominates over all other shrubs and forbs.

Series Relationship - The ABGR/LIBO2 type generally occurs on gentle forested slopes primarily north of the Wallowa Valley. The ABGR/VAME type differs from ABGR/LIBO2 by an absence or low coverage of twinflower and its occurrence on steeper slopes (avg. 33%). Grand fir is more abundant through all tree layers in ABGR/LIBO2 than in any other type in the series, reflecting the abundance of late seral, near-climax stands sampled. Big huckleberry amounts are low along with moss/lichen levels possibly reflecting not only less light intensity in late seral stands, but also the high use of the type by domestic and wild ungulates.

Role of Fire - Grand fir is susceptible to fire and will succumb following ground fires if duff burns deep, damaging the roots or if the cambium is killed. Heart rot can be introduced through fire scars. Stand replacement fires result in lodgepole pine stands. Western larch and Douglas-fir are also members of fire seral communities. Larch can form pure stands following fire or persist as a fire-resistant species in later successional stages of ABGR/LIBO2. The larch-dominated stands tend to be on slopes while gentle topography usually supports lodgepole pine-dominated stands.

Silvicultural Considerations - These productive sites have few limiting factors to management. Indian paint fungus, root rots, atropellus, western gall rust, spruce budworm, tussock moth, fir engraver beetle, and mistletoe are not uncommon. They do not appear to cause extensive damage in these stands. There is the potential for bark beetle attacks in lodgepole pine and larch stands under growth stress. The probability is high for natural regeneration of Douglas-fir, larch, lodgepole pine, and grand fir within five years of overstory removal if an adequate seed source is available. Exposure of some mineral soil through light broadcast burning or whole tree yarding is especially beneficial to lodgepole pine. Sites are suitable for Douglas-fir, larch, ponderosa pine, and lodgepole pine plantations. Frost pockets may be suitable for larch, lodgepole pine, and spruce only. Natural 'fill in' of plantations is very high in this type. Clearcutting of lodgepole and larch stands and shelterwoods in Douglas-fir and

grand fir stands are suitable silvicultural practices. Overstory removals in late seral stands have not proven to be successful in releasing suppressed grand fir and Douglas-fir understory poles. Information concerning response of advance grand fir regeneration to overstory removal (Ferguson and Adams, 1980) may make this option more feasible. Precommercial thinning is recommended in young lodgepole and larch stands. Animal use does not appear to be a problem unless sites have been seeded to grass.

Range and Wildlife Management - Late seral ABGR/LIBO2 stands do not provide desirable forage for domestic livestock or big game, but animals are attracted to these stands for shading and bedding in the hot summer months. Earlier successional stages provide big huckleberry fruits utilized by bear, grouse, and people. Strawberries are also frequently found and are used by rabbits, squirrels, and grouse. Seeding to exotic grasses will provide interim forage on silviculturally modified sites. Orchardgrass, timothy, and hard fescue are especially suited.

Stand Structure and Productivity - A wide range in diameter/age distribution occurs in stands belonging to this plant association reflecting different types of initial stand establishment and patterns of development. Early and mid-seral stands are even-aged to two-aged with pure or mixed species compositions. Mean basal area ranges from 220 to 270 sq. ft./acre in even-aged lodgepole pine and grand fir stands with tree ages usually below 100 years. Lower basal areas often occur in mid-seral two-aged stands where dominant and codominant trees range in age from 100 to over 200 years old. Late seral stands approach an all-aged condition and have mixed species composition, mean basal area around 250 sq. ft./acre, and dominant and codominant trees over 150 years old. Grand fir often occurs throughout all size and age classes. Unlike forested communities in the subalpine fir zone, few ABGR/LIBO2 stands appear to have developed under lodgepole pine overstories. The early seral lodgepole pine sample stands, however, all contain ample amounts of Douglas-fir and grand fir in subordinate positions indicating successional pathways like those found in the subalpine fir zone. Apparently larch and Douglas-fir play a more important role in the grand fir zone in site modification leading to grand fir establishment. This is reflected in mid seral mixed-stands which are typically two-aged, containing 200-year old larch and Douglas-fir overstories and 100-year old grand fir. Grand fir may re-establish under certain conditions without prior site modification by other tree species. Sample stands in these conditions contain grand fir with mean tree age never exceeding 100 years. These stands are termed mid seral because of their age and despite the fact that they are dominated by the climax species, grand fir. In the late seral stage, mean grand fir age is nearly 200 years with a mixed tree species composition. Douglas fir, which is longer-lived than grand fir, may codominate old-growth stands by taking advantage of space created by mortality of older large-crowned grand fir trees.

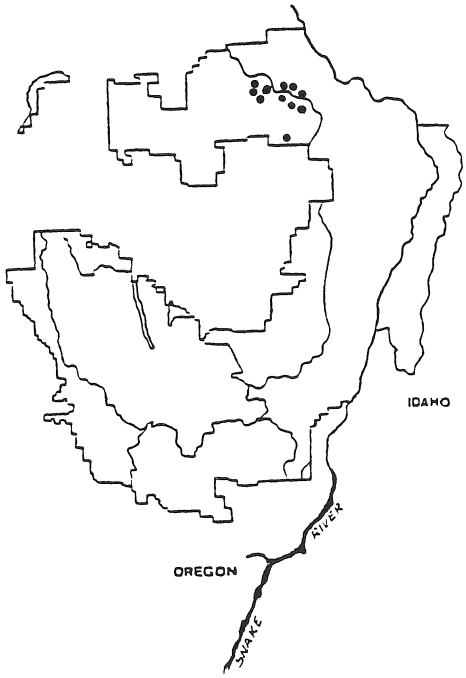
Overall productivity is moderate to high in comparison to other associations in the grand fir series. This plant association is among the best for production of larch. Surprisingly, lodgepole pine does not perform well on these sites. This may be due to warmer summer temperatures associated with communities in this type versus cooler temperatures in the subalpine fir zone and in ABGR/CLUN communities where lodgepole pine stockability and height growth is best. Within the type, grand fir has the best growth at highest stocking followed by Douglas-fir, larch, and lodgepole pine. Grand fir is able to maintain good diameter growth at the relatively high stocking levels found in this type although height growth is exceeded in ABGR/CLUN and ABGR/ACGL. Most species showed slightly better

diameter growth, but not always better height growth on plateau sites than on brows or drainage headlands. Species composition does not appear to heavily influence tree growth in this type. The highest grand fir GBA's, in fact, were recorded in pure grand fir stands. These stands may, however, be so young and vigorous that growth indices over-estimate production potential.

Comparison with Other Investigators - The ABGR/LIBO2 plant association has been described in the Blue Mountains by Hall (1973), in Montana by Pfister (1977), in central Idaho by Steele (1981), and in northern Idaho by Cooper, Neiman, and Steele (1985).

Lodgepole pine/twinflower plant community type
Pinus contorta (Abies grandis)/Linnaea borealis
PICO(ABGR)/LIBO2 (CLF2 11)

55. Southeast of Dougherty Spring *Plot 232*
(Wallowa Valley Ranger District)



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: all districts	Parent Material: ash and basalt colluvium
Elevation: (5100 ft.) 4600-5300 ft.	Solum depth: (47 in.) 37-70 in.
Aspect: all	Ash depth: (16 in.) 6-24 in.
Slope (12%) 2-21%	Root conc: (18 in.) 11-24 in.
Position: plateau and ridge flats, coves, lower slopes	Depth to GT 35% rock frag./size: (30 in.) (16-40 in.)/ gravels, cobbles
Other: Represents ABGR sites with stand replacement fire	Surface soil/subsoil texture: silt loam/silty clay loam, clay loam

Table of Principal Species

PICO(ABGR)/LIBO2 (n = 11)

Species	Code	Mean Cover(%)	Constancy (%)	Range
Overstory				
*lodgepole pine	PICO	45	100	30-60
western larch	LAOC	14	55	0-25
Understory				
*lodgepole pine	PICO	20	55	0-40
*grand fir	ABGR	19	73	0-65
Douglas-fir	PSME	19	100	1-40
Shrubs				
*twinflower	LIBO2	37	100	5-75
big huckleberry	VAME	43	91	0-70
*spiraea	SPBE	5	100	1-10
Utah honeysuckle	LOUT2	4	73	0-10
*prince's pine	CHUM	10	91	0-40
kinnickinnick	ARUV	12	45	0-25
Grasses and Sedges				
*pinegrass	CARU	16	82	0-50
*Ross' sedge	CARO	5	55	0-15
northwestern sedge	CACO	2	55	0-5
Forbs				
*round-leaved violet	VIOR2	8	91	0-20
sweet cicely	OSCH	2	91	0-5
strawberries	FRVE,FRVI	7	82	0-20
*rattlesnake plantain	GOOB	4	55	0-10
white hawkweed	HIAL	3	55	0-5

* Principal Indicator Species
See ABGR/LIBO2 for productivity estimates

Successional Relationship - Overstory tree coverage is dominated by lodgepole pine (PICO) and occasional larch in stands of early seral ABGR/LIBO2. Understory tree layers generally contain a mixture of reproducing lodgepole pine with Douglas-fir and grand fir regeneration establishing beneath the overstory of pine.

In the more open early seral stands, increased solar radiation permits higher amounts of big huckleberry, twinflower, and prince's pine than are found in more shaded late seral ABGR/LIBO2 stands. Twinflower, a shade tolerant plant, is able to persist in earlier seral stages due to cold air pockets and drainageways compensating for diurnal heating. Periodic fire will maintain an open overstory canopy and promote big huckleberry dominance. The seral big huckleberry provides solar insulation for the twinflower colonization and establishment. Big huckleberry diminishes rapidly when overstory canopy closures exceed 60% in ABGR/LIBO2 stands. Prince's pine is universally found in high abundance beneath lodgepole pine. Exemplifying the early seral nature of these stands is spiraea (SPBE), a species much more common beneath Douglas-fir stands at higher temperatures and in communities that are more open to solar radiation. Kinnickinnick (ARUV) is often present as a fire pioneering species.

Round-leaved violet (VIOR2) is abundant beneath the open lodgepole pine stands. Conversely, those species with greater shade tolerances and cooler temperature requirements are less common in earlier successional stages (i.e., fairy bells, fragrant bedstraw). Two forbs, kinnickinnick (ARUV) and lupine, often present under early seral lodgepole pine stands of the ABGR/LIBO2 association were absent from late seral stages. In the Douglas-fir/larch mid seral stage of ABGR/LIBO2, the following species are more strongly associated: spiraea (SPBE), Oregon-grape (BERE), prince's pine (CHUM), elk sedge (CAGE), woods strawberry (FRVE), meadow-rue (THOC), and white hawkweed (HIAL). In the late seral stages of ABGR/LIBO2, the shrub level is reduced to occasional occurrence by Oregon-grape (BERE) and lower coverages by spiraea (SPBE), prince's pine (CHUM), and big huckleberry (VAME).

With wild and domestic ungulate usage, big huckleberry decreases from 30+% to 10% or less with repeated browse resulting in hedged plants that rarely exceed 16 inches in height. Heavy concentration by ungulates is fairly common owing to the gentle slopes and hiding cover provided in lodgepole pine stands. Twinflower would be degraded in these situations with round-leaved violet increasing from the disturbance. The most prolific plant resulting directly from ungulate disturbance is long-stalked clover (TRLO).

Lodgepole pine produces non-serotinous and serotinous cones in the Blue and Wallowa Mountains. Fire is not necessary to open the serotinous cones as heat from increased solar radiation may be sufficient. The best germination of the species is on mineral soil or disturbed duff (USDA-Forest Service, 1965). Low intensity fires tend to burn along the ground surface and result in an uneven-aged stand. High intensity crowning fires will destroy the stand and result in a dense even-aged stand from the heavy seeding by serotinous cones (Lotan and Perry, 1983). Regeneration is abundant, often resulting in stagnation at extremely early ages. The tendency of lodgepole pine to overstock and stagnate is probably the most extreme of any tree species in North America (USDA-Forest Service, 1965). Management should utilize patch clearcutting and rely on natural regeneration of lodgepole pine to re-forest areas with even-aged stands.

Grand fir/goldthread plant association
Abies grandis/Coptis occidentalis
(ABGR/COOC2) (CWF5 11) (n = 2)

Vegetative Composition - Reproducing Engelmann spruce occur with grand fir in understories of this association. Big huckleberry (VAME) is the most prolific shrub species of the type with Utah honeysuckle (LOUT2) and prince's pine (CHUM) regularly associated. Columbia brome (BRVU), fragrant bedstraw (GATR), trail plant (ABDI), and round-leaved violet (VIOR2) are plants indicative of the moist, cool conditions found beneath the spruce-grand fir dominated overstory. Goldthread (COOC2) defines the type as the dominant forb.

Other species of high constancy are Utah honeysuckle (LOUT2), thimbleberry (RUPA), sweet cicely (OSCH), meadowrue (THOC), mitella (MIST2) and rattlesnake plantain (GOOB). Slightly moister sites within the type may be defined by queen's cup (CLUN), starry Solomon's seal (SMST), and fairy bells (TITRU).

Distribution and Environmental Features - This association has limited occurrence in the Wallowa-Snake Province, being more common at mid-elevations in the Seven Devils in Idaho and in the northern Rockies. Elevations of sample plots ranged from 5,200 to 5,400 ft. (ave. 5,300) on steep north-facing drainage headland sideslopes. This type may occupy the wetter, more sheltered portions of ABGR/VAME sites and the steeper slopes of ABGR/CLUN sites. Positions of sample plots were at mid- to upper-slope locations with concave to undulating surface relief. The relatively shallow depth to bedrock and evident influence of underground water creates conditions favoring growth of spruce and larch.

Successional Relationship - Larch is apparently the principal seral tree species for this type. No lodgepole pine was found in these stands. Douglas-fir precedes the grand fir climax dominants in mid-seral stages.

Series Relationship - This should be considered an incidental plant association for the Wallowa-Snake Province as it is quite uncommon. The two plots sampled were on steep slopes and contained the highest big huckleberry (VAME), Columbia brome (BRVU), and goldthread (COOC2) coverage of the ABGR series types.

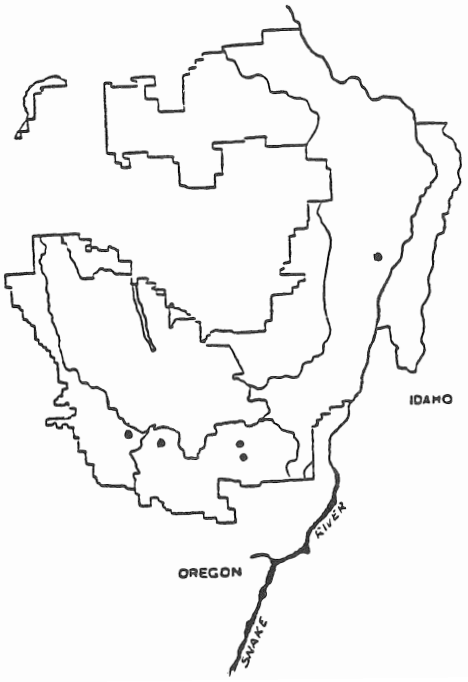
Stand Structure and Productivity - The diameter/age distribution for stands in this association is similar to the structure found in the ABGR/VAME type where groups of similar-aged trees appear to clump together. This condition is more pronounced as stands approach maturity. Typically larch dominates the upper crown classes with spruce while grand fir and spruce are well represented in all subordinate positions. Basal areas of sample plots ranged from 160 to 170 sq.ft./acre (ave. 165), well below that found in other members of the ABGR association under similar successional situations.

Overall productivity is similar to that found in ABGR/VAME. Grand fir site index is high but maintained at relatively low stocking levels; Douglas-fir performed more poorly here than in other types of the ABGR series. While individual species' growth appeared high, growth for stands based on growth basal area, and the GBA volume growth index was at the lower range of growth measured in the ABGR association. This was due to the lower stocking levels maintained in stands sampled in the ABGR/COOC2 type.

Comparison with Other Investigators - Steele (1981) identified this type as incidental in central Idaho on the Nez Perce National Forest. Cooper, Neiman, and Steele (1985) also recognized the type in the same geographic center of occurrence, but split it into two phases -- a colder, higher elevation COOC2 phase; and a warmer, lower elevation PHMA phase.

Grand fir/Rocky Mountain maple plant association
Abies grandis/Acer glabrum (ABGR/ACGL) (CWS9 12)

56. Gold King Creek Canyon (Pine Ranger District) *Plot 1179*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA, PRD	Parent Material: Ash-loess and colluvium from var. geologies
Elevation: (5300 ft.) 4600-6100 ft.	Solum depth: (61 in.) 51-80 in.
Aspect: Southerly	Loess-Ash depth: (28 in.) 17-40 in.
Slope (52%) 25-70%	Root conc: (31 in.) 26-40 in.
Position:(lower 1/3 of slopes)footslopes,coves and benches	Depth to GT 15% rock frag./size: surface to 40 in./gravels, cobbles
Other: limited occurrence; old growth stands important for wildlife value	Surface soil/subsoil texture: silt loam/silty clay loam, silty clay

Table of Principal Species

ABGR/ACGL (n = 5)

Species	Code	Mean Cov (%)	Const.(%)	Range
Tree Overstory				
*grand fir	ABGR	54	100	30-80
Douglas-fir	PSME	9	40	0-15
ponderosa pine	PIPO	16	40	0-30
Tree Understory				
*grand fir	ABGR	9	100	1-35
Douglas-fir	PSME	2	40	0-2
Shrubs				
*Rocky Mountain maple	ACGL	13	100	1-35
baldhip rose	ROGY	2	40	0-3
Utah honeysuckle	LOUT2	2	40	0-3
Oregon-grape	BERE	2	60	0-5
little prince's pine	CHME	2	60	0-3
Forbs				
sweet cicely	OSCH	3	80	0-5
*fragrant bedstraw	GATR	2	60	0-3
*fairybells	DITR	1	60	0-1
false Solomon's seal	SMRA	1	40	0-1
starry Solomon's seal	SMST	2	40	0-3
bigleaf sandwort	ARMA3	5	60	0-10
meadowrue	THOC	1	40	0-1
mitella	MIST2	1	40	0-1
white hawkweed	HIAL	1	40	0-1
bracken fern	PTAQ	4	40	0-5

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands n = 5
Herbage production (lbs./acre dry wt.)	less than 100
Average stand diameter/CI*	22.1/3.9
Number of trees per acre greater than 4 in dbh/CI	170/110
Total basal area/CI	310/90

Average basal area by species in all sampled stands

ABGR	224
PSME	57
LAOC	2
PIPO	28

Mean Age/GBA by species

ABGR	130/375
PSME	140/308
PIPO	300/190

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
ABGR	5	115(61)	3(2)	375	70	170	29
PSME	2	106	3	308	18	137	7
PIPO	1	92	#	190	#	75	#

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004
# n value insufficient to calculate statistics

Vegetative Composition - This type defines those cool, moist sites within the grand fir series where Rocky Mountain maple (ACGL) persists as a stable member of a late seral community. Other shrubs commonly associated with the type are Utah honeysuckle (LOUT2), baldhip rose (ROGY), Oregon-grape (BERE), and little prince's pine (CHME). Forbs frequently occurring are: fragrant bedstraw (GATR), fairy bells (DITR), sweet cicely (OSCH), and the Solomon's seals (SMRA, SMST). Bracken fern (PTAQ), meadowrue (THOC), and big leaf sandwort (ARMA3) all tend to increase in the type.

Distribution and Environmental Features - This type occurs sporadically across the Province and appears to be most common on the southern flank of the Wallowas. There it forms isolated stands often less than ten acres in size on steep southerly facing footslopes, benches, and concave slope depressions. Stands are often directly above riparian areas. Elevations of sample plots range from 4,600 to 6,100 feet (mean: 5,300 feet), the highest mean elevation of all communities in the grand fir series.

Soils - Soils are typically dark reddish brown to dark brown in color in the surface layers, greater than 50 inches in depth, and formed in ash, loess and colluvium from basalt, metavolcanic, or granitic parent materials. Surface layers contain loess and ash, have silt loam textures with less than 15% rock fragments by volume. Subsoils may be buried soils as in other grand fir groups. These layers have silty clay loam and clay loam textures with greater than 15% to greater than 35% rock fragments by volume. Rock fragments are predominantly gravel-sized in surface layers and cobble-sized in subsoils. Surface rock from rock outcrops may be common.

These soils occur on a number of different substrates and as such may vary considerably. Surface soils are usually always ash-loess derived, but rock fragments may be mixed throughout these layers. Relatively shallow granodiorite subsoils seldom have clay concentrations while the clayey basalt subsoils are usually deep. Loess influence is greater at elevations below 5,000 feet and may be minimal above 6,000 feet. Rock outcrops are often common in an undulating topography. Therefore, soil depth tends to be variable on most sites.

Management Considerations - Although timber productivity in this type is very high, the steep slopes, isolated character, and limited extent of stands, reduces the feasibility of logging. These stands may be more valuable to other resource values, namely wildlife habitat and watershed protection. Overstory removal may induce a shrubfield dominated by Scouler willow, serviceberry, ninebark, cherry, thimbleberry, big huckleberry, and/or maple. The location of the type may provide needed protection of water courses as a primary benefit. Overstory removals should be gradual in order to retard takeover by shrubs.

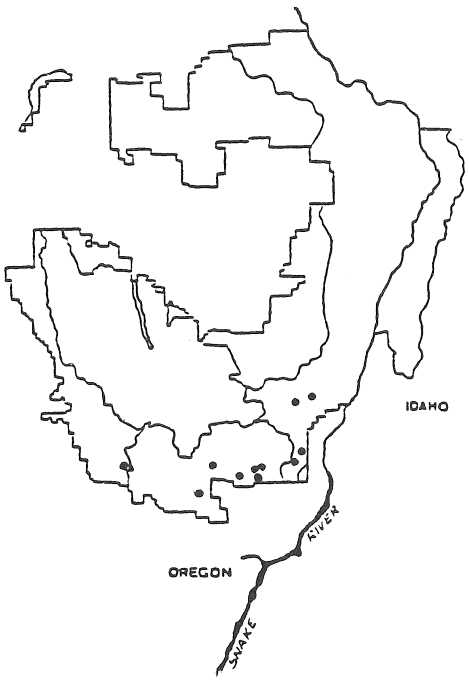
Range and Wildlife Management - Livestock use is minimal owing to steep slopes that are often unstable to a large animal. Deer and elk probably use the community for thermal cover. Big huckleberry and other seral shrubs provide good bear forage. The type affords excellent grouse habitat and may represent the most important habitat to the black bear.

Stand Structure and Productivity - Diameter-age distribution for stands in the ABGR/ACGL type is multi-aged with all plots characterized as late seral. Stands are usually mixed, but trees are often clumped by similar age class. Basal areas are high (range 200-400 sq. ft., mean: 310) and average stand diameters among the largest of all forest types. Dominant and codominant grand fir and Douglas-fir trees are usually at about the same age and evidently occupy the sites for the same amount of time. In general, sample stands represent some of the most attractive old-growth areas on the Forest. Stands in the ABGR/ACGL association occupy productive sites with deep rich soils. Stockability index (GBA) and stand growth estimates for Douglas-fir and grand fir exceeded that observed in all other forested communities. Even those stands with over 400 sq. feet of basal area showed tree diameter growth well beyond one inch per decade.

