

Wheeler Ridge, LLC
Forest
Stewardship Management Plan



2015

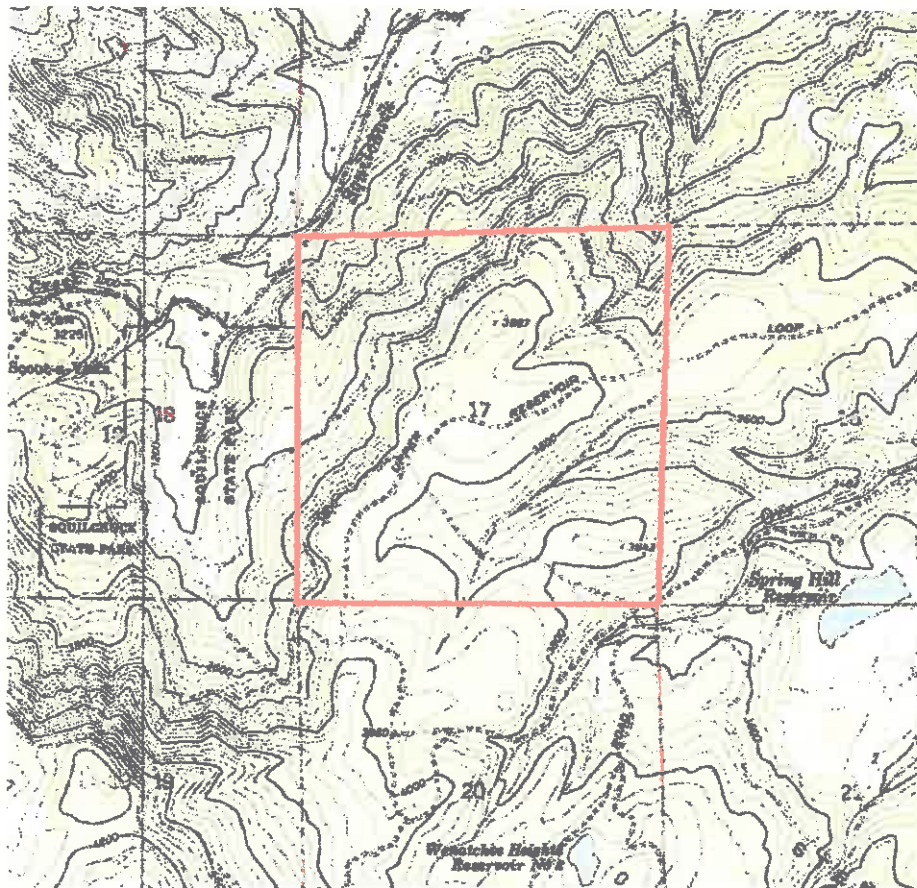