Comparison With Other Investigators - The only description of similar vegetation is from central Idaho where Steele (1981) found ABGR/ACGL occurring in the Payette and Nez Perce National Forests. He divided the habitat type into a nine-bark phase and a maple phase. The mesic vegetation of the maple phase is more like the ABGR/ACGL plant association of the Wallowa-Snake Province. He also notes that fairy bells (DITR) is a good indicator species for this type.

Grand fir/spiraea plant community type (n = 11)
Abies grandis/Spiraea betulifolia (ABGR/SPBE) (CWS3 21)

57. North Pine Creek Canyon (Hells Canyon NRA) *Plot 1280*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: PRD	Parent Material: loess, ash and basalt colluvium.
Elevation: (3800 ft.) 3200-4600 ft.	Solum depth: (48 in.) 43-52 in.
Aspect: NE-NW below 3500' S-SW above 4000'	Loess-Ash depth: (10 in.) 6-14 in.
Slope (29%) 10-50%	Root conc: (22 in.) 18-24 in.
Position: toe and footslopes	Depth to GT 15% rock frag./size: rock to surface/gravels, cobbles
Other: lower elevational extension of ABGR series; common on south flank of Wallowas.	Surface soil/subsoil texture: loam, silt loam/silty clay loam, clay loam, clay

Table of Principal Species

(ABGR/SPBE) (n = 11)

Mean Coverage (%)/Constancy (%)

Species	Code	Mid Seral (n=7)	Early Seral n=4)	Range
Tree Overstory				
grand fir	ABGR	17/43	-	0-20
Douglas-fir	PSME	27/43	1/25	0-50
*ponderosa pine	PIPO	24/100	39/100	10-45
Tree Understory				
*grand fir	ABGR	8/100	1/75	0-20
Douglas-fir	PSME	8/71	6/50	0-25
ponderosa pine	PIPO	3/57	9/100	0-20
Shrubs				
*serviceberry	AMAL	3/86	15/75	0-30
*spiraea	SPBE	30/100	13/100	1-70
*common snowberry	SYAL	20/100	28/100	1/80
rose spp.	ROSA	1/43	1/100	0-1
Oregon-grape	BERE	10/43	5/25	0-15
prince's pine	CHUM	1/43	1/25	0-1
Grasses				
*pinegrass	CARU	8/86	11/75	0-30
elk sedge	CAGE	2/43	6/75	0-10
western fescue	FEOC	2/43	-	0-3
blue wildrye	ELGL	3/29	1/50	0-5
Forbs				
fragrant bedstraw	GATR	1/43	1/75	0-1
trail plant	ADBI	2/29	3/25	0-3
bigleaf sandwort	ARMA3	2/57	1/25	0-3
heartleaf arnica	ARCO	10/71	40/25	0-40
*sweet cicely	OSCH	2/100	1/75	0-5
*woods strawberry	FRVE	3/71	21/50	0-40
white hawkweed	HIAL	1/29	1/75	0-1
showy aster	ASCO	2/43	8/75	0-15
American vetch	VIAM	1/57	10/25	0-10
peavines	LANEC,LAPA2	3/57	-	0-5

* Principal Indicator Species

Stand Characteristics and Productivity

	Mid Seral (n=4)	Early Seral (n=2
Herbage production (lbs./acre dry wt.)	less than 100	
Average stand diameter/CI*	15.8/1.0	18.2/10.0
Number of trees per acre greater than 4 in dbh/CI	202/66	168/100
Total basal area/CI	270/55	168/14
Average basal area by species in all sampled stands		
ABGR	73	
PSME	32	
PIPO	165	168
Mean Age/GBA by species		
PSME	90/300	
PIPO	110/250	120/180

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PSME	3	93	7	300	50	117	14
PIPO	6	113	6	225	13	110	16

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - This plant community type is characterized by dominant old-growth* ponderosa pine and a co-dominant shrub comprised of common snowberry and spiraea. It is succeeding to grand fir throughout much of the southern flank of the Wallowa Mountains. A mid seral stage, defined by ponderosa pine and Douglas-fir co-dominance in the overstory and a grand fir-dominant tree understory, characterizes the type as it usually occurs in the Province. Spiraea and snowberry are usually dominant with pinegrass and elk sedge highly associated. Serviceberry is frequent at lower coverage. Among herbaceous plants, sweet cicely (OSCH), heartleaf arnica (ARCO), and woods strawberry (FRVE) are usually present. Plants which are commonly associated with Douglas-fir zone associations are also found (i.e., peavines (LANEC, LAPA2), American vetch (VIAM), showy aster (ASCO), and bigleaf sandwort (ARMA3)).

*Old-growth as used in this study denotes those forested stands where old, relict or fire resistant trees are supported in a succeeding forest community usually dominated by more juvenile vegetation of the climax tree species.

Distribution and Environment - This type is apparently restricted to lower elevation basalt drainages along the southern flank of the Wallowas. There it forms extensive even-aged stands in foot and toeslope positions often merging with communities in the Douglas-fir series. Elevations range from 3,200 to 4,600 feet (mean: 3,800 ft.), the lowest elevational extension of grand fir communities. Microrelief is variable although convex to concave surfaces are common on toeslopes. Slopes are moderate to moderately steep (range 10-50%, mean: 29%). These low elevation communities occur on the warmest of all grand fir sites and may be more typical of areas occupied by white fir, a species that hybridizes with grand fir in this area.

Soils - Soils are typically dark reddish brown to very dark brown in color in surface layers, greater than 43 inches in depth, and formed in loess-ash and basalt colluvium. Surface layers have loam and silt loam textures with approximately 15-20% rock fragments by volume. Subsoils are often dense and have silty clay loam, clay loam, and clay textures. These may be buried soils. Clay is often so dense as to form hardpans restricting penetration by fine roots. Rock fragments are greater than 15% by volume in subsoils and gravel-sized fragments predominate in all soil layers. Surface rock is generally absent.

Soils are normally deep considering their position along toeslope accumulation areas. Rooting depths, however, may vary according to the depth of dense clayey subsoil layers. Ash and loess mixtures may also vary depending upon a complex of factors including past accumulation cycles, subsequent erosion, and slope position. These soils may be among the least ash-influenced of all soils supporting grand fir communities. Clay accumulations are more typical of soils found in the Douglas-fir series.

Successional Relationship - Late seral grand fir-dominated stands have not been observed in this type. Classification of these communities into ABGR/VAME, ABGR/LIBO2, or ABGR/ACGL seems unlikely because none of the principal indicators occur in ABGR/SPBE stands. A new plant association, ABGR/SPBE, is anticipated unless fire is re-introduced to the ecosystem.

The early seral stage is characterized by a dominant ponderosa pine tree overstory over a shrub layer consisting of common snowberry, rose and spiraea.

Ponderosa pine and Douglas-fir occur as a pole/sapling layer with a scarcity of grand fir in the tree understory. Serviceberry is a prominent early seral stage plant forming a highly variable tall shrub layer. Warm site plants are more common in this stage (i.e., pinegrass/elk sedge, showy aster, strawberry, and heartleaf arnica).

Role of Fire - Repetitive underburning will promote fire resistant ponderosa pine with a low shrub-pinegrass understory and discriminate against grand fir and Douglas-fir regeneration. Removal of fire in stands of this type will create a fire hazard from ladder fuels created by sapling and pole-sized fire thickets and undergrowth.

Silvicultural Considerations - These warm sites are best adapted to grow ponderosa pine, although both pine and Douglas-fir will grow well. Underburning is a good tool to promote pine with low shrub-grass understory. Burning should be moderate in intensity to promote a shrub-grass variety and to ensure

that some true fir regeneration remains to achieve a mixed tree species composition as a deterent to catastrophic loss from insect and disease outbreaks. Pinegrass competition may be severe requiring disturbance of the mat to enhance tree regeneration. Small clearcuts or group selection cuts would help promote a mixed age representation and continue a ponderosa pine dominance. The clayey soils have a high potential for compaction. Therefore, care should be used in logging operations.

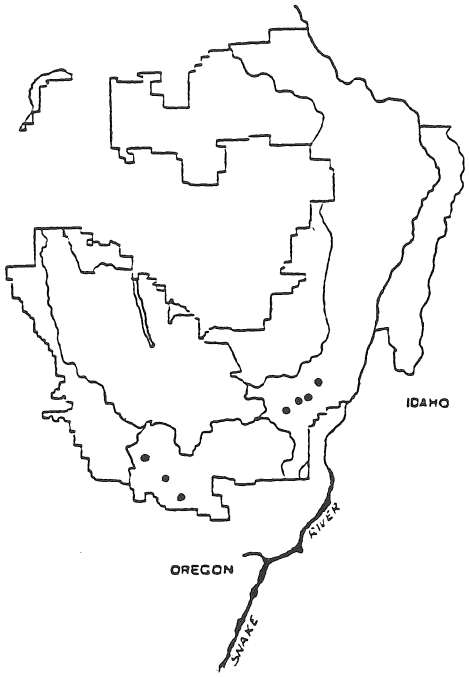
Range and Wildlife Management - Livestock are generally attracted by more desirable forage species in adjacent areas. Use of elk sedge and pinegrass is normally late in the season after other preferred areas have dried from hot summer drought. Big game species use sprouting elk sedge and pinegrass early in spring. Exotic grasses may improve forage production. Orchard grass, timothy, and hard fescue are species that perform well in this type. Reduction of severe competition from pinegrass - elk sedge and rhizomatous shrub species is necessary for the introduction of exotics. Associated shrubs provide fruits for songbirds (grosbeaks, towhees, thrushes), ruffed grouse, bear, and deer.

Stand Structure and Productivity - Sample stands are even-aged with early seral communities dominated by ponderosa pine. Mid seral mixed stands of Douglas-fir and pine are also very common; however, few sites contain grand fir in dominant and codominant overstory positions. These even-aged stands presumably have resulted from past stand replacement fires which affected extensive lower elevations along the southern flank of the Wallowa Mountains. Ponderosa pine age classes range from 80 to 160 years while Douglas-fir ranged from 60 to 100 years old. Basal areas in pure ponderosa pine stands are often substantially less than in mixed stands (mean: 170 vs. 270 sq. ft/acre). Mixed stands had much higher pine GBA than pure pine stands. Volume growth and stockability for both ponderosa pine and Douglas-fir is high on sites supporting communities in the ABGR/SPBE association. These two species perform better on these sites than on most other sites supporting grand fir and Douglas-fir communities. High productivity is perhaps due to a combination of warmer temperatures, deep rich soils with high water-holding capacity due to clay content, and the compatibility of pine and Douglas-fir to codominate stands.

Comparison with Other Investigators - Steele (1981) was the first investigator to describe an ABGR/SPBE type. He found it on the warm dry end of the grand fir series from 4,300 - 6,400 feet in elevation which is a little higher than the type's occurrence in the Wallowa-Snake Province. Hall's (1973) description of mixed conifer-pinegrass probably includes similar vegetation. Cooper, Neiman, and Steele (1985) classified ABGR/SPBE as a minor type in north central Idaho representing warm, dry extremes for the series at lower elevational limits for grand fir (less than 1,600 feet).

Grand fir/pinegrass plant community type
Abies grandis/Calamagrostis rubescens (ABGR/CARU) (CWG1 12)

58. Imnaha River Canyon above Skookum Creek (Hells Canyon NRA) *Plot 895*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA, PRD	Parent Material: Ash, loess & colluvium or alluvium from var. geologies
Elevation: (4400 ft.) 4100-4800, 5700 ft.	Solum depth: (45 in.) 30-60 in.
Aspect: All	Loess-Ash depth: (10 in.) 8-11 in.
Slope (15%) 3-30%	Root conc: (20 in.) 17-22 in.
Position: mid to upper 1/3 slopes and undulating topography	Depth to GT 15% rock frag./size: (10 in.) 8-11 in./gravels, cobbles
Other: may form mosaic with ABGR/VAME; reflects high fire periodicity.	Surface soil/subsoil texture: silt loam/silty clay, loam

Table of Principal Species

ABGR/CARU (n = 7)

Species	Code	Mean Cov (%)/Cons (%) Mid Seral (n=3)	Early Seral (n=4)	Total Range
Tree Overstory				
*grand fir	ABGR	20/67	-	0-30
Douglas-fir	PSME	13/67	3/25	0-15
ponderosa pine	PIPO	28/67	30/100	0-55
Tree Understory				
*grand fir	ABGR	9/100	6/50	0-20
Douglas-fir	PSME	6/100	1/50	0-15
ponderosa pine	PIPO	3/33	18/100	0-70
Shrubs				
big huckleberry	VAME	6/67	8/50	0-15
spiraea	SPBE	1/33	1/75	0-1
Grasses and Sedges				
*pinegrass	CARU	68/100	40/100	1-80
*elk sedge	CAGE	15/67	9/100	0-20
western fescue	FEOC	-	4/50	0-5
Forbs				
*heartleaf arnica	ARCO	20/67	43/50	0-60
woods strawberry	FRVE	13/67	2/75	0-20
hawkweeds	HIAL,HIAL2	4/100	1/50	0-10
yarrow	ACMIL	1/67	1/25	0-1
Cusick's peavine	LANEC	3/33	5/50	0-5
thick-leaved peavine	LALA2	-	6/50	0-10

* Principal Indicator Species

Stand Characteristics and Productivity

	All Plots (n = 4)
Herbage production (lbs./acre dry wt.)	
Pinegrass - CARU	300-600(420)
Total	300-900(530)
Average stand diameter/CI*	19.5/7.9
Number of trees per acre greater than 4 in dbh/CI	103/58
Total basal area/CI	245/70
Average basal area by species in all sampled stands	
ABGR	8
PSME	20
PIPO	217
Mean Age/GBA by species	
PSME	150/270
PIPO	170/195

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PSME	1	94	#	270	#	104	#
PIPO	4	101	7	195	42	85	28

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004
\# n value insufficient to calculate statistics

Vegetative Composition - A plant community dominated by old-growth ponderosa pine and Douglas-fir associated with a high coverage of pinegrass-elk sedge characterizes this plant community type. Big huckleberry (VAME) is usually present at low coverage levels with spiraea (SPBE) in early seral stands. Principal forb species associated are heartleaf arnica (ARCO), woods strawberry (FRVE), hawkweeds (HIAL,HIAL2), and peavines (LANEC, LALA2).

Distribution and Environmental Features - Stands in the ABGR/CARU community occur sporadically across the Province as site inclusions at mid-elevations in the grand fir zone. The type commonly occurs with ABGR/VAME and ABGR/SPBE

communities forming mosaics on undulating slope complexes. These complexes include communities referred to by Hall (1973) as mixed conifer. More continuous stands were observed between 4,000 and 4,500 feet in elevation in the upper Imnaha River drainage between Blackhorse and Coverdale campgrounds. There, the gentle-sloping Imnaha River terrace supports extensive park-like ABGR/CARU communities. Typical plot elevations range from 4,100 to 4,800 feet (mean: 4,400 ft), the second lowest mean elevation for communities in the grand fir series. Sample sites included river terrace, bench and complex ridgebrow-slope locations. Microrelief is commonly undulating and slopes moderate (range 3-30%, mean: 15%).

Soils - Soils are typically dark reddish brown in color in surface layers, less than 60 inches in depth, and formed in ash-loess and colluvium from variable parent materials. Surface layers have silt loam textures with less than 15% rock fragments by volume. Subsoils may be formed in buried soils or different dispositional sequences and usually have silty clay or loam textures with greater than 35% to greater than 65% rock fragments by volume. Rock fragments in surface soils are predominantly gravel-sized but cobble-sized in subsoils.

Samples were too few to determine variability in these soils. They appear to be similar to soils in the ABGR/VAME type, but occur more commonly on complex landscapes. Soils may be more well-drained and less productive than others supporting grand-fir communities. However, these often lie in close proximity to, or form complexes with, more ash-influenced, less rocky soils that are highly productive.

Successional Relationship - Late seral grand fir-dominated stands have not been observed in this type. Fire has been a repetitive occurrence in these communities. Most of these communities appear to trend towards a grand fir/big huckleberry climax. It is possible that grand fir/pinegrass communities will continue to be dominated by pinegrass on some sites that are too dry and hot to fully support big huckleberry, twinflower, or other associates of cooler, moister habitats.

The early seral stands assigned to this type have no grand fir associated in the overstory tree layer but do contain grand fir in the tree understory. Scouler's willow (SASC) is often present indicating an early seral stage of development.

Disturbance in these communities creates increases by heartleaf arnica (ARCO), strawberries (FRVE, FRVI), sticky starwort (STJA), bigleaf sandwort (ARMA3), and elk sedge (CAGE). The presence of trail plant (ADBI) and little prince's pine (CHME) are further indicators that grand fir may succeed on these sites.

Silvicultural Considerations - These are good sites for ponderosa pine as well as Douglas-fir growth, but management for fir may require exclusion of fire. A diverse mixed stand with old-growth and juvenile trees is desirable in order to fully utilize the complex of microsites typical in these communities. Promotion of pine results from periodic burning, shelterwood, and light clearcutting. Artificial regeneration may be necessary to promote tree seedling establishment if pinegrass-elk sedge mats are not broken-up through logging. Disturbance of this mat is necessary to promote successful seedbeds or planting sites. Multi-aged stand structures can be maintained through group selection or patch clear-cuts, but care must be taken to allow ample growing space for shade intolerant

species. Stocking level control may be required at an early age on these dry sites where seedling regeneration is often dense. Release of advanced regeneration should be successful in full crowned stem groups that have not stagnated too severely.

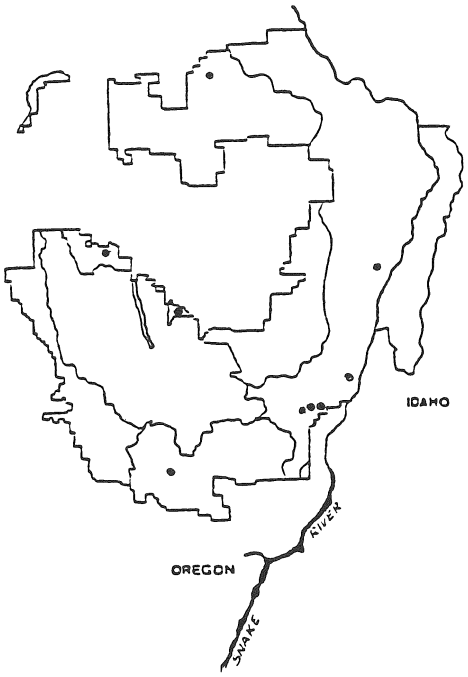
Range and Wildlife Management - Fire frequencies have been rather high (15-30 year intervals) in these communities and may be necessary to sustain pinegrass forage production. Repetitive underburning will promote fire resistant ponderosa pine and retard grand fir succession. Removal of fire in these stands may create a fire hazard by permitting sapling and pole-sized trees to form thickets and a more continuous tree understory enabling ground fire to more readily reach crowns of larger sized commercial trees.

Stand Structure and Productivity - Sample stands were predominately two-aged to multi-aged with older ponderosa pine (range 140-210 years, mean: 170 yrs) forming patchy canopies over groups of grand fir and ponderosa pine seedlings and saplings (ages 30-70 years). This is one of the two grand fir plant communities where canopies may be open enough to allow pine regeneration to comprise substantial portions of the understory. Occasionally stands contain Douglas-fir of the same age as pine in codominant overstory layers. Ponderosa pine diameter growth slows considerably at ages well below 100 years due to early and sustained tree competition. Static growth of less than one inch per decade for periods up to 100 years was common for sample trees. Basal areas are high, although variable, ranging from 170 to 320 sq. ft./acre (mean: 245 sq.ft./acre). In general, stockability and volume growth for both ponderosa pine and Douglas-fir are moderate to moderately high in this community. Growth may be variable depending upon complexity of site and stand configuration. Overstory tree growth may be retarded by competition for moisture from dense understory regeneration.

Comparison with Other Investigators - Hall's (1973) mixed conifer-pinegrass plant association is very similar. The environment created by earlier drought on ashy soils at lower limits of grand fir in the southern Wallowas is similar to climatic requirements in the southern Blue Mountains where this plant association is very common. It is a limited type in the Wallowa-Snake Province and in central Idaho (Steele 1981).

Grand fir/Rocky Mountain maple-ninebark plant community type
Abies grandis/Acer glabrum-Physocarpus malvaceus
(ABGR/ACGL-PHMA) (CWS4 12)

59. Chief Joseph Mountain (Eagle Cap Ranger District) Plot 1385



ENVIRONMENT
(all plots)

Location:
All Districts

Elevation: (4900 ft.)
3700-5600 ft.

Aspect: NE
N-SSE

SOILS
(typical soils)

Slope: (55%)
40-90%

Position: lower 1/3 to upper 1/3 mountain & canyon slopes

Other: transitional between ABGR/VAME and PSME/PHMA communities

Table of Principal Species

ABGR/ACGL-PHMA (n = 9)

Species	Code	Mean Coverage (%)/Constancy (%) Mid Seral	Early Seral	Total Range
Tree Overstory				
*grand fir	ABGR	30/80	-	0-45
*Douglas-fir	PSME	17/100	20/100	10-35
ponderosa pine	PIPO	5/20	25/25	0-25
Tree Understory				
*grand fir	ABGR	22/100	4/100	3-70
Douglas-fir	PSME	-	15/75	0-3
Shrubs				
*Rocky Mountain maple	ACGL	6/100	6/50	0-10
*ninebark	PHMA	14/80	36/100	0-70
*baldhip rose	ROGY	1/100	3/25	0-3
sticky currant	RIVI	4/60	-	0-10
*Utah honeysuckle	LOUT2	2/100	1/25	0-5
spiraea	SPBE	2/80	6/100	0-10
common snowberry	SYAL	1/20	8/50	0-10
Oregon-grape	BERE	1/40	1/50	0-1
prince's pine	CHUM	2/80	6/50	0-10
Grasses and Sedges				
Ross' sedge	CARO	1/80	-	0-1
Columbia brome	BRVU	1/40	5/25	0-5
elk sedge	CAGE	1/40	1/50	0-1
pinegrass	CARU	-	10/50	0-15
Forbs				
*false Solomon's seal	SMRA	7/80	-	0-10
trail plant	ADBI	8/40	1/25	0-15
*bigleaf sandwort	ARMA3	8/100	1/25	0-15
heartleaf arnica	ARCO	24/80	34/50	0-65
*sweet cicely	OSCH	6/100	2/75	0-10
woods strawberry	FRVE	2/60	2/100	0-5
*meadowrue	THOC	10/100	2/75	0-25
rattlesnake plantain	GOOB	1/40	4/75	0-5
white hawkweed	HIAL	1/100	1/25	0-1
mitella; mitrewort	MIST2	7/60	8/75	0-15
showy aster	ASCO	3/40	2/75	0-5
Cusick's peavine	LANEC	6/40	-	0-10
few-flowered peavine	LAPA2	1/40	-	0-1
Wilcox's penstemon	PEWI	1/60	-	0-1

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands N = 3
Herbage production (lbs./acre dry wt.)	less than 100
Average stand diameter/CI*	8.9/2.7
Number of trees per acre greater than 4 in dbh/CI	354/200
Total basal area/CI	210/120
Average basal area by species in all sampled stands	
ABGR	18
PSME	175
LAOC	7
PIPO	10
Mean Age/GBA by species	
ABGR	70/210
PSME	90/300
LAOC	90/140

Productivity estimates

(V.early seral excluded)

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
ABGR	1	77(41)	#	210	#	65	#
PSME	2	86	20	300	115	100	#
LAOC	1	85(51)	#	140	#	50	#

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004
\# n value insufficient to calculate statistics

Vegetative Composition - This plant community is transitional between Douglas-fir/ninebark plant communities and the grand fir-dominated types of higher elevations. In the type, grand fir and Douglas-fir codominate tree overstories. These communities contain the typical drier site species associated with Douglas-fir/ninebark as well as mesic site species more frequent in grand fir-dominated communities. The mesic site species present are Rocky Mountain maple, Columbia brome, and trail plant. Typic Douglas-fir/ninebark plants associated in a more xeric environment are ninebark, spiraea, heartleaf arnica, meadowrue, mitella, and peavines. Other species frequently associated in these transitional communities are baldhip rose, Utah honeysuckle, princes' pine, false Solomon's seal, big leaf sandwort, woods strawberry, sweet cecily, white hawkweed, Ross' sedge, and Wilcox' penstemon.

Distribution and Environmental Features - Stands in the ABGR/ACGL-PHMA association occur sporadically across the Province as pockets or transition zones between Douglas-fir/ninebark and grand fir/big huckleberry communities. They appear to represent the dry end of grand fir distribution at mid elevations. Slopes are steep (mean: 55%, range 40-90%). Soils are deep and rocky with ash and loess influence. Elevations range from 3,700 to 5,600 feet (mean: 4,400 feet) overlapping the upper elevational range of PSME/PHMA and lower elevation range of ABGR/VAME. Sites are predominantly convex to undulating and occur on north to easterly aspects in lower to upper third slope positions.

Successional Relationship - These are highly variable communities which usually are limited in extent. They are mostly on steeper slopes and have been frequented by fire in the past. With the curtailing of fire from the ecosystem, grand fir is succeeding on more favorable aspects in moister, deeper soils adjacent to drier PSME/PHMA communities.

Late seral stands containing only the climax dominant grand fir and absence of Douglas-fir were not encountered. It is possible that ninebark will not persist through climax and that ABGR/ACGL-PHMA communities are mid seral to communities of the ABGR/ACGL plant association. The ABGR/ACGL stands, however, are above the altitudinal limits of ninebark, however (mean: 5,300 feet vs. 4,900 ft).

Early seral stands of ABGR/ACGL-PHMA have no grand fir in the tree overstory, are dominated by Douglas-fir, and differ from mid seral stands by containing almost three times greater cover by ninebark beneath more open tree canopies. Also spiraea and common snowberry are significantly higher in cover.

With heavy domestic and wild ungulate disturbance in these understories, heartleaf arnica (ARCO), bigleaf sandwort (ARMA3), meadowrue (THOC), and Cusick's peavine (LANEC) all tend to increase weedily. Many stands visited contained a high level of ungulate disturbance from trampling due to heavy use for shading cover.

Management Considerations - Fire and harvest of overstory trees would probably eliminate grand fir from many sites, resulting in a shrubfield dominated by ninebark, ceanothus, spiraea, and pinegrass. Slope steepness may limit silvicultural management opportunities although site potential is high for Douglas-fir. The steep, unstable slopes on which these communities usually occur make passage by cattle difficult, especially with the denser shrub understory. Big game make heavy use of these communities for hiding and thermal cover as well as good bedding sites. Elk, deer, bear, cougar, and ruffed grouse are principal users of this type.

Stand Structure and Productivity - Sample stands are even-aged with trees all less than 100 years old. Evidently the sites are too severe to allow grand fir to dominate overstories, for no stands were without a vigorous dominant and codominant Douglas-fir component. Growth basal area for grand fir is lower than that observed in all other forest types. This is the only forest type where Douglas-fir growth and stockability exceeds that for grand fir. Douglas-fir performs well on these sites as a result of less competition from grand fir or other species. The deep, moderately productive soils, and higher moisture retention versus what is typical in communities in the PSME series also influence tree growth and yield. Although sample numbers were few and results variable, stockability for Douglas-fir may be among the highest of all forest types.

Comparison with Other Investigators - The ABGR/PHMA habitat type is a minor but broadly distributed type in northern Idaho (Cooper, Neiman, Steele - 1985) where it merges with PSME/PHMA on drier slopes and ABGR/XETE, ABGR/CLUN-PHMA, and ABGR/CLUN-XETE on moister slopes. They delineated two phases within the type -- a moister, cooler site gold thread (COOC2) phase and a ninebark (PHMA) phase which is similar to the vegetation in ABGR/ACGL-PHMA of this study. The ABGR/ACGL-PHMA habitat type described by Steele (1981) in central Idaho is also similar.

Key to Douglas-fir (PSME) Series Vegetation

(Ponderosa pine old-growth generally present and often dominating, but with Douglas-fir regeneration demonstrating future climax status)

1. Ninebark dominates on steep slopes 2

    2. Rocky Mountain maple usually occurring with ninebark . . . . . PSME/ACGL-PHMA (pg. 339)

    2. Absence of Rocky Mountain maple . . . . . PSME/PHMA (pg. 345)

1. Ninebark absent or occasional on moderate to gentle slopes . . 3

    3. Big huckleberry (VAME) dominates the low shrub layer . . . . . PSME/VAME (pg. 364)

    3. big huckleberry absent or occasional 4

        4. Spiraea (SPBE) present at 5% cover or greater . . . . . PSME/SPBE (pg. 352)

        4. Spiraea absent or present at less than 5% cover 5

    5. Common snowberry (SYAL) dominates the low shrub layer . . . . . PSME/SYAL (pg. 358)

    5. Common snowberry absent or occasional 6

        6. Pinegrass (CARU) present at greater than 5% cover; shrub cover less than 5% . . . . . PSME/CARU (pg. 332)

        6. Pinegrass present, but low shrub coverage is 5% or greater . . . . . PSME/SYOR (pg. 365)

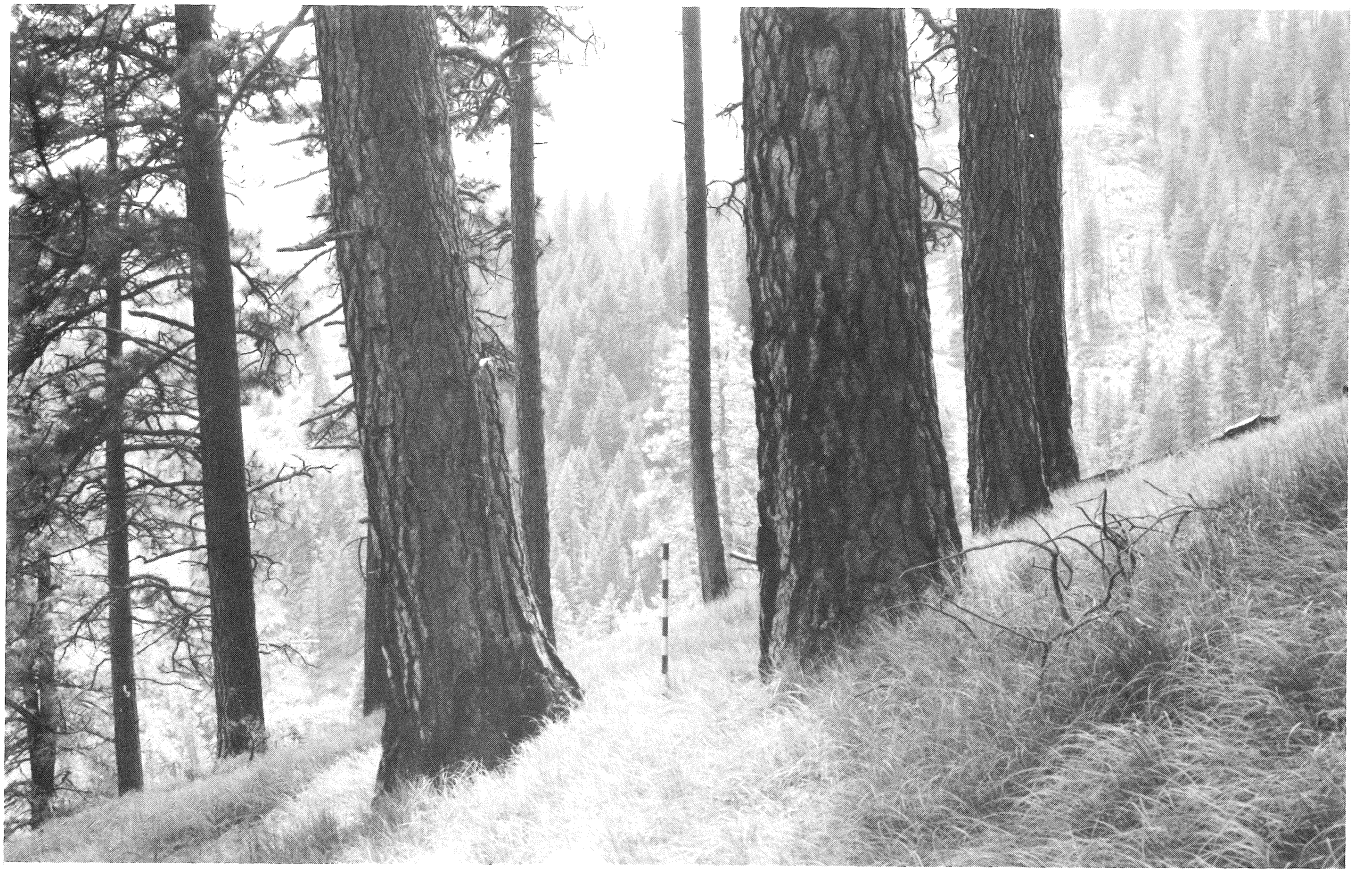
DOUGLAS FIR (PSME) SERIES

Summary of Plant Association and Community Type Characteristics 1/

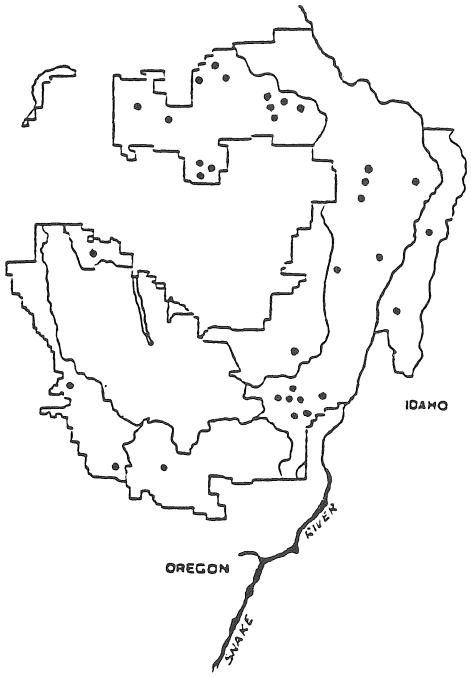
Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	(3) Relative Cubic prod./ Stockability	(4) Forage (lbs./acre) dry
PSME/CARU	4100-6000 (4800)	ridges, upper slope	all	3-70% (32%)	Loess(ash)+ basalt colluvium	20-60 (38) 14-40 (29)	CARU,CAGE ARCO,FRVE	Moderate/ Moderate	(550) 170-1300
PSME/ACGL-PHMA	2500-5800 (4450)	lower to upper slope	all	15-85% (55%)	Loess + basalt colluvium	40-60 (50) 13-26 (18)	ACGL,PHMA OSCH,CARU	Moderate/ Moderate	(150) 100-310
PSME/PHMA	2500-5300 (4300)	lower to upper slope	all	30-90% (56%)	Loess + basalt colluvium	24-40 (32) 14-34 (20)	PHMA,SYAL CARU,MIST2	Low/ low-moderate	(275) 115-900
PSME/SPBE	3300-5400 (4400)	lower to upper slope	SE-SW	15-60% (35%)	Loess + mixed geol. colluvium	35-50 (40) 17-20 (20)	SPBE,CARU BERE,SYAL	Mod.- low/ Moderate	(315) 100-500
PSME/SYAL	3500-5100 (4300)	lower to upper slope	all	5-50% (14%)	Loess + basalt colluvium	35-47 (40) 16-28 (22)	SYAL,CARU ARCO,CAGE	Mod. - low/ Moderate	(330) 50-630
PSME/SYOR	4300-5300 (4850)	upper slope	SE-W	5-30% (18%)	Loess + basalt colluvium	20-48 (33) 19-37 (25)	SYOR,AMAL OSCH,FRVE	Mod. - low/ Moderate	(150) 100-300

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Comparison of relative cubic volume production/stockability for the primary species (from Appendices E & F)
4/ Forage production in all conditions sampled.

Douglas-fir/pinegrass plant association
Pseudotsuga menziesii/Calamagrostis rubescens
(PSME/CARU) (CDG1 21)



60. North of Rattlesnake Creek, Snake River Canyon (Hells Canyon NRA) *Plot 761*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: loess and basalt colluvium
Elevation: (4800 ft.) 4100-6000 ft.	Solum depth: (38 in.) 20-60 in.
Aspect: (E-W) All	Loess depth: (18 in.) 8-30 in.
Slope (32%) 3-70%	Root conc: (29 in.) 14-40 in.
Position: undulating ridges and brows	Depth to GT 15% rock frag./size: (20 in.) 5-30/gravel, cobbles
Other: sites overlap with PSME/SYAL, PSME/SPBE, PSME/PHMA.	Surface soil/subsoil texture: silt loam/clay loam, clay

Table of Principal Species

PSME/CARU (n = 34)

Species	Code	Mean Cover (%)/Constancy(%) Late Seral (n=3)	Mid Seral (n=11)	Early Seral (n=20)	Late to Mid Seral Range
Overstory					
ponderosa pine	PIPO	5/33	40/100	40/100	0-70
Douglas-fir	PSME	53/100	20/100	5/10	10-75
Understory					
ponderosa pine	PIPO	-	5/55	9/65	0-15
*Douglas-fir	PSME	7/100	14/91	10/55	0-40
Shrubs					
common snowberry	SYAL	4/100	5/36	2/60	0-15
spiraea	SPBE	1/33	2/64	6/40	0-5
serviceberry	AMAL	-	1/27	2/45	0-1
Grasses and Sedges					
*pinegrass	CARU	55/100	56/100	51/100	20-85
*elk sedge	CAGE	15/33	15/64	12/60	0-30
western fescue	FEOC	10/33	1/36	1/20	0-10
Forbs					
*heartleaf arnica	ARCO	10/67	16/64	11/65	0-35
bigleaf sandwort	ARMA3	5/33	4/55	6/25	0-10
*strawberry spp.	FRVE,FRVI	13/67	7/45	9/55	0-20
showy aster	ASCO	16/67	16/27	1/10	0-45
yarrow	ACMIL	2/100	3/55	3/75	0-10
*long-stalked clover	TRLO	9/100	4/45	53/30	0-40
lupine spp.	LUPIN	-	14/45	18/35	0-50

* Principal Indicator Species

Stand Characteristics and Productivity

	Late Seral (n=2)	Mid Seral (n=7)	Early Seral (n=8)
Herbage production (lbs./acre dry wt.)			
Total range and mean	170-425(300)	250-1300(705)	330-800(475)
CARU range and mean	60-200(130)	200-1100(605)	100-600(290)
Average stand diameter/CI*	17.4/1.4	16.0/5.0	17.0/3.6
Number of trees per acre greater than 4 in dbh/CI	99/25	128/45	125/52
Total basal area/CI	160/62	170/48	171/38
Average basal area by species in all sampled stands			
PSME	145	52	1
PIPO	15	118	170
Mean Age/GBA by species			
PSME	160/175	120/185	80/250
PIPO	230/130	195/160	140/160

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
PSME	10	72	4	195	38	57	18
PIPO	16	85	4	160	21	60	9

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Old-growth, fire-resistent ponderosa pine is common in most stands with Douglas-fir generally increasing as a result of fire suppression. Pinegrass (CARU) dominates the understory with elk sedge (CAGE) usually present. Snowberry (SYAL) occurs as an opportunist in an otherwise continuous pinegrass stand. With proximity to PSME/PHMA communities spiraea (SPBE), snowberry (SYAL), ninebark (PHMA), serviceberry (AMAL), and mitella (MIST2) are more frequent. Forb occurrence is minimal in this type where competition from rhizomatous shrubs, sedges, and grasses is generally severe. Forbs defining the type are woods strawberry (FRVE), heartleaf arnica (ARCO), and long-stalked clover.

Many stands of PSME/CARU are degraded by ungulate trampling and trailing. Often PSME/CARU stands are included in larger expanses of ABGR/LIBO2 and ABGR/VAME stands. As a result, animals are attracted to the more open sedge-grass stands of this type. In late August, when bunchgrasses have desiccated, pinegrass is regularly used by ungulates, whereas prior to this time of season pinegrass is

avoided. Snowberry often invades as the rhizomatous pinegrass mats are broken down. Identification of degenerated PSME/CARU stands containing snowberry "weediness" is based on occurrence of the following forbs indicative of disturbance: woods strawberry (FRVE), long-stalked clover (TRLO), and heartleaf arnica (ARCO). Elk sedge (CAGE) appears to increase with disturbance of the pinegrass mats. Cleavers (GAAP) is prolific on animal trails. PSME/CARU also occupies sites at the upper end of PSME/PHMA stringers and near FEID-AGSP slopes. Kentucky bluegrass (POPR) increases on gentle topography in PSME/CARU replacing an Idaho fescue (FEID) component. Yarrow (ACMIL), lupines (LUSE, LUCA), and red avens (GETR) also increase on PSME/CARU sites located near bunchgrass communities. Showy aster (ASCO) invades PSME/CARU-disturbed areas adjacent to PSME/PHMA communities.

Distribution and Environment - This association is one of the more widespread types in the PSME series and forms extensive stands along mid-to upper elevation ridges and less extensive stands on steep canyon sideslopes. Elevations range from 4,100 feet to 6,000 feet (ave. 4,800 ft.). Slopes range from nearly flat to over 60%. The type occupies three distinct landforms: 1) ridges with slopes less than 20% and undulating microrelief; 2) moderately steep to steep ridgebrows with convex to undulating microrelief; and 3) steep canyon backslopes with southwest aspects, and undulating microrelief. These sites are similar in having accumulations of soil material through trapping of windborne particles or from erosion of the more elevated surrounding landscapes. Ridgebrow sites are below ridge summits but above the first basalt rim-outcrop which acts as a barrier to soil accumulation. These sites commonly merge abruptly with the very steep slopes below where PSME/PHMA communities predominate.

Soils - Soils are typically dark brown in color in surface layers, less than 60 inches in depth, and formed in loess and basalt colluvium. Surface soils have silt loam textures with less than 15% rock fragments by volume. Subsoils are often dense and have clay loam and clay textures. They tend to have more than 35% rock fragments by volume. Rock fragments in surface layers are predominantly gravel-sized; in subsoils they are gravel and cobble-sized. Surface rock seldom exceeds 10% cover.

These soils vary considerably depending upon landform position, elevation, and slope steepness. The typical situation described above occurs on undulating ridges and ridgebrows. Soil depth in these situations may be shallower (less than 30 inches) in convex exposed ridgebrows than in depressions (greater than 40 inches) near summit areas. Steep brows and sideslopes (greater than 45% slope) just below summits have more colluvium mixed with loess in surface layers and often are ash-influenced. These soils also have greater rock fragments in subsoils and may be transitional to ABGR/VAME soils on similar landscape positions. Rockier soils with ash and loess are also more common on all sites above 5000 feet in elevation. Clay concentrations in subsoils are rare on slopes greater than 25% but are more common at elevations below 4,500 feet.

Summary of Soil and Site Characteristics (all samples) - PSME/CARU

Solum Depth*	Rooting Depth**	Loess Ash	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
20 in. to 60 in.	11 in. to 47 in.	0 in. to 45 in.	very stable	52°F to 55°F	surface to 45 in.	occasional

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - PIPO/CARU communities are converting to Douglas-fir domination due to the protection from periodic fire. Larch and lodgepole pine occur infrequently as relicts from past fire seres when stands are near subalpine fir or grand fir sites. Unless fire or logging discriminate against the fir component, Douglas-fir will succeed on these sites. Grand fir requires moister-cooler environmental conditions that are not found in this type.

Late seral stands are dominated by Douglas-fir in the tree overstory. Pinegrass and elk sedge coverage is very high (mean: 70%). Common snowberry is usually present, but as an opportunist rather than a succeeding plant. Strawberries, showy aster, heartleaf arnica, and long-stalked clover are the most frequent forbs reflecting occupancy of disturbed pinegrass mats by ungulates.

Mid seral stands are characterized by ponderosa pine dominance over Douglas-fir in a 2:1 ratio in tree overstory layers. Douglas-fir is the codominant regenerating tree species. Reflecting drier and an earlier seral nature of these communities is the common occurrence by spiraea and lupines at this stage.

Early seral stands are dominated by ponderosa pine in tree overstory layers. Douglas-fir and ponderosa pine are codominant in the tree understory. Spiraea, common snowberry, and occasional serviceberry shrubs may be part of the dominant pinegrass-elk sedge herbaceous understory. Throughout all stages of succession, pinegrass and elk sedge cover is 60-70% with pinegrass dominating 4:1 over elk sedge.

Series Relationship - Douglas-fir/pinegrass and Douglas-fir/spiraea communities occupy the highest elevations for types of the Douglas-fir series. Pinegrass-elk sedge coverage is highest for this type over all others (mean: 70%). Disturbance was often very pronounced in PSME/CARU stands. Reflecting this were high coverage amounts for long-stemmed clover (TRLO) and the strawberries (FRVE, FRVI). Moss/lichen coverage was low. Mosses and lichens were found at low levels due to: 1) the open nature of the overstory vegetation which created drier conditions; 2) high moisture-demanding stoloniferous pinegrass mats; and 3) high litter buildup from the relatively droughty micro-environment. When PSME/CARU communities occurred adjacent to PSME/PHMA communities, the ninebark usually occupied well-drained and gravelly areas or rocky outcroppings where the shrubs could more readily tap moisture unavailable to the grass and forb roots. The PSME/CARU stands would then occupy convexities or nonlithic slopes adjacent to PSME/PHMA forests.

Role of Fire - Elk sedge and pinegrass are both resistant to fire. Periodic ground fires of a light to moderate intensity will generally not consume old-growth trees and will leave an open understory dominated by pinegrass and elk sedge. Periodic fire may retard Douglas-fir seedlings and shrubs (snowberry, spiraea) promoting the old-growth character of pine-dominated stands. An intense fire would expose areas of bare mineral soil where dormant ceanothus seed may initiate growth and establish dominance. Doghair ponderosa pine clumps also occur on areas of intense burning. Both pinegrass and elk sedge palatability should be temporarily improved by fire. Ponderosa pine needs periodic ground fire to successfully regenerate in this type whereas Douglas-fir is favored by

lack of fire. Fire exclusion is rapidly converting ponderosa pine-dominated pinegrass communities to Douglas-fir with dense pole and intermediate-sized trees now often occurring beneath old-growth pines. These overstocked layered stands have a greater potential for catastrophic stand replacement fires.

Silvicultural Considerations - The major limitation to management in this type is competition from rhizomatous grasses. There is a low probability of natural regeneration of both ponderosa pine and Douglas-fir within five years of overstory removal due to the heavy competition with pinegrass and elk sedge in natural situations and with Kentucky bluegrass and pinegrass in stands where logging disturbance has favored these grasses. Sites are most suitable for planting ponderosa pine, although Douglas-fir can be expected to do well on the more moist sites. Other tree species are unsuited on these sites. Seedling release may be necessary where overstocking exists, while control of pinegrass appears important in nearly all situations. Natural 'fill in' of planted areas is poor. In general, shelterwoods should achieve best results but where mistletoe is heavy, clearcuts may be more appropriate. Ungulate damage as well as pocket gopher damage may be severe in young trees. On these sites where dryness and pinegrass competition limit the growth potential for the better site-demanding species (i.e., Douglas-fir), mistletoe may be serious. Spruce budworm and tussock moth cause their highest incidence of damage in these communities. There is also a potentially high risk of bark beetle attacks in old-growth overstocked stands.

Range and Wildlife Management - Livestock generally are attracted to more desirable forages utilizing pinegrass and elk sedge only late in the season after other species have desiccated. Early spring use by wild ungulates occurs on succulent young shoots of both species. The moist site exotic grasses (orchardgrass, timothy, hard fescue) along with smooth brome and intermediate wheatgrass will out-produce pinegrass and elk sedge following severe site disturbance. Site preparation is necessary to break up the rhizomatous sod. Some sites containing buckbrush (CEVE) and Scouler willow (SASC) in an early post-fire seral stage may provide important deer browse and hiding cover. Elk and deer may be helping to promote pinegrass dominance by browsing of the shrubs that enter when the pinegrass mat breaks down.

Stand Structure and Productivity - The diameter/age distribution for stands in this type is similar to that observed in PSME/PHMA where an even-aged condition is more common than a multi-aged one. Sufficient fuels in the PSME/CARU type and the relatively large extension of stands has contributed to stand replacement fires in the past. This is especially true along ridgetops where almost all stands are even-aged. The multi-aged condition is more common on ridgebrows and steep sideslopes. Even-aged stands may contain Douglas-fir and ponderosa pine ranging in age from 80 to over 250 years old in one of the following distinct age classes: 70-90, 110-130, 140-160, 190-200, or 240+ years. Multi-aged stands may contain at least four distinct age classes of grouped trees of similar age. Across the type, basal area ranges from 80 to 280 sq.ft./acre (ave. 170). Even-aged stands average around 200 sq.ft./acre and multi-aged stands around 150 sq.ft./acre.

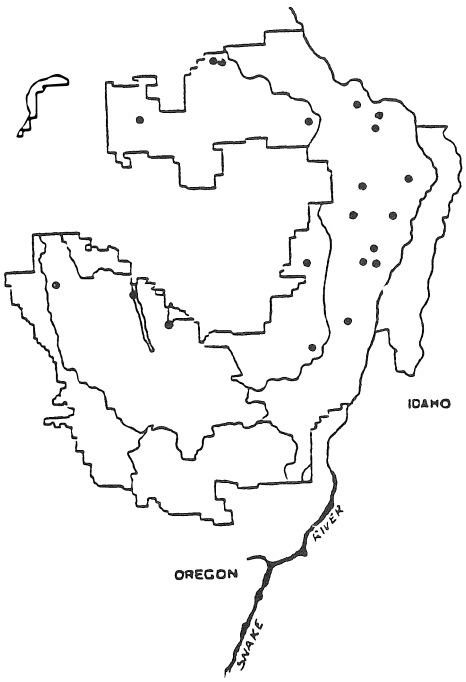
Overall production is moderate in stands belonging to this association, but moderately high in comparison to other communities in the PSME series. Average site index and stockability for Douglas-fir is always greater in the ABGR series. This appears to be the most productive site for Douglas-fir within the PSME series. Although Douglas-fir height growth is exceeded in PSME/ACGL-PHMA stands,

stocking levels there are noticeably lower. For dominant and codominant trees within the type, Douglas-fir has greater stockability and volume growth than ponderosa pine.

Comparison with Other Investigators - The PSME/CARU habitat type was first described by the Daubenmires (1968) in eastern Washington as their highest elevation Douglas-fir type. Hall (1973) did not separate PSME/CARU in the Blue Mountains where both grand fir and Douglas-fir were considered co-climax depending on elevation. He placed sites similar to PSME/CARU in a "mixed conifer-pinegrass plant association" on either ash or residual soils. Pfister (1977) separated PSME/CARU in Montana into four phases. Steele (1981) described two phases of PSME/CARU in central Idaho as one of his major types. Cooper, Neiman, and Steele (1985) considered PSME/CARU incidental in northern Idaho. Williams (1983) and Lillybridge (1984) both found PSME/CARU in northern Washington.

Douglas-fir/Rocky Mountain maple-ninebark plant association
Pseudotsuga menziesii/Acer glabrum/Physocarpus malvaceus (PSME/ACGL-PHMA) (CDS7 22)

61. Sluice Creek (Hells Canyon NRA) *Plot 760*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: loess and basalt colluvium
Elevation: (4450 ft.) 2500-5800 ft.	Solum depth: (50 in.) 40-60 in.
Aspect: All	Loess depth: mixed
Slope (55%) 15-85, 101%	Root conc: (18 in.) 13-26 in.
Position: (lower 1/3) lower to upper 1/3 slopes	Depth to GT 15% rock frag./size: rock to surface/gravels, cobbles
Other: occur in deep soil areas of PSME/ PHMA as moist inclusion.	Surface soil/subsoil texture: silt loam/silty clay loam, loam

Table of Principal Species

PSME/ACGL-PHMA (n = 20)

Species	Code	Mean Cover (%)/Constancy (%) Late Seral (n=11)	Mid Seral (n=4)	Early Seral (n=5)	Late to Mid Seral Range
Tree Overstory					
ponderosa pine	PIPO	-	18/100	40/100	0-30
*Douglas-fir	PSME	55/100	19/100	-	5-70
Tree Understory					
*Douglas-fir	PSME	10/91	18/75	12/80	0-35
ponderosa pine	PIPO	-	-	2/60	-
Shrubs					
*Rocky Mountain maple	ACGL	9/100	9/100	11/100	1-20
*ninebark	PHMA	31/91	48/75	31/100	0-65
*spiraea	SPBE	4/11	5/100	4/60	0-35
*common snowberry	SYAL	17/82	35/50	9/40	0-55
serviceberry	AMAL	3/55	13/50	8/100	0-15
baldhip rose	ROGY	3/55	-	4/40	0-10
oceanspray	HODI	3/36	16/50	5/60	0-30
Utah honeysuckle	LOUT2	2/27	7/75	13/60	0-10
common chokecherry	PRVI	25/9	10/25	12/80	0-25
Grasses and Sedges					
*pinegrass	CARU	7/73	7/75	15/100	0-20
*elk sedge	CAGE	4/64	11/50	5/60	0-20
Columbia brome	BRVU	7/64	-	5/60	0-25
western fescue	FEOC	3/55	-	-	0-10
Forbs					
*bigleaf sandwort	ARMA3	4/64	3/50	2/60	0-10
meadowrue	THOC	11/55	1/75	1/60	0-20
heartleaf arnica	ARCO	15/73	33/75	1/20	0-75
rattlesnake plantain	GOOB	3/55	-	1/40	0-10
false Solomon's seal	SMRA	2/55	2/100	2/60	0-5
*sweet cicely	OSCH	6/73	2/50	7/80	0-20
woods strawberry	FRVE	3/73	25/25	7/100	0-25
mitella	MIST2	5/64	-	3/40	0-20
*bladder fern	CYFR	2/55	1/50	1/20	0-3
long-stalked clover	TRLO	11/45	5/25	2/40	0-30
cleavers	GAAP	12/55	6/50	7/80	0-40
miner's lettuce	MOPE	3/27	8/50	1/60	0-15
showy aster	ASCO	3/18	15/25	5/80	0-15
Cusick's peavine	LANEC	1/18	1/25	6/40	0-1

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands n = 8
Herbage production .(lbs./acre dry wt.)	
Total range and mean	(100-310) 150
Average stand diameter/CI*	15.7/3.7
Number of trees per acre greater than 4 in dbh/CI	95/40
Total basal area/CI	145/25
Average basal area by species in all sampled stands	
PSME	87
PIPO	59
Mean Age/GBA by species	
PSME2	132/160
PIPO	153/135

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PSME	5	92	4	160	17	63	5
PIPO	5	94	14	135	40	50	30

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - These steep-slope communities are characterized by old-growth Douglas-fir trees spaced widely among basaltic outcrops in areas of accumulation of soil and rock materials (canopy cover averages approximately 55%). Douglas-fir poles, seedlings, and saplings essentially make up the entire tree understory. These open tree layers permit ample opportunity for abundant shrub growth to fill in the unoccupied growing area. Consequently, in this type, a tall shrub layer dominated by Rocky Mountain maple (ACGL) with serviceberry (AMAL) overtops a mid-shrub layer dominated by ninebark (PHMA) with oceanspray (HODI).

A low shrub layer occurs below the ninebark-oceanspray plants with domination by common snowberry (SYAL). Shiny leaf spiraea (SPBE), Utah honeysuckle (LOUT2), and baldhip rose (ROGY) are other low shrubs often in association.

Pinegrass (CARU) and elk sedge (CAGE) are very common in this type and form a mosaic between shrub patches. Columbia brome (BRVU) occurs almost exclusively at footslope locations within the elevational ranges of these steep drainage communities.

The most common forbs within the type are false Solomon's seal (SMRA), meadowrue (THOC), bigleaf sandwort (ARMA3), sweet cicely (OSCH), and heartleaf arnica (ARCO). Other less common forbs that have affinities to the type are rattlesnake plantain (GOOB), mitella (MIST2), bladder fern (CYFR), woods strawberry (FRVE), showy aster (ASCO), fairy bells (DITR), and kittentails (SYMI).

Animal concentrations are minimal due to the steep topography. Deer and elk use these communities for shading, bedding, and trafficking to and from adjacent bunchgrass slopes. Forbs which appear to increase as a result of ungulate disturbance are long-stalked clover (TRLO), meadowrue (THOC), and heartleaf arnica (ARCO). On steep slopes, disturbance is often more a result of accelerated slope movement which may have been enhanced by the weight of large animals. The high constancy by bigleaf sandwort is more a result of unstable slope activity than overgrazing.

At the lower elevational range of the type (below 4,500 feet), invading species that occur from the trailing and use by ungulates are: enchanter's nightshade (CIAL), cleavers (GAAP), and chervil (ANSC2). Lower canyon plants increasing on steep, unstable slopes are Cusick's peavine (LANEC) and tonella (TOFL2).

Distribution and Environment - This plant association occurs within the very steep portions of PSME/PHMA forest stringers where colluvial materials collect. Commonly occupying the lower-lying portions of these narrow drainages, PSME/ACGL/PHMA sites receive additional water channeled from the adjacent slopes. Elevations range from 2,500 to 5,800 feet (ave: 4,450), and are second only to PSME/PHMA in having the largest range of all forest communities in the Province. Slopes in steep drainages range from 50% to over 80% (ave 70%) creating unstable site situations where soil and rock materials appear to be moving constantly downhill. Pistol-butted trees are common. These communities also may occur on slopes less than 30% at toeslope locations. Exposures are predominately northeasterly below 4500 feet in elevation and variable above this level. Microrelief is mostly concave to undulating but depends upon the portion of the accumulation area sampled.

Soils - Soils are typically very dark brown to dark brown in color in surface layers, greater than 40 inches in depth, and formed in loess and basalt colluvium. Unconsolidated rock material may extend beyond the soil depth. Surface layers have silt loam textures with greater than 15% rock fragments by volume. Subsoils have silty clay loam, silt loam, and loam textures with greater than 35% to greater than 65% rock fragments by volume. Rock fragments tend to be gravel sized in surface layers and cobble-sized in subsoils. Surface rock seldom exceeds 25% cover except in rock outcrop areas.

These soils are very similar to those found supporting PSME/PHMA communities. They are deeper on the average and usually occur within the PSME/PHMA stringers in soil accumulation areas. Elevation range for the PSME/ACGL/PHMA type is also very large and soils can be expected to vary as they do in PSME/PHMA communities. Deeper soils, with nearly rock-free loess surface layers are also common at toeslope locations. In these situations, soil characteristics between these two types are nearly identical.

Summary of Soil and Site Characteristics (all samples) - PSME/ACGL/PHMA

Solum Depth*	Rooting Depth**	Loess Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
30 in. to 70 in.	11 in. to 32 in.	0 in. to 27 in.	unstable	46°F to 55°F	surface to 27 in.	common

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - These steep-slope canyon communities have been repeatedly controlled and modified by fire. Old-growth ponderosa pine and Douglas-fir trees are survivors of repetitive fires. The open nature of the type with heavy shrub undergrowth reflects the periodic fire history. Closed tree canopies probably will not result from fire protection as these sites are limited in their potential for growing trees at high stocking levels. Maple is more tolerant than ninebark as crown cover increases. As overstory canopy coverage increases to 60%, ninebark and pinegrass decrease resulting in greater maple and Columbia brome dominance on the site.

Late seral stands are dominated in tree overstory and understory layers by Douglas-fir. Mid seral stands have ponderosa pine and Douglas-fir as codominants in the overstory, but only Douglas-fir reproducing beneath in the tree understory. Snowberry and spiraea are more frequent associates of mid seral stands than late seral communities.

Early seral stands are characterized by a tree overstory of ponderosa pine with the only Douglas-fir occurring in tree understories as more youthful members. Serviceberry and chokecherry are more frequent associates of early seral stands. Pinegrass and elk sedge mats are more extensive reflecting the more open nature of early seral stands and more recent occurrence by fire.

Series Relationships - The steepest slopes in the PSME series are occupied by PSME/ACGL/PHMA and PSME/PHMA communities. Rocky Mountain maple establishes on or directly below rim-controlled sites or at lower slope positions where it can tap into abundant moisture levels. Tree regeneration is among the lowest of all types sampled, reflecting the extremely competitive nature of the shrubland. Tall shrubs (ACGL, AMAL) attain their greatest abundance in this type. The high degree of ground shading coupled with good soil moisture retention permits plants more commonly found in grand fir and subalpine fir communities to occur in this type (e.g., Utah honeysuckle (LOUT2), Columbia brome (BRVU), baldhip rose (ROGY), fairy bells (DITR), and rattlesnake plantain (GOOB)).

Role of Fire - Repetitive fires have resulted in scattered old-growth ponderosa pine and Douglas-fir with high abundance of shrubs. Ninebark, maple, spiraea, snowberry, and serviceberry are all resistant to fire and resprout from stem bases following fire. The open nature of the tree overstory tends to inhibit crowning of fires. When fires do burn hot, they tend to consume all understory vegetation. Ninebark appears to have a competitive advantage over the other shrub members. Maple tends to become more dominant at later stages of fire succession.

Silvicultural Considerations - The major limitations to management in this type are the very steep unstable slopes and competition from rhizomatous shrubs and grasses. Little silvicultural activity has occurred in stands belonging to this plant association due to these factors and to the relative isolation of stands. There is a low probability of natural regeneration within five years of overstory removal because of the movement of soil material and competition with pinegrass, snowberry, and ninebark. Harvesting techniques should employ partial overstory removal systems; although clearcutting of mistletoe stands may be necessary followed by understory vegetation control measures. Burning in these stands to control understory vegetation using commonly practiced techniques is not recommended since pinegrass, ceanothus, and ninebark may increase dramatically following fire. Steep slopes will limit other site preparation techniques such as mechanical treatments. Perhaps some form of chemical control in conjunction with fire may prove successful in future management of these stands. Other factors may also limit management in this type. For example, ungulate use of sites is high and may increase in planted areas. Mistletoe can be very severe in Douglas-fir. The probability of tussock moth outbreaks is high, especially in the upper third of stringers. Overstocked Douglas-fir thickets may require precommercial thinnings to ensure quality crop trees. As with PSME/PHMA communities, toeslopes are usually more productive and better suited to intensive management than those on steep backslope sites.

Range and Wildlife Management - Forage species are limited in this type to pinegrass and elk sedge as these occur in only small amounts. The type is primarily used for hiding cover, bedding, and thermal cover as well as by transient animals enroute to adjacent bunchgrass slopes. Management improvements are severely limited by the steep, unstable slopes and extreme grass-shrub competiton. These steep canyon forested slopes are particularly important for wintering elk. Also using these communities are bear, deer, cougar, ruffed grouse, and chukars. The varied shrubs of this type are important for winter browse (Rocky Mountain maple is especially preferred by mule deer).

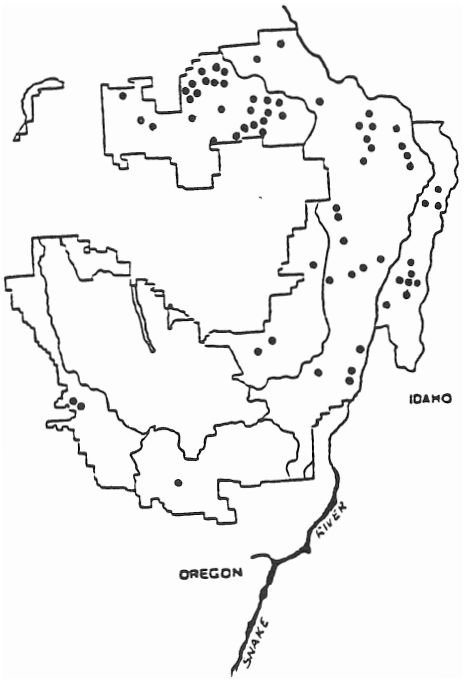
Stand Structure and Productivity - Stand diameter/age distribution is nearly identical to that observed in PSME/PHMA stands. Even-aged stands are most common and overstories include a 70- to 90-year or 120- to 150-year age class. Two-aged and multi-aged stands are often patchy and contain age classes ranging from 80 to over 300 years. Basal areas range from 90 to 200 (ave. 145) and were lower than those measured in most PSME/PHMA stands perhaps due to the difficulty in establishment of trees on a more unstable substrate.

Production rates in stands belonging to this plant association are similar to PSME/PHMA; however, average site index for Douglas-fir is among the highest for all types sampled. Due to this good height growth, and to the relatively high stocking rates, volume increment for Douglas-fir is higher than in other Douglas-fir types. Douglas-fir maintains good diameter increments on large diameter trees while diameter growth for ponderosa pine is only moderate to poor. Within the type, Douglas-fir has the best overall growth, although ponderosa pine diameters are usually greater.

Comparison with Other Investigators - This type is similar to Steele's Douglas-fir/ninebark habitat type (Rocky Mountain maple phase) as printed in the preliminary draft of Forest Habitat Types of Central Idaho (1975). It has not been described by other authors.

Douglas-fir/ninebark plant association
Pseudotsuga menziesii/Physocarpus malvaceus
(PSME/PHMA) (CDS7 11)

62. Chesnimnus Creek Canyon (Wallowa Valley Ranger Dist) Plot 238



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: loess and basalt colluvium
Elevation: (4300 ft.) 2500-5300 ft.	Solum depth: (32 in.) 24-40 in.
Aspect: N. below 4000 ft. all aspects above 4000 ft.	Loess depth: mixed
Slope (56%) 30-90%	Root conc: (20 in.) 14-34 in.
Position: lower to upper 1/3 slopes	Depth to GT 15% rock frag./size: rock to surface/gravels, cobbles, stones
Other: Among the most widespread types in Wallowa-Snake Province.	Surface soil/subsoil texture: silt loam/loam, silt loam, silty clay loam

Table of Principal Species

PSME/PHMA (n = 66)

Mean Cover (%)/Constancy(%)

Species	Code	Late Seral (n=23)	Mid Seral (n=29)	Early Seral (n=9)	Very Early Seral (n=5)	Mid-Late Seral Range
Tree Overstory						
ponderosa pine	PIPO	4/22	23/100	28/100	5/20	0-60
Douglas-fir	PSME	43/100	27/97	4/33	-	0-75
Tree Understory						
*Douglas-fir	PSME	22/91	21/90	24/56	10/60	0-70
ponderosa pine	PIPO	2/13	5/34	3/56	12/60	0-10
Shrubs						
*ninebark	PHMA	44/91	43/97	33/100	18/100	0-95
oceanspray	HODI	-	14/48	10/56	8/60	0-45
*common snowberry	SYAL	19/87	15/83	27/78	15/80	0-50
*spiraea	SPBE	8/83	12/66	5/67	1/60	0-40
*serviceberry	AMAL	2/30	2/72	12/78	3/40	0-10
baldhip rose	ROGY	4/43	4/45	1/11	-	0-15
Oregon-grape	BERE	5/13	5/41	9/33	-	0-25
Scouler willow	SASC	-	-	-	10/20	-
redstem ceanothus	CESA	-	-	-	42/60	-
Grasses and Sedges						
*pinegrass	CARU	21/91	22/90	14/89	10/60	0-60
*elk sedge	CAGE	7/65	11/66	26/22	8/60	0-25
Columbia brome	BRVU	3/30	6/24	7/22	-	0-30
western fescue	FEOC	2/48	5/34	1/22	-	0-15
Forbs						
*mitella	MIST2	17/74	11/52	6/22	2/80	0-40
big leaf sandwort	ARMA3	10/83	10/76	13/33	-	0-40
heartleaf arnica	ARCO	23/65	18/62	13/56	13/60	0-80
*woods strawberry	FRVE	11/74	12/90	5/67	8/40	0-60
meadowrue	THOC	10/52	10/38	-	-	0-60
*brittle bladder fern	CYFR	5/52	2/21	1/33	-	0-20
showy aster	ASCO	11/26	7/31	18/22	1/40	0-25
false Solomon's seal	SMRA	1/43	1/28	2/33	1/20	0-3
sweet cicely	OSCH	5/43	3/52	4/56	3/40	0-15
long-stalked clover	TRLO	16/56	22/62	26/22	30/20	0-70
miner's lettuce	MOPE	13/30	2/21	2/56	-	0-40
yarrow	ACMIL	2/26	3/55	3/67	1/60	0-15
cleavers	GAAP	9/22	3/21	1/56	1/60	0-30
harsh paintbrush	CAHI2	-	-	-	2/80	-

* Principal Indicator Species

Stand Characteristics and Productivity

	Late Seral (n=12)	Mid Seral (n=10)	Early Seral (n=4)
Herbage production (lbs./acre dry wt) Total range and mean	250-900(430)	115-300(205)	170-560(340)
Average stand diameter/CI*	11.0/2.7	9.4/1.7	15.0/5.0
Number of trees per acre greater than 4 in dbh/CI	154/38	207/55	90/38
Total basal area/CI	130/20	165/36	100/15
Average basal area by species in all sampled stands			
PSME	95	130	2
PIPO	34	32	98
LAOC	-	3	-
Mean Age/GBA by species			
PSME	130/125	80/160	75/125
PIPO	160/105	230/120	100/100

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PSME	20	73	4	140	15	44	7
PIPO	15	87	6	105	18	40	10

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - The steep forested canyon slopes of the Wallowa-Snake Province are generally covered by communities of the PSME/PHMA type. Aspect strongly controls the location and orientation of these communities. Generally PSME/PHMA vertical bands or stringers are located on northern aspects while contrasting bunchgrass vegetation occupies southern aspects. Old-growth ponderosa pine and Douglas-fir form an open overstory canopy (avg. 48%). Tree understory coverage (only about 25%) consists almost exclusively of Douglas-fir seedlings, saplings, and poles. Occasionally some youthful ponderosa pine trees occur on drier microsites.

Ninebark (PHMA) generally forms a mosaic with pinegrass-elk sedge (CARU-CAGE) beneath the timbered stands. Common snowberry (SYAL) and spiraea (SPBE) have strong affinities to the ninebark patches. Serviceberry (AMAL) is often relict from higher abundance in earlier seral stands. Forbs with high fidelity to

PSME/PHMA are mitella (MIST2), woods straw- berry (FRVE), meadowrue (THOC), and bladder fern (CYFR). Kittentails (SYMI) and showy aster (ASCO) were infrequent, but did show affinities to the PSME/PHMA and PSME/ACGL/PHMA types.

Deer, elk, and cattle use PSME/PHMA stands for bedding, shading, hiding cover, and as transit-ways to and from adjacent bunchgrass-dominated feeding areas. PSME/PHMA stringers are generally heavily laced with trails. Grazing within the type is minimal except in late summer when shrub browsing of ninebark and ocean-spray occurs. Also late in summer pinegrass and elk sedge become preferred as exposed bunchgrass slopes become desiccated. Indicative of disturbance within the type are increasing coverage levels of woods strawberry, heartleaf arnica, and big-leaf sandwort. Invasion by either long-stem clover, yarrow, lupine, cleavers, houndstongue, and miner's s lettuce is indicative of severe disturb-ance. Columbia brome was occasionally found in PSME/PHMA communities at lower slope positions, often adjacent to logs where protection was afforded from ungu-late utilzation. Given less ungulate pressure, Columbia brome probably would be more prevalent in more mesic portions of PSME/PHMA stnads. On sites with heavy ungulate impact, mitella (MIST2) and baldder fern (CYFR) declined with a notable increase by woods strawberry (FRVE) following disturbance.

Distribution and Environment - This association is the most widespread type in the PSME series. Extensive stands cover steep canyon drainage sideslopes at elevations ranging from 2,500 to 5,800 feet (ave: 4,300 ft). The PSME/PHMA community has the widest elevational range of any forest plant association in the Wallowa-Snake Province. Communities are restricted to moderately deep to deep colluvium in sheltered forest stringers or on lower canyon footslopes. Aspects are predominantly northeast to northwesterly at elevations below 4,000 feet, but this community may occur on all aspects above this elevation. Stands are common from just below ridgetops to lower canyon positions on slopes ranging from 30% to over 90% (ave. 56%). They are confined at the upper and mid-slope positions by the topographic configuration of steep canyon drainages. However, stands tend to widen toward canyon bottoms following the extension of colluvium on more gentle slopes in drainage bottoms. Surface microrelief is mostly convex to smooth, but undulating in the lower portions of the steep draws. Rock outcrops are common in many stands.

Soils - Soils are typically very dark brown to dark brown in color in surface layers, greater than 24 inches in depth, and formed in loess and basalt collu-vium. Unconsolidated rock material may extend well beyond the soil depth. Surface soils have silt loam textures with greater than 15% rock fragments by volume. These layers are usually thin (less than 12 inches in depth). Subsoils have loam, silt loam, and silty clay loam textures with greater than 35% to greater than 65% rock fragments by volume. Rock fragments in surface layers tend to be predominately gravel-sized and those in subsoils cobble-sized. Gravels may mix throughout the soil layers, but rock fragment size normally increases with soil depth. Surface rock may exceed 30% cover, especially in rock outcrop areas.

Soil characteristics may vary considerably throughout the wide elevational range of PSME/PHMA communities. Slope position also may determine the character of these soils. Surface rock fragments and loess content, clay accumulation layers, and soil depth are among the most variable features. Soils at elevations less than 4,000 feet are usually deeper, have a nearly rock-free loess surface layer, and are often black in color indicating a high rate of nutrient cycling. These rich soils may be the result of secondary succession in PSME/PHMA communities which commonly includes short-term domination of sites by bunchgrass vegetation

or shrubfields capable of more rapid organic matter accumulation than occurs under shaded coniferous forest stands. Toeslopes at lower elevations have the deepest loess accumulations and darkest surface soil color. Clay concentrations are also more common on stable sites such as toeslopes; however, they may occur at all elevations and on steep slopes. Shallower soils tend to be dominated by cobble and stone-sized rock fragments and often occur at elevations above 4,500 feet. East, west, and south aspects at mid-elevations usually contain shallow soils, especially near rock outcrop areas. They represent the driest and hottest sites supporting PSME/PHMA communities. Soils formed in parent materials other than basalt do not appear to vary considerably from the typical soil.

Summary of Soil and Site Characteristics (all samples) - PSME/PHMA

Solum Depth*	Rooting Depth**	Loess Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
16 in. to 80 in.	10 in. to 60 in.	mixed to 33 in.	unstable	46°F to 56°F	surface to 40 in.	common to very common

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - The PSME/PHMA communities have been historically entered by periodic wildfire. Relict fire-scarred old-growth ponderosa pine and larch attest to the periodicity of fire. Shrublands resulting from stand replacement fires are dominated by the following species: redstem ceanothus (CESA), spiraea (SPBE), common snowberry (SYAL), and Scouler willow (SASC). These very early seral stands often have a high frequency of harsh paintbrush (CAHI2) in the developing pinegrass-elk sedge herbaceous layer. With fire suppression, a ponderosa pine/ninebark early seral stage shifts to Douglas-fir/ninebark domination of these sites through mid seral codominance by both tree species. Snowberry and ninebark are able to colonize openings where occurrence is on aspects favorable to afternoon shading. Pinegrass and elk sedge tend to be relicts on more exposed non-concave slope positions where moisture is limiting for shrub growth. As a result, ponderosa pine-dominated grass/sedge very early seral communities have trended to a PIPO-PSME/PHMA-SYAL mid-seral stage with pinegrass-elk sedge patches forming a mosaic. The late seral stage is characterized by Douglas-fir-dominated open overstory with ninebark and pinegrass levels similar to mid seral understories. Persisting as shade-tolerant plants in the late seral stage are mitella (MIST2), rattlesnake plantain (GOOB) and false Solomon's seal (SMRA). Brittle bladder fern (CYFR) is frequent in late seral stands and increases on the site as succession advances.

Lower ends of PSME/PHMA stringers meeting riparian grand fir-dominated communities were found to contain a grand fir transitional type on rocky talus with tall shrub components overtopping a heavy moss/twinflower layer. Lower ends of PSME/PHMA stringers at the limits of tree growth in major canyons were also found to have a tall shrub component of Rocky Mountain maple, chokecherry, and serviceberry.

Upper ends of PSME/PHMA stringers are often transitional since ABGR/LIBO2 and ABGR/VAME-dominated ridgetops mix to provide an ABGR-PSME transition. This is characterized as the ABGR/ACGL-PHMA type. The uppermost brow of the stringer contains PSME-ABGR trees that are often "doghair" from intense burning. Beneath these dense tree canopies, ninebark is unable to persist under the 70%+ crown

cover usually found. Species occurring under these low-light levels are mitella (MIST2), rattlesnake plantain (GOOB), woods strawberry (FRVE), anemone (ANPI), meadowrue (THOC), sweet cicely (OSCH), and round-leaved violet (VIOR2).

Series Relationship - Steep slopes and intermediate elevational levels are typical for the PSME/PHMA type. Tree overstories are open (mean: 50%) while Douglas-fir regeneration is among the highest in the PSME series reflecting the mid-seral nature of most stands sampled. The most spectacular ground cover percentages for the PSME series types were found here. Moss and lichens flourished (avg. 42%). Exposed rock and bare ground percentages were among the highest, reflecting the steep, unstable, rim-controlled substrate. Litter levels were therefore extremely low for a forested type. Unlike PSME/PHMA stands in the northern Rockies, the type was restricted to canyon slopes. Few stands ever occurred on plateau tops or on gentle terrain.

Role of Fire - Fire periodicity has been high in PSME/PHMA stringers as demonstrated by the large number of even-aged stands. Fires tend to re-cycle stands every 40 years. Intense burns promote redstem ceanothus, Scouler willow, and pinegrass. Light or infrequent burning will permit a varied shrub community to persist dominated by ninebark, snowberry, and spiraea. Most of the associated shrubs resist fire and resprout basally from lower stem buds. Lightning-ignited late summer fires provide the greatest probability of stand replacement. Old-growth stands are more susceptible to crowning fires than are even-aged second growth where ladder fuels tend to be unavailable.

Silvicultural Considerations - The major limitations to silvicultural management in this type are the very steep unstable slopes and competition from rhizomatous shrubs and grasses. Little silvicultural activity has occurred in stands belonging to this plant association due to these factors and to the relative geographic isolation of stands. There is a low probability of natural regeneration within five years of overstory removal because of the movement of soil material and competition with pinegrass, snowberry, and ninebark. Harvesting techniques should employ partial overstory removal systems; although clearcutting of mistletoe stands may be necessary followed by understory vegetation control measures. Burning in these stands to control understory vegetation using commonly practiced techniques is not recommended since pinegrass, ceanothus, and ninebark may increase dramatically following fire. Steep slopes will limit other site preparation techniques such as mechanical treatments. Perhaps some form of chemical control in conjunction with fire may prove successful in future management of these stands. Other factors may also limit management in this type. For example, ungulate use of sites is high and may increase in planted areas. Mistletoe can be very severe in Douglas-fir and the probability of tussock moth outbreaks is high, especially in the upper third of stringers. Overstocked Douglas-fir thickets may require precommercial thinnings to ensure quality crop trees. Communities in footslope positions are usually more productive and better suited to intensive management than those on steep backslope sites. Footslopes usually occur at the lowest elevational limit of these communities where ponderosa pine often dominates stands. Douglas-fir will be less productive and less competitive on these sites. Management should favor the less shade-tolerant pine.

Range and Wildlife Management - The steep, unstable slopes, lack of water, and dense shrub understory limit the use by domestic livestock. Cattle use these areas for shading and cover. Pinegrass and elk sedge provide some forage, but is usually deferred due to more desirable bunchgrass often adjacent to these

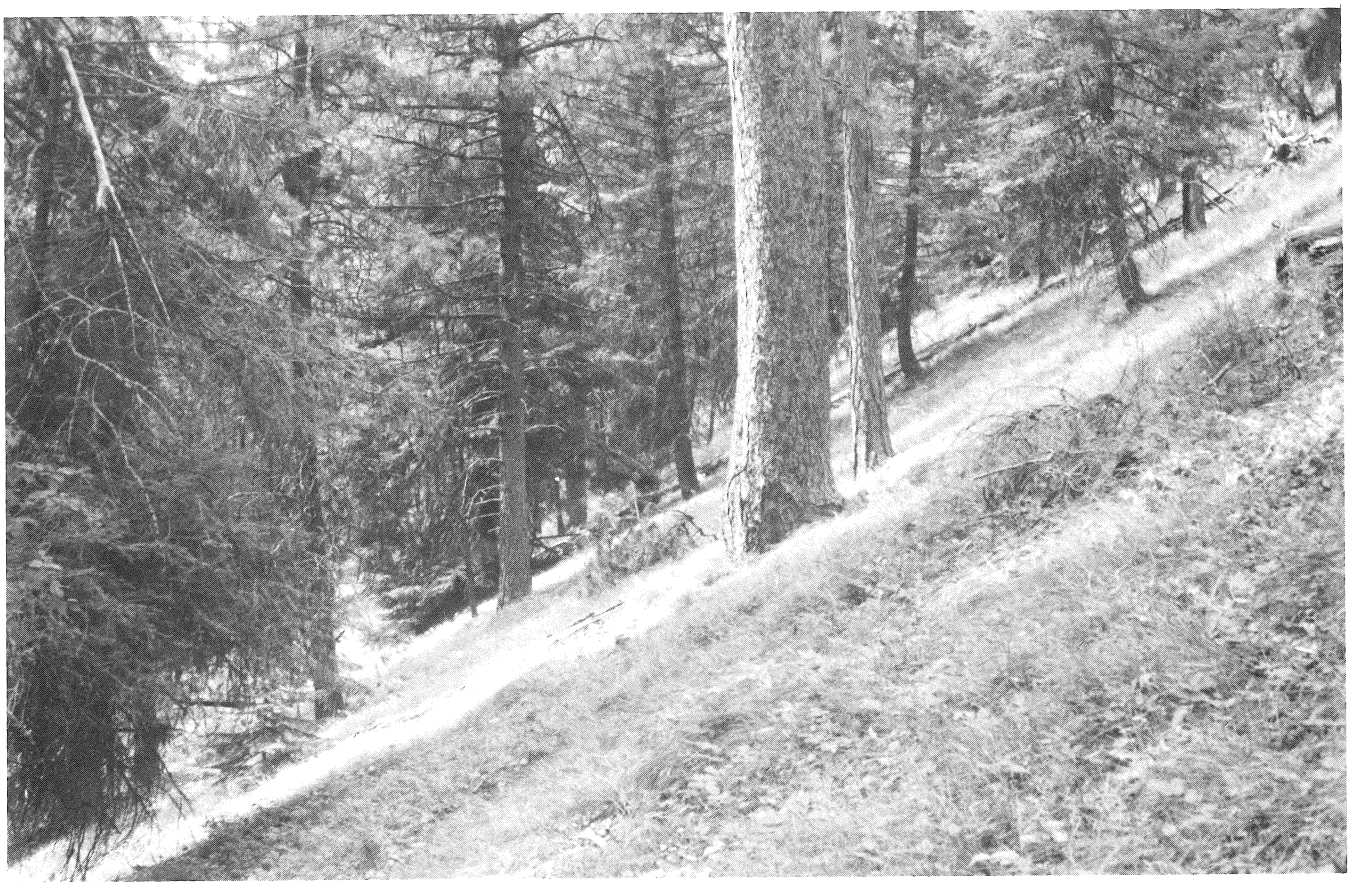
stringers. Domestic sheep may make more efficient use of these steep canyon slope communities. Arnica and showy aster are desirable forbs for sheep. Heavily disturbed portions of PSME/PHMA stands permit invasion by undesirable plants (i.e., houndstongue, cleavers).

Big game use is high, especially by wintering deer and elk. Elk primarily forage on adjacent bunchgrass communities, but use PSME/PHMA for hiding cover, bedding, and thermal cover. Deer, bear, cougar, chukars and ruffed grouse also utilize these communities. Early successional stages are especially valuable to browsing wildlife when redstem ceanothus and Scouler willow are prominent.

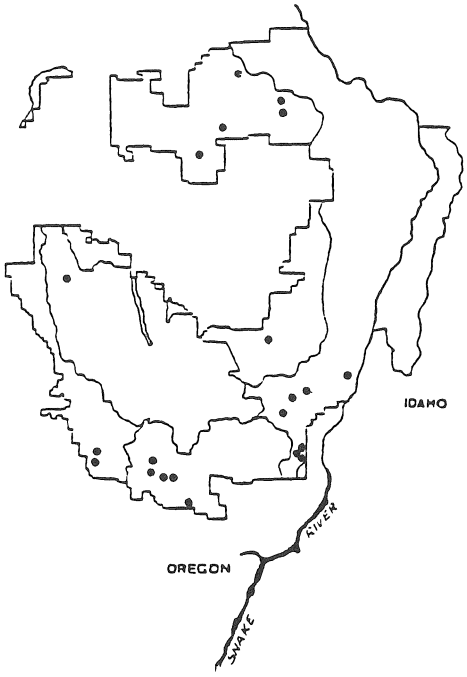
Stand Structure and Productivity - Stand diameter/age distribution is variable and ranges from an even-aged to multi-aged condition. The most typical condition sampled was even-aged reflecting the importance of stand-replacement fires in the past. In even-aged stands, an 80- to 100-year age class or a 120- to 150-year age class was dominated by Douglas-fir in dense overstories. Occasional ponderosa pine and Douglas-fir veterans of the previous stands occurred regularly but in low numbers. Multi-aged stands often occur and consist of patchy canopies and trees grouped by age class. Ages of trees in these stands range from less than 50 to over 200 years old with approximate 30-year intervals between age classes. Basal areas are variable and range from less than 100 to over 250 sq.ft./acre (ave: 140). Early seral stands have lower stocking levels (ave 100 sq. ft./acre) than mid and late seral stands (ave. 165 and 130 sq.ft./acre). Overall growth is poor in stands belonging to this association, placing this type at the lowest end of production for members of the PSME series. For dominant and codominant Douglas-fir and ponderosa pine, average diameter, diameter increment, stockability, and volume growth is lower than in other types in the PSME series. Site index is moderately high. Within the type, Douglas-fir maintains more acceptable growth at higher stocking levels than does ponderosa pine. Stand production and growth basal area tend to vary according to site characteristics. Douglas-fir GBA is above average on northerly aspect stands. For both pine and fir it is below average on east, west, and southerly aspects. Soils greater than 45 inches in depth are slightly more productive for both species.

Comparison with Other Investigators - The PSME/PHMA habitat type was described in eastern Washington by Daubenmire (1968). Hall (1973) described a similar PIPO-PSME/PHMA plant association in the northern Blue Mountains. His PIPO-PSME/SYAL-HODI plant association was not classified in the Wallowa-Snake Province. This community does occur as a lower elevation, footslope, stringer bottom type dominated by oceanspray and common snowberry in the major canyons tributary to the Grande Ronde River. Future sampling should provide an adequate characterization of it. Pfister (1977) described the PSME/PHMA habitat type in Montana and separated it into ninebark and pinegrass phases. Steele (1981) defined three phases (pinegrass, ponderosa pine, Douglas-fir) of the PSME/PHMA habitat type in central Idaho. Cooper, Neiman, and Steele (1985) split the habitat type into pinegrass, elk sedge, and ninebark phases in northern Idaho. Williams (1983) and Lillybridge (1984) also describe a PSME/PHMA plant association.

Douglas-fir/spiraea plant association
Pseudotsuga menziesii/Spiraea betulifolia (PSME/SPBE) (CDS6 34)



63. O'Brien Creek Canyon (Pine Ranger District) *Plot 1176*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: loess and colluvium from various geologies
Elevation: (4400 ft.) 3000, 3300-5400 ft.	Solum depth: (40 in.) 35-50 in.
Aspect: SE-SW	Loess depth: mixed
Slope: 35% 15-60%	Root conc: (20 in.) 17-20 in.
Position: lower to upper 1/3 slopes and ridge brows	Depth to GT 15% rock frag./size: rock to surface/gravels, cobbles
Other: forms mosaic with PSME/CARU and PSME/PHMA at higher elevations.	Surface soil/subsoil texture: loam, silt loam/clay loam, silty clay loam

Table of Principal Species

PSME/SPBE (n = 20)

Mean Coverage (%)/Constancy(%)

Species	Code	Late Seral (n=2)	Mid Seral (n=6)	Early Seral (n=12)	Mid to Late Range
Tree Overstory					
*ponderosa pine	PIPO	10/50	24/100	39/100	0-35
Douglas-fir	PSME	32/100	11/100	-	5-45
Tree Understory					
ponderosa pine	PIPO	3/100	5/100	20/75	1-13
*Douglas-fir	PSME	8/100	10/83	13/83	0-30
Shrubs					
*spiraea	SPBE	10/100	25/100	25/100	5-50
*common snowberry	SYAL	10/50	4/50	29/83	0-10
*Oregon-grape	BERE	5/50	6/67	2/33	0-15
baldhip rose	ROGY	5/50	1/17	4/67	0-5
serviceberry	AMAL	1/50	1/83	13/75	0-1
Grasses					
*pinegrass	CARU	45/100	28/100	28/92	1-60
*elk sedge	CAGE	5/50	16/67	21/50	0-40
western fescue	FEOC	1/100	1/17	3/17	0-1
Forbs					
*strawberries	FRVE,FRVI	23/100	4/67	7/58	0-40
sweet cicely	OSCH	1/100	1/33	6/50	0-1
*heartleaf arnica	ARCO	36/100	31/100	28/33	1-73
hawkweeds	HIAL,HIAL2	5/100	4/50	2/33	0-10
lupines	LUPIN	6/100	1/17	3/58	0-10
peavines	LATHY	1/50	6/50	13/33	0-10
American vetch	VIAM	-	-	2/33	-

* Principal Indicator species

Stand Characteristics and Productivity

	All Plots n = 9
Herbage production (lbs/acre dry wt)	
pinegrass-elk sedge range and mean	50-350(160)
Total range and mean	100-500(315)
Average stand diameter/CI*	15.2/3.4
Number of trees per acre greater than 4 in dbh/CI	105/30
Total basal area/CI	155/35
Average basal area by species in all sampled stands	
PSME	28
PIPO	127
Mean Age/GBA by species	
PSME	125/160
PIPO	170/165

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PSME	1	70	12	160	#	44	#
PIPO	9	91	8	165	20	60	13

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004
\# n value insufficient to calculate statistics

Vegetative Composition - Ponderosa pine dominates the overstories of this type with Douglas-fir either present as a co-dominant or absent in more seral stands. Ponderosa pine and Douglas-fir occur as reproducing species in the understory with grand fir always absent. The understory shrub layer contains both spiraea (SPBE) and common snowberry (SYAL) with spiraea usually dominating. A frequent indicator shrub occurring with this type is Oregon-grape (BERE). Pinegrass (CARU) and elk sedge (CAGE) are very common in these stands. Forb abundance is relatively low but strawberries (FRVI, FRVE) and heartleaf arnica are frequent at high coverages.

With domestic and wild ungulate disturbance of these sites, species from the nearby grasslands often invade. Arrowleaf balsamroot (BASA), lupines, and cinquefoil (POGL) were often present in these stands. As the CARU-CAGE rhizomatous mat is disturbed, the shrub species may increase into those degraded portions of the community. Heartleaf arnica (ARCO) and bigleaf sandwort (ARMA3) often form dense patches beneath denser tree canopies where animals congregate for shade and cause trampling damage.

Distribution and Environmental Features - This association occurs on canyon backslopes and ridge-brows in the dissected plateau area. Elevations range from 3,000 to 5,400 feet (mean: 4,400 ft.). Stands commonly are limited in size and often occur as mosaics with the more widespread PSME/CARU association or in conjunction with higher elevation grassland communities. Slopes ranged from 15% to 60% (mean: 39%). Microrelief is usually convex.

Soils - Soils are typically dark reddish brown to dark brown in color in surface layers, less than 50 inches in depth, and formed in loess and colluvium from variable parent materials. Surface layers have loam and silt loam textures with greater than 15% rock fragments by volume. Subsoils have clay loam and silty clay loam textures with greater than 35% to greater than 65% rock fragments by volume. Rock fragments are predominately gravel-sized in surface layers and gravel and cobble-sized in subsoils.

These soils are fairly uniform in rock fragment content and presence of clay accumulations. Total depths vary depending upon landscape position. Deeper soils often occur at lower slope positions while soils less than 30 inches are common at ridge brow locations. Some soils at higher elevations have loess as well as ash mixed in coarse surface layers, but ash caps of nearly rock-free surface materials over buried soils that are commonly found in grand fir communities are not found here. In general, these are some of the rockier soils supporting Douglas-fir communities.

Summary of Soil and Site Characteristics (all samples) - PSME/SPBE

Solum Depth*	Rooting Depth**	Loess depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
16 in. to 60 in.	13 in. to 30 in.	mixed with Colluvium	stable	50°F to 55°F	rocks to surface	common

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - Mid-successional stages of this type are reflected in many stands throughout the Wallowa-Snake Province where old-growth ponderosa pine almost always dominates in tree overstory levels. Succession to Douglas-fir is reflected by the usual dominance of Douglas-fir in pole and seedling density. The occurrence of spiraea and snowberry as common members within the type is indicative of the high percentage of tree canopy opening (60%) exposing the undergrowth to sunlight and warmth in PSME/SPBE stands.

Early seral stands are dominated by ponderosa pine in the overstory (mean: 40%) with usual absence of Douglas-fir. Both tree species are codominant in tree understories. Higher coverages of spiraea, common snowberry, serviceberry,

pinegrass, and elk sedge reflect the influence of recent fire in early seral stands. A stand sampled in the Minam River bottom characterizes this type in the very early seral stage. Snowberry dominated 5:1 over the more drought-intolerant spiraea. Tall shrubs were noticeably present reflecting this open, fire-created community. Dominant were chokecherry, serviceberry, ceanothus species (CEVE, CESA), and blue elderberry. The tree layer was codominated by Douglas-fir and ponderosa pine in pole-sized trees occupying only 20% of the area.

Spiraea appears to be favored by moist-cool environments with a tendency to be restricted to higher elevations. Snowberry is apparently able to tolerate drier-warmer conditions at lower elevations. The snowberry extends into the bunchgrass zone (i.e., SYAL-ROSA plant association) whereas spiraea is never far from streamsides or adjacent forested vegetation as an ecotonal community at lower elevations).

Series Relationship - This is one of the higher elevation Douglas-fir plant associations. It occurs at upper-mid elevations as a mosaic with PSME/CARU and PSME/PHMA. At its lower extremities, it may occupy more cool-moist microsites adjacent to PSME/SYAL plant communities.

Role of Fire - Repetitive burning tends to promote more fire-resistant ponderosa pine and pinegrass. Reduction of fire frequency will stimulate common snowberry and spiraea. Douglas-fir will be promoted by fire-free periods. Many stands in this type now contain heavy ladder fuels provided by Douglas-fir saplings and poles. Fire damage potential to old-growth stands is increased by removal of fire from these communities.

Silvicultural Considerations - As in PSME/CARU and PSME/SYAL communities, competition with rhizomatous understory vegetation may provide the greatest problem to management. Competition with pinegrass-elk sedge mats and the spiraea and snowberry shrubs may make natural regeneration difficult within five years following removal of tree overstories. Ponderosa pine is more suitable for planting than Douglas-fir. Clearcutting of dense old-growth pine clumps may require artificial regeneration. Shelterwood systems may allow for a high degree of understory disturbance to break-up the rhizomatous plant community and permit planting and establishment of more shade-requiring Douglas-fir trees.

Range and Wildlife Management - Livestock make light forage use in these stands, but shading and bedding use is high. Introduction of exotic grass species following silvicultural modification may improve the forage production using moist site species (orchardgrass, timothy, and hard fescue), but including some drier site species as well (intermediate wheatgrass, smooth brome). Introduction of exotic grass species requires reduction of sedge-grass-shrub competition.

Mule deer use is high in these communities. Spiraea is little used, but associated snowberry provides important deer, elk, and cattle browse. Common snowberry may be less abundant in these communities as a result of selective use by elk and deer. Avian users of the type are nuthatches, grouse, grosbeaks, towhees, and thrushes.

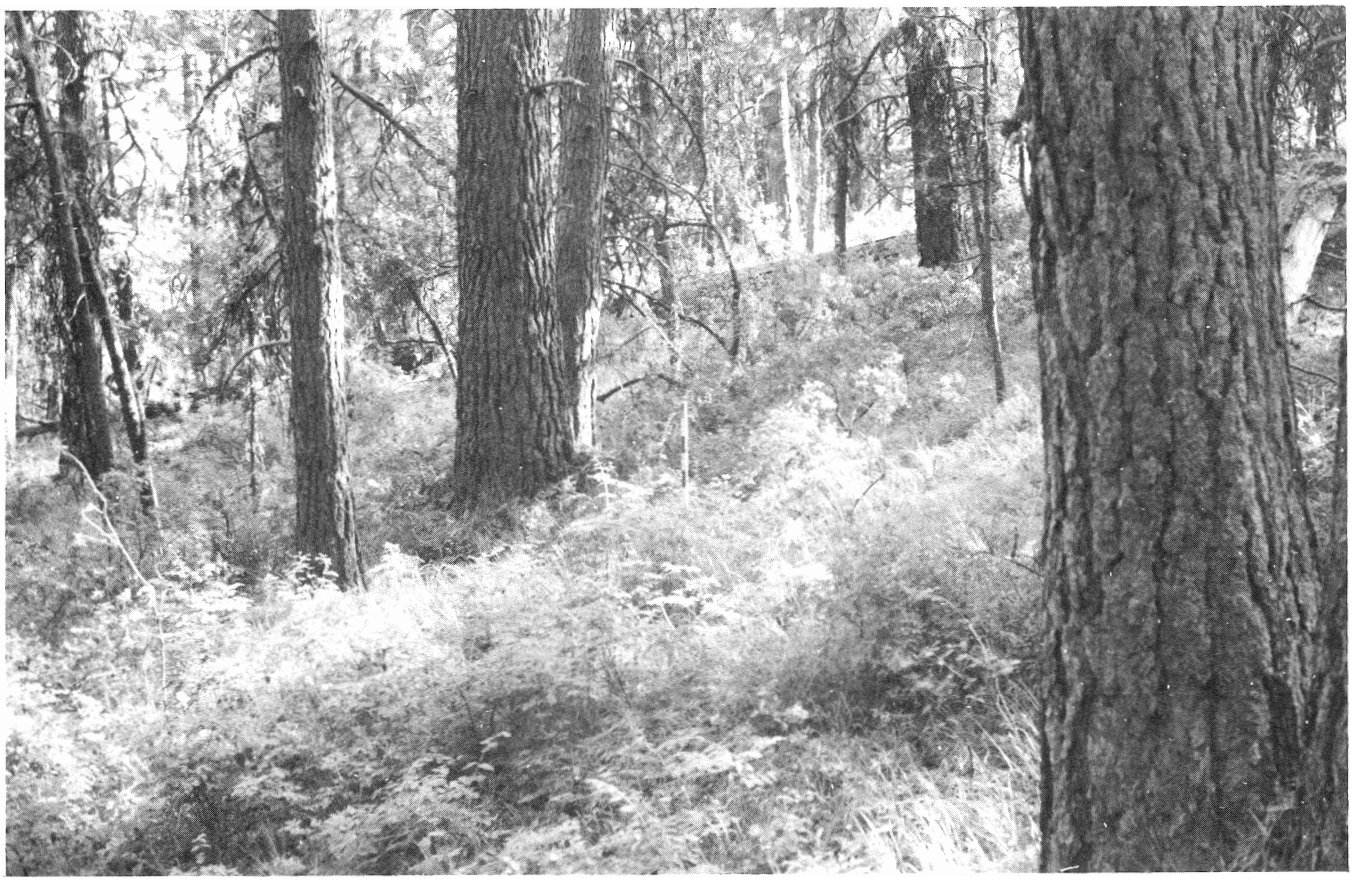
Stand Structure and Productivity - Stands in this association are two-aged to multi-aged reflecting a long history of fire influence and recent fire suppression. Catastrophic stand replacement fires were probably not common in the past due to the lack of extensive heavy fuels in these communities and in the adjacent

grasslands. Ground fires were probably more common and favored regeneration and establishment of individual trees or tree groups. Since fire suppression, one major age class has dominated in the understory while the overstory has retained its multi-aged arrangement. Basal areas of sample stands range from 70 to nearly 200 sq. ft./acre.

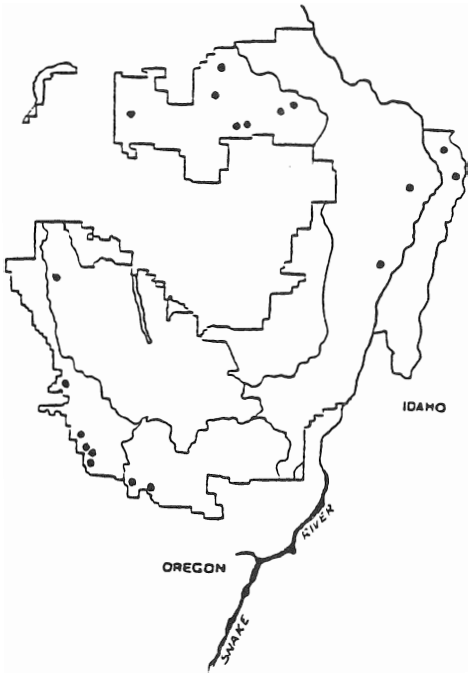
Productivity in stands of the PSME/SPBE association is moderate in comparison to all forest types, but moderately high for ponderosa pine in communities of the PSME series. Ponderosa pine GBA and volume growth exceeds that found in other Douglas-fir types.

Comparison with Other Investigators - The Daubenmires (1968) included SPBE with SYAL as floristic equivalents in their habitat types. Hall (personal communication) included similar vegetation in his PIPO-PSME/SYAL-HODI and deferred classification of this type for a greater number of samples. Steele (1975) and Pfister (1977) described PSME/SPBE habitat types. Pfister found PSME/SPBE sites in Montana to be too dry for common occurrence of pinegrass, elk sedge, or common snowberry. Steele (1981) portrayed a PSME/SPBE habitat type in central Idaho where snowberry was uncommon, but with significant composition by pinegrass and elk sedge. His ponderosa pine phase most closely resembles the stands encountered in the Wallowas except for the higher frequency of common snowberry included in the Wallowa-Snake stands. Cooper, Neiman, and Steele (1985) mention PSME/SPBE as an incidental type in northern Idaho, but there bluebunch wheatgrass is the dominant grass associate with low frequency of pinegrass. Williams (1983) and Lillybridge (1984) did not distinguish a spiraea type from PSME/SYAL in northern Washington.

Douglas-fir/common snowberry plant association
Pseudotsuga menziesii/Symphoricarpos albus
(PSME/SYAL) (CDS6 22)



64. Red Ridge (La Grande Ranger District) *Plot 1164*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: loess and basalt colluvium
Elevation: (4300 ft.) 3000, 3500-5100, 5600 ft.	Solum depth: (40 in.) 35-47 in.
Aspect: All	Loess depth: mixed
Slope (14%) 5-50%	Root conc: (22 in.) 16-28 in.
Position: lower 1/3 to upper 1/3 slopes and ridge brows	Depth to GT 15% rock frag./size: (30 in.) 24-35 in./gravels,cobbles
Other: most common on southern flank of Wallowas	Surface soil/subsoil texture: silt loam/silty clay, silty clay loam, clay

Table of Principal Species

PSME/SYAL (n = 24)

Species	Code	Mean Coverage(%)/Constancy(%) Late Seral (n=3)	Mid Seral (n=9)	Early Seral (n=12)	Mid-Late Seral Range
Tree Overstory					
*ponderosa pine	PIPO	10/100	37/100	39/100	5-60
*Douglas-fir	PSME	63/100	14/100	-	5-80
Tree Understory					
ponderosa pine	PIPO	10/33	8/89	22/92	0-20
*Douglas-fir	PSME	18/100	15/89	17/50	0-70
Shrubs					
*common snowberry	SYAL	30/100	26/100	41/100	1-60
spiraea	SPBE	1/67	3/56	3/42	0-5
serviceberry	AMAL	1/67	1/67	5/58	0-3
Oregon-grape	BERE	-	8/56	1/33	0-25
roses	ROSA	5/33	8/44	4/67	0-15
Grasses and Sedges					
*pinegrass	CARU	40/100	17/78	23/75	0-75
*elk sedge	CAGE	13/67	21/56	12/67	0-50
western fescue	FEOC	25/33	1/22	4/42	0-25
Forbs					
blueleaf strawberry	FRVI	-	6/44	7/58	0-10
woods strawberry	FRVE	3/33	9/44	8/67	0-20
yarrow	ACMIL	-	2/67	2/92	0-5
*heartleaf arnica	ARCO	6/67	24/78	22/50	0-75
*hawkweeds	(HIAL,HIAL2)	1/67	8/22	1/50	0-15
bigleaf sandwort	ARMA3	4/67	15/11	12/42	0-15
peavines	LATHY	-	17/22	12/42	0-30
cinquefoils	POTEN	4/67	1/22	1/67	0-5

* Principal Indicator Species

Stand Characteristics and Productivity

	All Plots n = 7
Herbage production (lbs/acre dry wt.)	
pinegrass-CARU range and mean	0-350(155)
Total range and mean	50-630(330)
Average stand diameter/CI*	12.4/2.1
Number of trees per acre greater than 4 in dbh/CI	200/48
Total basal area/CI	160/25
Average basal area by species in all sampled stands	
PSME	6
PIPO	152
Mean Age/GBA by species	
PSME	95/170
PIPO	95/160

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PSME	1	66	#	170	#	48	#
PIPO	7	94	7	160	24	65	12

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004
\# n value insufficient to calculate statistics

Vegetative Composition - Overstory tree canopies always contain old-growth ponderosa pine while Douglas-fir is most prevalent in understory levels reflecting the seral nature of most stands sampled.

Common snowberry (SYAL) always occurs and is the only prominent shrub in the type. Pinegrass (CARU) is generally present with elk sedge (CAGE) highly associated. Forbs are generally not present at high coverage levels. Heartleaf arnica (ARCO), hawkweeds (HIAL, HIAL2), cinquefoils (POGR, POGL), and bigleaf sandwort (ARMA3) are the most frequently encountered forbs.

Forbs demonstrating an increase with disturbance are long-stalked clover (TRLO), strawberries (FRVE, FRVI), lupine (LUPIN), yarrow (ACMIL), arrowleaf balsamroot (BASA), and bigleaf sandwort (ARMA3). Elk sedge demonstrated a notable ability to increase in the pinegrass stand as ungulate disturbance increased. Bare ground percentage also increased as a result of heavy ungulate use. Browsing by domestic and wild ungulates is often severe since PSME/SYAL communities frequently occur at lower slope locations and adjacent to heavily grazed grasslands.

Distribution and Environmental Features - This plant association occurs on canyon sideslopes and ridgebrows on the dissected plateau. Elevations range from below 3,000 feet on the lower slopes of deep canyons to 5,600 feet in drainage headland areas (ave. 4,300 feet). Although well distributed throughout this range, stands are usually limited in size, except along the southern flank of the Wallowas. The type commonly occurs as small tree groves on canyon sideslopes or footslopes surrounded by non-forest sites. Slopes range from 5 to 50% (ave. 14%) and microrelief is convex to undulating.

Soils - Soils are typically dark reddish brown in color in surface layers, less than 50 inches in depth, and formed in loess and basalt colluvium. Surface layers have silt loam textures and less than 15% rock fragments by volume. Subsoils are clayey and may be dense and compacted. Textures in subsoils are silty clay, or silty clay loam and clay. Rock fragments tend to increase, but usually do not exceed 35% by volume. Rock fragments are predominantly gravel-sized in surface layers and gravel and cobble-sized in subsoils. Surface rock seldom exceed 15% cover. Soil characteristics vary according to landscape position and elevation. Above 4,000 feet in elevation, soils are generally shallower (less than 40 inches) and may have nearly rock-free surface layers. These soils are among the least rocky of all soils supporting Douglas-fir communities.

Summary of Soil and Site Characteristics (all samples) - PSME/SYAL

Solum Depth*	Rooting Depth**	Loess Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
24 in. to 60 in.	11 in. to 35 in.	mixed with colluvium	very stable	50°F to 55°F	surface to 33 in.	occasional

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - Ponderosa pine dominates over Douglas-fir in the tree overstories of mid seral stands by at least a 2:1 ratio. Tree understories are dominated by Douglas-fir regeneration. Shrub composition and cover levels are essentially equivalent to late seral stands. Sun-loving plants are more abundant in mid seral stands than in late seral communities (i.e., strawberries, heartleaf arnica). Early seral stands are characterized by a dominant old-growth ponderosa pine overstory without Douglas-fir and with pine regeneration more common in tree understories. Snowberry-rose patches are more extensive under the very open tree overstory. Reflective of the early seral stage is the frequent occurrence of serviceberry beneath the open pines. Peavines (LANEC, LAPA2), bigleaf sandwort, heartleaf arnica, and strawberries are all abundant at this stage.

Series Relationship - PSME/SYAL commonly occurs at the lowest elevations of the Douglas-fir series on moderately steep slopes. The type is often adjacent to PSME/PHMA at higher elevations or on favorable aspects and concave positions at the lower limits of the type with a PIPO/FEID interface. The amount of animal disturbance on the sites is reflected more by the amount of bare ground than by increases in perennial plant weediness. Long-stalked clover (TRLO) is a minor component of disturbed stands in this type as compared to its aggressive nature in other types. Reflective of the proximity to bunchgrass vegetation, invading perennial plants more common to those communities also invade these communities (i.e., Kentucky bluegrass, arrowleaf balsamroot, yarrow, Idaho fescue).

Role of Fire - Frequent burns tend to promote pine and pinegrass. With reduction of fire frequency and intensity, Douglas-fir and snowberry are favored. As Douglas-fir succeeds following a fire-free period, the potential for destructive crown fire increases due to the stand structure of fire-susceptible Douglas-fir saplings and poles providing fire access to old-growth crowns. Many of the Wallowa-Snake PSME/SYAL communities are overstocked and pose a fire-damage potential to old-growth stands.

Silvicultural Considerations - As in the PSME/CARU type, competition with rhizomatous understory vegetation poses the major problem to management although to a lesser extent in this type. Again there is a low probability for natural regeneration of ponderosa pine and Douglas-fir within five years of overstory removal due to competition with pinegrass and snowberry. Ponderosa pine is more suitable for planting. Shelterwoods would be most effective except where mistletoe is heavy and clearcutting is needed to renovate the stand. Domestic and wild ungulate use is high in this type due to the proximity of high range value, non-forest plant communities. Spruce budworm and tussock moth are potentially high-risk defoliators. Mistletoe may be serious and bark beetles may pose a problem in old-growth overstocked stands.

Range and Wildlife Management - Livestock utilize these stands heavily for shading, bedding, and some foraging. Usually more preferred grazing areas are available on bunchgrass slopes near these open forested communities. Introduction of moist site exotic grass species (orchardgrass, timothy, hard fescue) plus drier site species (intermediate wheatgrass, smooth brome) should improve forage production. Snowberry provides important browse to deer, elk, and cattle. Ruffed grouse, Franklin's grouse, grosbeaks, towhees, and thrushes are frequent users of this type.

Stand Structure and Productivity - Stands sampled in this association were even-aged, and two-aged to multi-aged reflecting a long history of fire influence and recent fire suppression. Basal areas range from 115 to nearly 200 sq. ft./acre (ave. 160). Overall production in stands of the PSME/SYAL association is moderate in comparison to all other forest types. Volume growth and stockability for Douglas-fir and ponderosa pine is moderately high for stands in the Douglas-fir series.

Comparison with Other Investigators - The PSME/SYAL habitat type was described by Daubenmire (1968) in eastern Washington. Pfister (1977) described PSME/SYAL in Montana as one of the more common habitat types and separated three phases (pinegrass, common snowberry, bluebunch wheatgrass). Steele (1981) identified a similar PSME/SYAL habitat type in central Idaho with two phases (ponderosa pine, common snowberry). His pine phase most closely approximates the PSME/SYAL plant association of the Wallowa-Snake Province. Cooper, Neiman, and Steele (1985)

found PSME/SYAL as an incidental habitat type in northern Idaho. Williams (1983) and Lillybridge (1984) also describe the PSME/SYAL plant association in northern Washington. Hall (1973) described a ponderosa pine-Douglas-fir/snowberry-oceanspray plant association in the Blue Mountains which is similar in part to the PSME/SYAL of this study.

Douglas-fir/big huckleberry plant association
Pseudotsuga menziesii/Vaccinium membranaceum
(PSME/VAME) (CDS8 12) (n = 2)

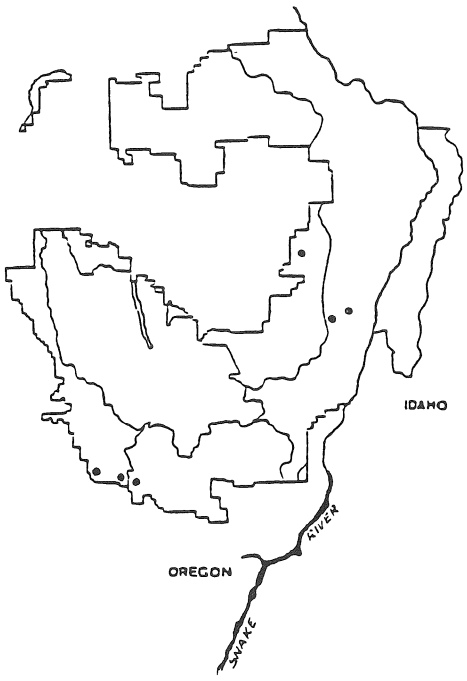
This is an incidental plant association occurring only in the Seven Devils and along the Snake-Salmon Divide of the Hells Canyon NRA in Idaho. Douglas-fir old-growth is often associated in the ponderosa pine-dominated overstory. Reproducing Douglas-fir appears to be the climax tree species. A grand fir seed source is apparently absent; but environmental conditions are cool and moist enough to permit big huckleberry establishment. The seral nature of these stands is characterized by spiraea, serviceberry, pinegrass, and strawberry occurrence. Disturbance by heavy ungulate use (domestic sheep, cattle, and elk) is often reflected by increases in heartleaf arnica and bigleaf sandwort.

Sampled sites occurred at 5,200-feet elevation on moderate to steep slopes with westerly aspects. Communities occupy basaltic and granitic substrates. PSME/PHMA and PSME/CARU may occur adjacent to PSME/VAME stands at lower elevations while ABLA2/VAME is common at higher elevations. Other investigators have defined a similar PSME/VAGL habitat type; Pfister (1977) in Montana where PSME/VAGL is considered a major habitat type; Steele (1981) in central Idaho; and Cooper, Neiman, and Steele (1985) in northern Idaho where it is considered incidental.

Volume growth and stockability is similar to stands in the PSME/PHMA and PSME/ACGL associations. Ponderosa pine and Douglas-fir grow moderately well on these sites. With control of shrub competition, ponderosa pine can be planted successfully. Natural regeneration will require a longer establishment and growth period due to competition from the dense big huckleberry undergrowth. Ungulate use is light, but big huckleberry provides bear, grouse, and people with heavy crops of berries in this type.

Douglas-fir/mountain snowberry plant community type
Pseudotsuga menziesii/Symphoricarpos oreophilus (PSME/SYOR) (CDS6 23)

65. Red Ridge (La Grande Ranger District) *Plot 1273*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: HCNRA, PRD	Parent Material: loess and basalt colluvium
Elevation: (4850 ft.) 4300-5300, 6200 ft.	Solum depth: (33 in.) 20-48 in.
Aspect: SE to W	Loess depth: loess
Slope (18%) 5-30%	Root conc: (25 in.) 19-37 in.
Position: upper 1/3 slopes + brows	Depth to GT 15% rock frag./size: rock to surface/gravels, cobbles
Other: On edge of forest-steppe communities. High wildlife value.	Surface soil/subsoil texture: loam, silt loam/silty clay laom, clay loam

Table of Principal Species

PSME/SYOR (n = 6)

Species	Code	Mean Coverage (%)/Constancy(%) Mid-Late Seral (n=3)	Early Seral n=3)	Mid-Late Seral Range
Tree Overstory				
*Douglas-fir	PSME	32/100	1/33	10-65
ponderosa pine	PIPO	40/67	32/100	0-60
Tree Understory				
*Douglas-fir	PSME	5/67	13/67	0-5
ponderosa pine	PIPO	-	7/100	-
Shrubs				
serviceberry	AMAL	1/33	6/67	0-1
*mountain snowberry	SYOR	22/100	28/100	20-25
Grasses and Sedges				
pinegrass	CARU	8/67	10/33	0-10
elk sedge	CAGE	5/33	13/67	0-5
Ross' sedge	CARO	3/67	1/33	0-5
Forbs				
heartleaf arnica	ARCO	14/100	18/67	3-35
*sweet cicely	OSCH	2/100	8/67	1-3
*woods strawberry	FRVE	23/100	10/100	20-30
yarrow	ACMIL	1/67	1/100	0-1
cleavers	GAAP	4/67	-	0-5
houndstongue	CYOF	3/67	1/33	0-5

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands n = 3
Herbage production (lbs/acre dry wt)	
Total range and mean	(100-300)150
Average stand diameter/CI*	15.4/3.1
Number of trees per acre greater than 4 in dbh/CI	150/59
Total basal area/CI	155/22
Average basal area by species in all sampled stands	
PSME	55
PIPO	100
Mean Age/GBA by species	
PIPO	145/150

Productivity Index

	No. of Plots Sampled	Site Index ** Mean	CI	GBA Mean	CI	Productivity Index *** Mean	CI
PIPO	3	78	2	150	19	50	7

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Douglas-fir/mountain snowberry communities are codominated by ponderosa pine and Douglas-fir in mid and late seral stands. Mountain snowberry forms an open, spatially arranged stand with squaw apple (PERA3) and squaw currant (RICE) sometimes associated. Pinegrass and elk sedge are associated in stands lacking major degradaton. The most frequent forbs are heartleaf arnica (ARCO), sweet cicely (OSCH), and woods strawberry (FRVE).

Distribution and Environmental Features - The PSME/SYOR type occurs sporadically across the dissected plateau and on the south flank of the Wallowas. Individual stands are small and adjacent to bunchgrass communities, but may be common along plateau brows at the upper fringes of PSME/PHMA stringers. Extensive stands are more typical on the southern flank of the Wallowas. Elevations of most sampled stands ranged from 4,300 to 5,300 feet (mean: 4,850), the highest mean elevation

for communities in the Douglas-fir series. One stand was sampled above 6,000 feet in elevation. Sites are mostly ridgebrows or upper slopes with convex to undulating microrelief. Slopes are moderate (range: 5-30%, mean: 18%) with aspects west to southeasterly.

Soils - Soils are very dark brown to dark reddish brown in color in surface layers, less than 48 inches in depth, and formed in loess and basalt colluvium. Surface soils have loam and silt loam textures with greater than 15% rock fragments by volume. Subsoils have silty clay loam textures with greater than 15% to greater than 35% rock fragments by volume. Gravel-sized rock fragments are predominant in the surface layer while gravel and cobble-sized fragments occur in subsoils. Surface rock usually exceeds 5% cover. Few soil samples have been taken in this community and therefore variation in soil characteristics has not been determined.

Successional Relationship - Early seral stands are dominated by ponderosa pine with little or no representation by Douglas-fir. The snowberry is more abundant with serviceberry, pinegrass, and elk sedge as common associates reflecting the influence of recent fire. These communities are transitional between non-forested communities and Douglas-fir forested stands. PSME/SYOR stands often are found at the heads of PSME/PHMA stringers, adjacent to lodgepole pine stands and FEID-CAHO communities on ridgetops, or at the forest fringe with cold desert shrublands. A codominant ponderosa pine-Douglas-fir stand is probable. Environmental conditions are capable of supporting Douglas-fir, yet pine is more tolerant of the extremes created by fire, drought, and warm temperatures which frequent these sites.

Ungulate disturbance can be severe based on the forest-steppe "edge" these communities provide for shading, browsing animals. Many PSME/SYOR stands have been so degraded that gooseberries have invaded in dense thickets beneath the trees (i.e., Lord Flat, Haas Horse Troughs). Forbs which increase dramatically with disturbance are heartleaf arnica, woods strawberry, and bigleaf sandwort. Reflecting the animal presence and principal seed dissemination by animals are invading species frequently found in these shrublands (i.e., long-stalked clover, houndstongue, and cleavers).

Management Considerations - Ponderosa pine may perform best in PSME/SYOR communities and should be the species promoted in silvicultural treatments. Both regeneration and tree growth should be enhanced by shrub removal on these often harsh sites. Stands tend to progress to a structure that will lend itself to small patch clearcuts or large group selection, but because of shrub competition, the probability is low for regeneration within five years of overstory removal. Douglas-fir tends to be heavily infested with mistletoe in many communities as a result of the stress under which the trees grow. Harvesting of Douglas-fir will enhance forest sanitation and permit pine to dominate. Mountain snowberry will become more prolific with site disturbance through logging or ground fire. If these sites are to be managed for tree production, competing shrubs must be controlled. Primary value of this community is in the variety of plant life produced at the forest edge which ensures wildlife species a diverse habitat.

Stand Structure and Productivity - Sample stands are even-aged and multi-aged, the latter condition being more typical of later seral stages. Ages of dominant and codominant ponderosa pine range from 90 to 180 years. Basal area in these often patchy stands ranges from 140 to 170 sq. ft./acre. Clumps of trees of similar age are spaced widely enough to allow vigorous shrub growth. The effect

such high shrub cover may have on tree growth has not been determined. Stands in PSME/SYOR communities have only moderate to low timber-producing capability. Site index for ponderosa pine is among the lowest measured in all forest communities, although GBA is about average for stands in the Douglas-fir series.

Comparison with Other Investigators - The PSME/SYOR habitat type was described by Steele (1981) in east-central Idaho; Pfister (1977) as a minor occurrence in southwestern Montana; Steele (1983) as a minor habitat type in the Wind River Range of Wyoming; Mauk (1984) in northeastern Utah; and Williams (1983) in north-central Washington. Steele describes the habitat type as an overlap of Douglas-fir forest and mountain shrub communities. Steele found PSME/SPBE and PSME/CAGE forests often adjacent to these communities. Pfister noted that PSME/CARU communities were always adjacent in southwest Montana. Williams separated PSME/SYOR stands from PSME/SYAL based on slope percentages, differences in productivity, and management considerations instead of species composition. The PSME/SYOR communities of the Wallowa-Snake Province are most similar to those defined by Steele in east-central Idaho.

Key to the Ponderosa Pine (PIPO) Series Vegetation

(Ponderosa pine old-growth always present in the absence of Douglas-fir If Douglas-fir is regenerating in the stand, it is expected to be subordinate to a ponderosa pine open-growing stand structure of the future.)

1. Stands with shrub undergrowth present (at greater than 10% coverage) 2

    2. Common snowberry present 3

        3. Horizontal stringers with spiraea, common snowberry, bitterbrush, and Oregon-grape often present . . . . . PIPO/SPBE (pg. 377)

        3. Spiraea absent; bitterbrush, and Oregon-grape also absent . . . . . PIPO/SYAL (pg. 372)

    2. Common snowberry absent; bitterbrush present at 3% coverage or greater . . . . . PIPO/PUTR/AGSP (pg. 388)

1. Stands usually shrubless; Idaho fescue or bluebunch wheatgrass usually associated 3

        3. Idaho fescue always present with bluebunch wheatgrass usually associated . . . . . PIPO/FEID (pg. 378)

        3. Idaho fescue absent . . . . . PIPO/AGSP (pg. 383)

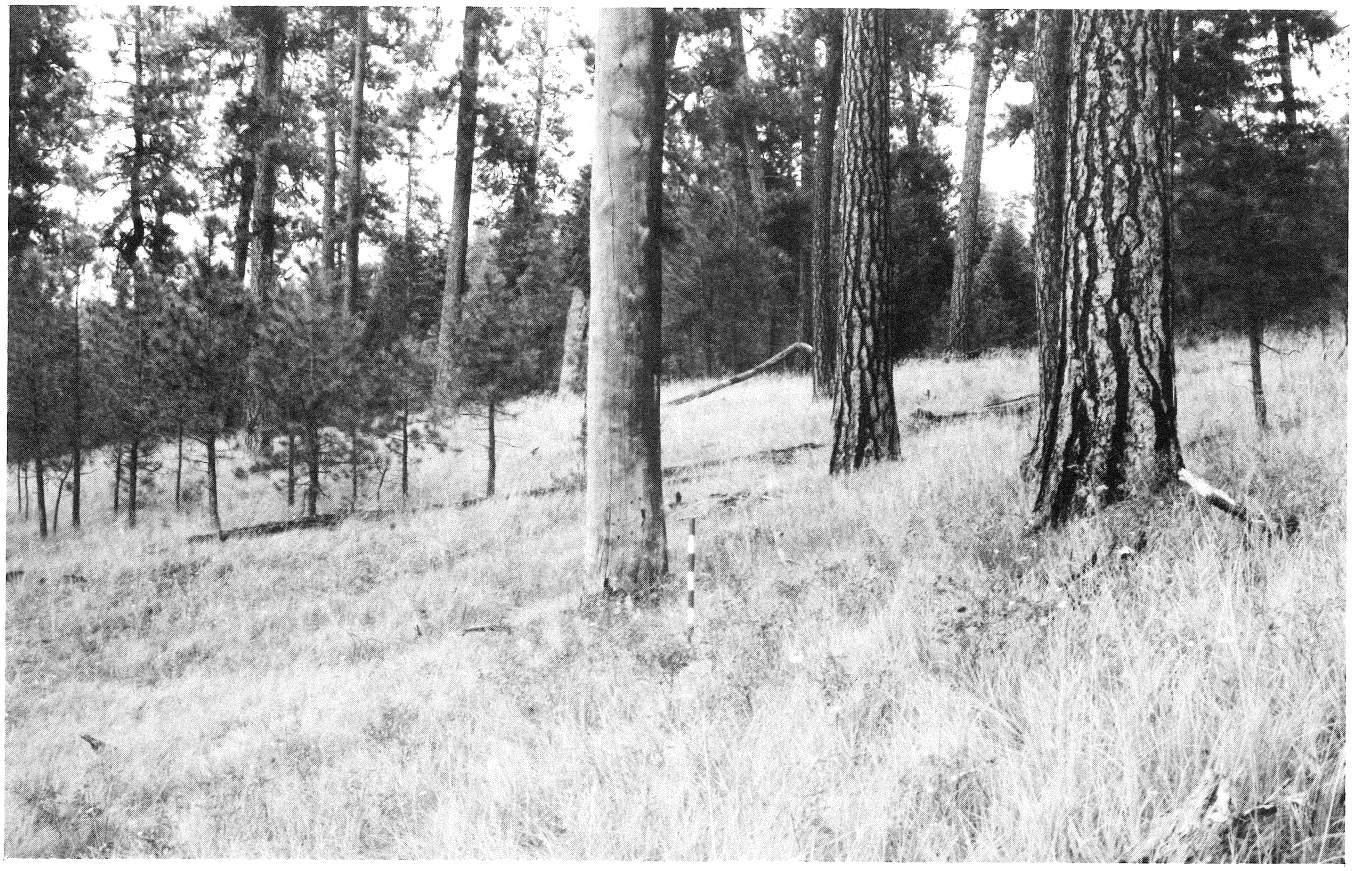
PONDEROSA PINE (PIPO) SERIES

Summary of Plant Association and Community Type Characteristics 1/

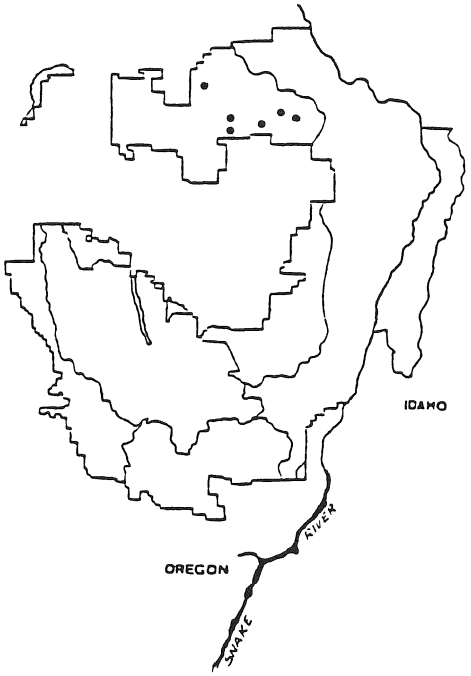
Plant Community Type	Elevation (feet)	Slope Position	Aspect	Slope	Parent Material	(2) Soil Depth Total (in.) Rt. Conc.	Principal Indicators	(3) Relative Cubic prod./ Stockability	(4) Forage (lbs./acre) dry
PIPO/SYAL	3800-4500 (4050)	upper slope	E-W	9-55% (37%)	Loess + basalt colluvium	25-40 (30) 11-24 (18)	SYAL,AGSP FEID,CARU	Low/Low	(600) 400-850
PIPO/SPBE	3600-5300 (4800)	mid to upper slope	S-SE	53-60% (56%)	Loess + basalt colluvium	26-40 (33) 11-22 (17)	SPBE,CARU PUTR,BERE	Low/Low	(700) 500-1000
PIPO/FEID	3600-4800 (4200)	ridges,mid-upper slope	W-E	4-45% (25%)	Loess + mixed geol.	10-18 (15) 9-20 (16)	FEID,AGSP BROMES	Low/ low	(220) 130-260
PIPO/AGSP	3200-4900 (3800)	mid to upper slope	S	45-65% (58%)	Loess + mixed geol.	8-20 (15) 12-18 (20)	AGSP,POSC BRTE	Low/ Low	(90) 20-240

1/ Range and mean (no.)
2/ Total soil depth and depth of root concentration (80% of roots)
3/ Comparison of relative cubic volume production/stockability for the primary species (from Appendices E & F)
4/ Forage production in all conditions sampled.

Ponderosa pine/common snowberry plant association
Pinus ponderosa/Symphoricarpos albus (PIPO/SYAL) (CPS5 22)



66. Peavine Creek Canyon ***Plot 211***
(Wallowa Valley Ranger District)



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: WVRD	Parent Material: loess and basalt colluvium
Elevation: (4050 ft.) 3000, 3800-4500 ft.	Solum depth: (30 in.) 25-40 in.
Aspect: (SW) E-W	Loess depth: mixed
Slope (37%) 9-55%	Root conc: (18 in.) 11-24 in.
Position: upper 1/3 slopes to brows	Depth to GT 15% rock frag./size: rock to surface/gravels, cobbles
Other: Heavily used by deer and elk for winter browse.	Surface soil/subsoil texture: silt loam/silt loam, silty clay loam

Table of Principal Species

PIPO/SYAL (n = 6)

Species	Code	Mean Coverage (%)	Constancy (%)	Range
Tree Overstory				
ponderosa pine	PIPO	33	100	10-65
Tree Understory				
*ponderosa pine	PIPO	42	83	0-60
Shrubs				
*common snowberry	SYAL	34	100	5-75
serviceberry	AMAL	2	67	0-5
Grasses and Sedges				
*pinegrass	CARU	9	67	0-20
elk sedge	CAGE	1	17	0-1
*Idaho fescue	FEID	14	67	0-40
*bluebunch wheatgrass	AGSP	18	100	3-40
prairie junegrass	KOCR	2	50	0-3
Kentucky bluegrass	POPR	11	67	0-16
mountain brome	BRCA	4	50	0-10
Forbs				
blueleaf strawberry	FRVI	7	67	0-15
woods strawberry	FRVE	12	50	0-20
heartleaf arnica	ARCO	4	50	0-10
yarrow	ACMIL	7	83	0-15
lupines	LUPIN	10	50	0-20
long-stalked clover	TRLO	7	67	0-15

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands n = 3
Herbage production (lbs./acre dry wt.)	
Grasses; range and mean	300-500(400)
Total range and mean	400-850(600)
Average stand diameter/CI*	12.8/6.2
Number of trees per acre greater than 4 in dbh/CI	115/80
Total basal area/CI	120/37
Mean Age/GBA by species	
PIPO	240/100

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
PIPO	3	78	9	100	23	34	6

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - In these communities, ponderosa pine dominates all tree coverage levels and is reproducing as the predicted climax species. The occasional Douglas-fir on the site is considered to be ephemeral. Common snowberry (SYAL) and pinegrass (CARU) comprise the majority of the understory vegetation. Hawthorne (CRDO) and Woods' rose (ROWO) occur on gentle slopes while serviceberry (AMAL) is found on steep slopes within the type. Since bunchgrass steppe generally occurs adjacent to PIPO/SYAL stands, bluebunch wheatgrass (AGSP), Idaho fescue (FEID), and prairie junegrass (KOCR) are commonly found. The most ubiquitous forbs are yarrow (ACMIL), woods strawberry (FRVE), and heartleaf arnica (ARCO).

Since PIPO/SYAL communities are generally near feeding grounds for domestic cattle and elk, they are heavily used for bedding, shading, and cover. Pinegrass use by domestic stock has been observed in September following curing of adjacent bunchgrass vegetation. Heavy usage decreases snowberry and reduces pinegrass and desirable forage grasses. Increasing with disturbance are yarrow (ACMIL), lupine (LUCA), vetch (VIAM), strawberries (FRVI, FRVE), and bigleaf sandwort (ARMA3). Invading species under very heavy pressure are long-stem

clover (TRLO), Kentucky bluegrass (POPR), and hounds tongue (CYOF). Dense stands of currants and gooseberries (RIBES) under ponderosa pine stands assigned to this type are the result of extreme site disturbance.

Distribution and Environment - This plant association occurs sporadically throughout the steep canyon slopes in the plateau region at elevations ranging from 3,000 to 4,500 feet (ave: 4,000). Exposure of sites varies with elevation. Within the forest zone, the type occupies the more severely exposed sites, while within the grassland zone, more sheltered sites are occupied. The type was sampled on ridgebrows and backslopes (ave. slope: 37%). Overall, these sites are more severe than those sampled in the PSME/SYAL association. All sites showed at least some accumulation of soil material from the surrounding areas. This is typical on slopes in basalt plateau and canyon areas where rims or flow contacts act as barriers to downward movement of eroding soil and rock materials. These accumulation areas provide a favorable rooting medium for ponderosa pine allowing domination of trees over the more common grasses.

Soils - Soils are typically very dark brown to dark reddish brown in color in the surface layers, less than 40 inches in depth, and formed from loess and basalt colluvium, and bedrock materials. Surface layers have silt loam to silty clay loam textures with greater than 35% rock fragments by volume. Rock fragments tend to be gravel-sized in the surface soil and gravel and cobble-sized in the subsoil. Surface rock usually exceeds 10% cover. Few soils were sampled in this type and, therefore, variability in characteristics has not been determined. These soils are more loess-influenced and much deeper than soils supporting PIPO/FEID communities.

Successional Relationships - The typical stand of PIPO/SYAL contains a high FEID-AGSP component. At the drier limits where PIPO/SYAL interfaces with the bunchgrass types, snowberry becomes patchier. Its orientation in these areas follows coves and swales where moisture retention is greater and/or aspects more favorable than the dry, hot exposures more conducive to bunchgrasses. Often at these extremes, snowberry is found northeast of large-crowned trees and beneath tree canopy patches. These more xeric PIPO/SYAL stands usually contain a more pronounced rose composition with the snowberry, and a much greater bunchgrass composition. Strawberries, clover, and Kentucky bluegrass are especially prominent in these more xeric stands following repeated disturbance.

Series Relationship - PIPO/SYAL communities are found on steep slopes and deeper soils providing a moister rooting medium than PIPO/FEID communities. Shrubs are common with snowberry dominating. Pinegrass is also common on wet extremes of the type while bunchgrasses are often present at the dry extremes of the type. Bareground percentages are among the highest (PIPO/SYAL and PIPO/AGSP = 4%; PIPO/FEID = 5%) of the forest types. These surface relationships result from natural dryness of the sites and compacted soils induced by trafficking animals. Kentucky bluegrass has greater affinities to the PIPO/SYAL type following disturbances.

Role of Fire - Rangeland fires have influenced the pattern or mosaic of understory vegetation in these stands. Pinegrass is favored by fire with snowberry somewhat controlled by periodic burning. Establishment of ponderosa pine seedlings is favored by periodic fire which reduces the competitive grass-sedge mats and shrubs and reduces the litter buildup to expose mineral soil. Fire frequents these stands approximately every 20 years. Grasses and forbs are temporarily

stimulated by surface fires. Prescribed fire has proven an excellent tool in this type for controlling understory vegetation, maintaining vigor in crop trees, and in continuing the natural uneven-aged structure of stands.

Silvicultural Considerations - Limitations to management in this type include limited moisture and competition with shrubs and graminoids. There is a very low probability for natural regeneration success within five years of overstory removal. Snowberry, pinegrass, and elk sedge competition will also limit artificial regeneration success. Additionally, Kentucky bluegrass has a potential of creating regeneration problems in overgrazed, disturbed areas. The only species suited to stands in this association is ponderosa pine. It should be managed in an uneven-aged silvicultural system. Although there are no serious disease problems, bark beetles are a major concern in decadent stands and in young stagnated stands.

Range and Wildlife Management - All ungulates are frequent users of this type due to the proximity of these communities to highly desirable bunchgrass slopes and riparian canyon bottoms. Associated pinegrass is used late in the season. The bunchgrasses occurring as opportunists from adjacent types are preferred forage during the early and mid season grazing period. Silvicultural modification of these communities may result in reseeding needs. Control of rhizomatous shrub and sedge-grass species is necessary to promote other bunchgrass vegetation on these sites. Dry-site species that perform well include: hard fescue, intermediate wheatgrass, and big bluegrass.

Deer and elk use these communities for escape cover. Deer are browsers of snowberry; elk use the snowberry, but make more use of sedge-grass species. Thrushes, robins, grosbeaks, and grouse may be common in these communities.

Stand Structure and Productivity - The diameter/age distribution for stands sampled in this association is all-aged to multi-aged as the result of past fire influences. Tree ages ranged from 100 to over 350 years while distinct age classes were evident at intervals ranging from 10 to 27 years (ave. 18 years). This interval compares closely to fire frequency intervals (range 8-34 years, ave. 20 years) measured from fire scars on trees within these same stands. Basal areas ranged from 80 sq. ft./acre to over 140 sq. ft./acre (ave. 120).

In general, tree production in this association was poor in comparison to types in other series, but the best for stands in the PIPO series. Ponderosa pine stockability and volume growth is very low, but individual tree growth appeared as good as that measured in some stands in the PSME series. The largest diameter trees are relatively old (+200 years), but even trees within the 100-200 year age group have diameters near those measured in some of the more productive sites in the PSME series. The poor overall production was the result of open stand conditions with few trees potentially able to occupy the site and maintain good growth rates.

Comparison with Other Investigators - The PIPO/SYAL habitat type was described by Daubenmire (1968) in eastern Washington and northern Idaho. Pfister (1977) described a PIPO/SYAL habitat type in Montana with two phases (common snowberry, Oregon-grape). Steele (1981); and Cooper, Neiman, and Steele (1985) also identified the PIPO/SYAL habitat type. Hall (1973) did not recognize a climax ponderosa pine/common snowberry plant association in the Blue Mountains.

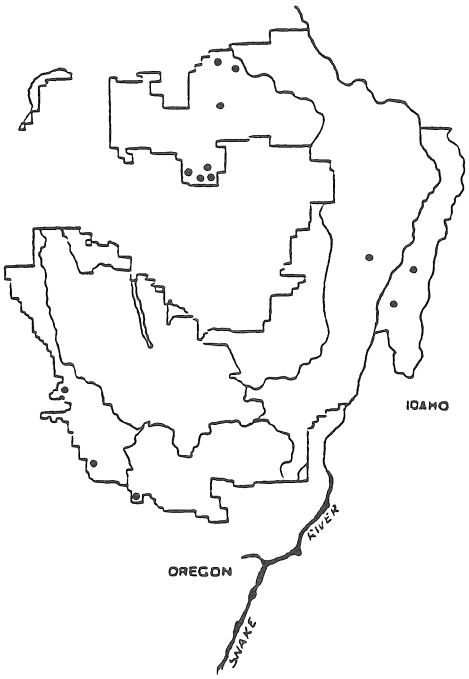
Ponderosa pine/spiraea plant community type
Pinus ponderosa/Spiraea betulifolia
(PIPO/SPBE) (CPS5 23) (n = 3)

Forested horizontal stringers located on seepy rim palisades of the Imnaha-Big Sheep drainages are dominated by ponderosa pine with codominant spiraea and common snowberry beneath. These communities are oriented on southerly aspects with bunchgrass vegetation dominating the drier inter-rim slopes. Bitterbrush and Oregon-grape are frequent shrub associates. Pinegrass is always associated at relatively high coverages while Idaho fescue occupies drier microsites. Harsh paintbrush (CAHI2), yarrow (ACMIL), wayside gromwell (LIRU), and heartleaf arnica (ARCO) are forbs frequently associated.

These forested garlands are dramatically visible on rim palisades above the Gumboot Creek and Mahogany Creek vicinity of the Imnaha Canyon and on Echo, Big Sheep, Corral Creek Ridges above Big Sheep Creek Canyon. These communities are very limited in extent, remote to active silvicultural management, and provide their greatest benefit to watershed quality by stabilization of steep slopes and vegetative filtering of sediment loads. Wildlife make high use of these stands for cover, bedding, and shading. The garlands provide prime mule deer habitat.

Ponderosa pine/Idaho fescue plant association
Pinus ponderosa/Festuca idahoensis (PIPO/FEID) (CPG1 31)

67. Goose Creek Canyon (Pine Ranger District) *Plot 1265*



ENVIRONMENT
(all plots)

Location:
All Districts

Elevation: (4200 ft.)
3600-4800 ft.

Aspect: W-E

Slope (25%)
4-45%

Position: ridges, and mid to upper 1/3 slopes

Other:
Forms mosaic with fescue dominated communities.

SOILS
(typical soils)

Parent Material: loess + colluvium from various geologies

Solum depth: (15 in.)
10-18 in.

Loess depth: mixed

Root conc: (16 in.)
9-20 in.

Depth to GT 15% rock frag./size:
rock to surface/gravels, cobbles

Surface soil/subsoil texture:
loam, silt loam/loam, clay loam, silty clay loam

Table of Principal Species

PIPO/FEID n = 13

Species	Code	Mean Coverage (%)	Constancy (%)	Range
Tree Overstory				
*ponderosa pine	PIPO	34	100	10-60
Tree Understory				
*ponderosa pine	PIPO	10	77	0-20
Shrubs				
common snowberry	SYAL	2	31	0-5
woods rose	ROWO	2	38	0-5
Wyeth's buckwheat	ERHE	3	31	0-10
Grasses and Sedges				
*Idaho fescue	FEID	23	100	4-65
prairie junegrass	KOCR	5	46	0-10
*bluebunch wheatgrass	AGSP	7	77	0-25
cheatgrass	BRTE	3	62	0-5
other annual bromes	BROMU	8	69	0-25
Forbs				
yarrow	ACMIL	2	100	1-10
lupine	LUPIN	6	69	0-15
yellow salsify	TRDU	1	31	0-1
wayside gromwell	LIRU	1	31	0-1
Surface Features				
rock/gravel		5	69	0-10
bare ground		5	69	0-20
moss/lichen		7	31	0-20
litter		81	100	40-99

* Principal Indicator Species

Stand Characteristics and Productivity

	All Stands n = 7
Herbage production (lbs./acre dry wt.)	
bluebunch wheatgrass AGSP range and mean	0-110(45)
Idaho fescue FEID range and mean	20-170(80)
Total range and mean	130-260(220)
Average stand diameter/CI*	15.9/2.1
Number of trees per acre greater than 4 in dbh/CI	52/11
Total basal area/CI	78/17
Mean Age/GBA by species	
PIPO	120/85

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
PIPO	6	77	9	85	20	28	9

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Vegetative Composition - Ponderosa pine totally dominates as the only tree species able to persist in the PIPO/FEID type. Shrubs are essentially absent, but common snowberry and rose do occur in limited amounts. Idaho fescue (FEID), bluebunch wheatgrass (AGSP), and prairie junegrass (KOCR), are the dominant understory species in the type. The most common forbs are lupine (LUPIN), and yarrow (ACMIL).

Disturbance from cattle and elk is highly visible throughout these communities. This type is highly desirable to grazing animals based on its gramineous composition, gentle slopes and proximity to bunchgrass types adjacent to PIPO/FEID stands. Increasing with disturbance are yarrow (ACMIL), lupine (LUPIN), and prairie junegrass (KOCR). Invading species of major importance are Kentucky bluegrass (POPR), annual bromes (BRTE, BRMO), and annual forbs (i.e., shining chickweed).

Distribution and Environment - This plant association has a limited distribution in the Wallowa-Snake Province. It occurs only as scattered tree groups within a predominantly non-forest regime. Stands could be characterized as forest savannah and are found on mid- to low-elevation broad ridges and steep canyon slopes. Elevations range from 3,600 to 4,800 feet (ave: 4,200 ft.). Sites occur on upper convex ridgebrows with west to east aspects and moderate slopes (range 10-12%, ave: 11%) and on steep canyon backslopes with southerly aspects. These sites are among the most severe of all the forest types in the Province.

Soils - Soils are typically dark brown in color in surface layers, less than 18 inches in depth, and formed in loess and fractured bedrock. Rooting is common beyond this depth into rock fractures and unconsolidated rock material. Surface soils are thin, have loam and silt loam textures, and contain greater than 15% rock fragments by volume. Subsoils are often clayey (clay loam, silty clay loam textures) and very rocky with rock fragments exceeding 35% by volume. Rock in surface soils is predominantly gravel-sized and gravel, cobble, and stone-sized in subsoils. Surface rock usually exceeds 30% cover.

These soils are fairly uniform. Steeper slopes often have deeper soils (greater than 18 inches) in soil accumulation areas and may not have clayey layers. Soils derived in granitic substrates or near rock outcrops are usually shallower and rockier.

Summary of Soil and Site Characteristics (all samples) - PIPO/FEID

Solum Depth*	Rooting Depth**	Loess Depth	Site Stability	*** Summer Temp.	Depth to 15% rock fragments	Rock Outcrop
9 in. to 22 in.	4 in. to 20 in.	0	very stable	50°F to 58°F	to surface	common

* Depth to bedrock, paralithic contact, or unconsolidated rock material.
** Depth that includes 80% of all roots. *** Temperature at 20 in. depth.

Successional Relationship - PIPO/FEID is more xeric than the often adjacent PIPO/SYAL and PSME/SYAL communities. PIPO/FEID is located on convexities at the extreme limits of suitable moisture for tree growth. The type is characterized by both pole-sized even-aged trees and scattered, open-growing old-growth in uneven-aged stands. Communities of common snowberry-rose and pinegrass-elk sedge tend to occur on more moist microsites within stands most closely associated with PIPO/SYAL and PSME/SYAL types. The xeric end of the type contains ponderosa pine in an open park-like savannah with bunchgrass vegetation (i.e., FEID-KOCR, FEID-AGSP, and AGSP-POSA3).

Series Relationship - See PIPO/SYAL for comparison.

Silvicultural Considerations - PIPO/FEID communities occur on some of the most severe forest sites described in the Wallowas, Seven Devils, and associated ridges of the Snake-Imnaha. They are severely limited for long-term timber management and are often unsuited as commercial forest land. Little silvicultural activity has occurred in this type. Past timber harvesting practices have concentrated on reducing competition in potential crop trees or in high grading the scattered, most valuable trees. This type has a very low probability for natural regeneration success following overstory removal. Ponderosa pine is the only natural tree species suitable for planting on these sites and requires

site preparation and control of competing vegetation. Uneven-aged management with special care in protecting existing trees appears to be the only silvicultural system suited on these harsh sites. Although sites are too dry for pocket gophers, the potential for porcupine damage is high.

Role of Fire - Stocking of ponderosa pine can be influenced by fire intensity. The role of fire in this type can help maintain grasslands by periodic burning of ponderosa pine seedlings, saplings, and pole clumps slowing the succession to pine and increasing the gramineous coverage on an area. Periodic fire also helps rejuvenate grasses, but may result in increased forb composition. The grass-forb diversity may be desirable for the wildlife and range manager.

Range and Wildlife Management - Use by domestic livestock and big game is high. Many PIPO/FEID communities of the Wallowa-Snake Province have been severely overgrazed and are generally in early and very early seral stages. Sites are often suitable for successful revegetation using dry site species (intermediate wheatgrass, hard fescue, big bluegrass). These drier site forest communities are often among the first to become available in spring and remain available to big game into the winter. The associated native vegetation is extremely vulnerable to use at critical growth periods and is readily damaged from trampling by the animals when soils are saturated.

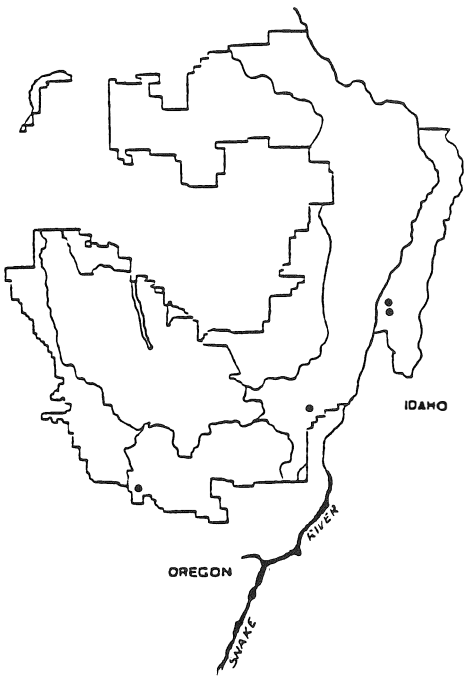
Stand Structure and Productivity - Stand diameter/age distribution is mainly even-aged reflecting past fire disturbance. Tree groups of similar age forming multi-aged structures were also sampled. As with stands in the PSME/CARU plant association that occur on ridges, stand replacement fires were probably common in the past. Stand ages range from 50 to 80 years in the even-aged stands and from 50 to over 300 years in the multi-aged stands. It is difficult to accurately assess the stocking level of these sites because of stand patchiness. Within tree groups, basal areas ranged from 50 to over 100 sq. feet per acre. Average basal area, including nonstocked areas, is approximately 80 sq. feet per acre.

Overall growth is poor in stands belonging to this plant association. Individual tree growth, especially in young trees, is moderate. Stockability is very low and may be much less than the data indicates. Accurate estimates of GBA could not readily be made due to clumping of trees. The SDI volume growth index may be a more reliable means for determining the commercial status of these and similar sites. These sites should be considered non-commercial.

Comparison with Other Investigators - The PIPO/FEID habitat type was described in eastern Washington by Daubenmire (1968); in the Blue Mountains of Oregon by Hall (1973); in west-central Montana by Pfister (1977); in central Idaho by Steele (1981); and in northern Idaho by Cooper, Neiman, and Steele (1985). Volland (1976) and Hopkins (1979) describe ponderosa pine/bitterbrush/fescue on buried soils with ash or pumice surface layers in central Oregon.

Ponderosa pine/bluebunch wheatgrass plant association
Pinus ponderosa/Agropyron spicatum (PIPO/AGSP) (CPG1 32)

68. Little Granite Creek Canyon, Seven Devils (Hells Canyon NRA) *Plot 1251*



ENVIRONMENT (all plots)	SOILS (typical soils)
Location: All Districts	Parent Material: loess and colluvium from various geologies
Elevation: (3800 ft.) 3200-4900 ft.	Solum depth: (15 in.) 8-20 in.
Aspect: southerly	Loess depth: mixed
Slope (58%) 45-65%	Root conc: (20 in.) 12-18 in.
Position: mid to upper 1/3 slopes	Depth to GT 15% rock frag./size: rock to surface
Other: often forms mosaic with bunchgrass communities; hottest, driest forested type.	Surface soil/subsoil texture: sandy loam, loamy sand/ sandy loam, sand

Table of Principal Species

PIPO/AGSP (n = 4)

Species	Code	Mean Coverage (%)	Constancy (%)	Range
Tree Overstory				
*ponderosa pine	PIPO	26	100	5-40
Tree Understory				
*ponderosa pine	PIPO	1	75	0-1
Grasses				
*bluebunch wheatgrass	AGSP	9	100	1-15
*pine bluegrass	POSC	5	100	3-10
*cheatgrass	BRTE	2	75	0-3
Forbs				
lupines	LUCA, LUSE	7	75	0-10
yarrow	ACMIL	4	100	1-10
Surface Features				
rock/gravel		14	100	3-25
bare ground		8	75	0-20
moss/lichen		1	50	0-1
litter		71	100	40-95

* Principal Indicator Species

Stand Characteristics and Productivity

		All Stands n = 5
Herbage production (lbs./acre dry wt.)		
bluebunch wheatgrass	range and mean	10-140(40)
Total	range and mean	20-240(90)
Average stand diameter/CI*		12.0/7.0
Number of trees per acre greater than 4 in dbh/CI		92/39
Total basal area/CI		78/28
Mean Age/GBA by species		
PIPO		125/75

Productivity estimates

	No. of Plots Sampled	Site Index ** Mean	Site Index ** CI	GBA Mean	GBA CI	Productivity Index *** Mean	Productivity Index *** CI
PIPO	5	75	4	75	22	25	9

* CI = 95% confidence interval, mean plus or minus this value
** Site Index Base 100, Base 50 ()
*** SI Base 100 X GBA x .004

Climax ponderosa pine stands with the drought-tolerant bluebunch wheatgrass (AGSP) are very uncommon in the Wallowa-Snake Province. The type most frequently occurs as an ecotonal fringe adjacent to more moist, and more extensive sites supporting PIPO/FEID or PSME/SYAL communities. Commonly the vegetation on southerly exposures of mid-canyon slopes trends from bunchgrass to Douglas-fir domination without a distinct ponderosa pine climax zone. Usually PIPO/AGSP requires a drier substrate than that common to the Wallowa-Snake.

Vegetative Composition - The PIPO/AGSP community is very dry with trees occurring in a savannah over bluebunch wheatgrass-dominated steppe. Ponderosa pine totally dominates as the only tree species able to persist in the PIPO/AGSP type. Shrubs are absent except for occasional dry-site opportunists (serviceberry, mountain-mahogany, squaw currant). Bluebunch wheatgrass and pine bluegrass (POSC) dominate the understory with cheatgrass usually associated in areas where ungulates have churned the soil beneath the old-growth trees. Idaho fescue is absent as it is unable to persist on these drier sites. Yarrow and lupines are the only common forbs regularly associated.

Distribution and Environment - Communities in the PIPO/AGSP plant association occur sporadically across the Wallowa-Snake Province and often indicate the limits of tree growth on south-facing slopes. Individual stands are typically small and often made up of scattered individuals within more extensive bunchgrass slopes. Continuous stands are more common on the southern flank of the Wallowas, although even there, most communities occur as tree-bunchgrass mosaics. Elevations range from 3,200 to 4,700 feet (mean: 3,800 feet); the largest range of all communities in the ponderosa pine series. Communities occur only on steep (range 15-45%, mean 53%), mostly convex, south-facing slopes and are among the hottest and driest sites supporting forest types.

Soils - Soils are typically dark reddish brown to dark brown in color in surface layers, less than 20 inches in depth, and formed from loess, basalt colluvium, and bedrock. Surface layers are thin and have sandy loam or loamy sand textures with greater than 35% rock fragments by volume. Subsoils are also thin, but may extend into bedrock fractures. Textures are sandy loam with sand and rock fragments often as high as 65% by volume. Rocks in surface layers are predominantly gravel-sized and cobble and stone-sized in subsoils. Surface rock usually exceeds 15% cover.

Few soils were sampled in this type. Variability in characteristics has not been determined. Deeper soils with clayey subsoils supporting PIPO/FEID communities may form complexes in undulating topography.

Successional Relationship - The PIPO/AGSP type is the most xeric of all forested plant associations. It is only present on southerly slopes. The substrates are either granitic- or basaltic-derived soils that are stonier and lacking loess influence than those found in PIPO/FEID communities. The loessal soils of the Columbia River basaltic plateau coupled with a regional climate that is generally moist and cool in comparison to climates of more southerly latitudes nearer the Great Basin has provided ponderosa pine with Douglas-fir in forested communities instead of more xeric climax ponderosa pine communities. Idaho fescue, beneath pine or in the steppe communities, is usually adjacent to the PIPO/AGSP stands. PIPO/AGSP communities have less moss/lichen surface cover, more bare ground, and three times greater surface rock/gravel coverage than PIPO/FEID stands.

Management Considerations - The severity of the site, limited occurrence of this type in the Province, and probable regeneration difficulties make these communities unsuited as commercial timber lands. Ponderosa pine is the only natural tree species capable of growing on these sites. An uneven-aged management strategy with removal designed to release future crop trees, yet promote a diversity for wildlife and range purposes, is recommended. Resource values other than timber management should dictate use in the PIPO/AGSP stands of the Wallowa-Snake.

Wild game and domestic livestock use is often very high on some benchland sites, but the predominant steep slopes of this type often limit heavy use. The southerly, steep slopes usually are first to become available in early spring for big game animals. Concentration beneath the limby, open-growing pines is common. Resultant disturbance from trampling by the animals where soils are saturated is common, reducing forage production and accelerating surface soil erosion. Mule deer, and elk to a lesser extent, make high use of the PIPO/AGSP communities.

Role of Fire - Stocking of ponderosa pine can be influenced by fire intensity. The role of fire in this type can help maintain grasslands by periodic burning of ponderosa pine seedlings, or thinning dense stands of regeneration, and helping to prepare seedbeds for pine establishment. Periodic fire also helps rejuvenate grasses, but may result in increased forb composition. The grass-forb diversity may be desirable for the wildlife and range manager. Bluebunch wheatgrass is more resistant to a burn than is Idaho fescue and should respond more favorably. Fires may be less capable of carrying uniformly through the often discontinuous understory vegetative layer.

Stand Structure and Productivity - Stands are usually very open and often multi-aged reflecting the difficulty in establishment and maintenance of trees on these harsh sites. Stocking seldom exceeds 100 sq. feet/acre except where trees are clumped around favorable microsites. Tree site index and growth basal area are the lowest of all forest types in the Province. Volume growth is less than one-third of that estimated for ponderosa pine in the average stand of all types in which it occurs.

Comparison with Other Investigators - The PIPO/AGSP habitat type was described in eastern Washington by Daubenmire (1968); in the Blue Mountains of Oregon by Hall (1973); in west-central Montana by Pfister (1977); in central Idaho by Steele (1981); and in northern Idaho by Cooper, Neiman, and Steele (1985).

Ponderosa pine/bitterbrush/bluebunch wheatgrass plant community type
Pinus ponderosa/Purshia tridentata/Agropyron spicatum (PIPO/PUTR/AGSP) (CPS2 31) (n = 1)

Bitterbrush is a minor species with very limited occurrence in the Wallowa-Snake Province. A bitterbrush/bluebunch wheatgrass plant association was defined with communities occurring below 1,500 feet (mean: 3,600 feet) along the southern flank of the Wallowas east of Eagle Creek. Ponderosa pine/ bitterbrush/bluebunch wheatgrass communities occur as a forest-steppe transition in this area between the bitterbrush, big sagebrush steppe and more mesic forested communities (i.e., PSME/SPBE, PSME/SYAL). These communities often have only scattered bitterbrush owing to the demands placed on them by deer in winter range. Some slopes in lower Eagle Creek are so impacted by deer, elk, and domestic livestock that bitterbrush, bluebunch wheatgrass, pine bluegrass, and other vegetation are almost depleted on these steep, south-facing slopes.

Plant communities dominated by climax ponderosa pine over bitterbrush and bunchgrasses (FEID, AGSP) are more commonly found in central Oregon (Volland, 1979) and the southern Blue Mountains (Hall, 1973).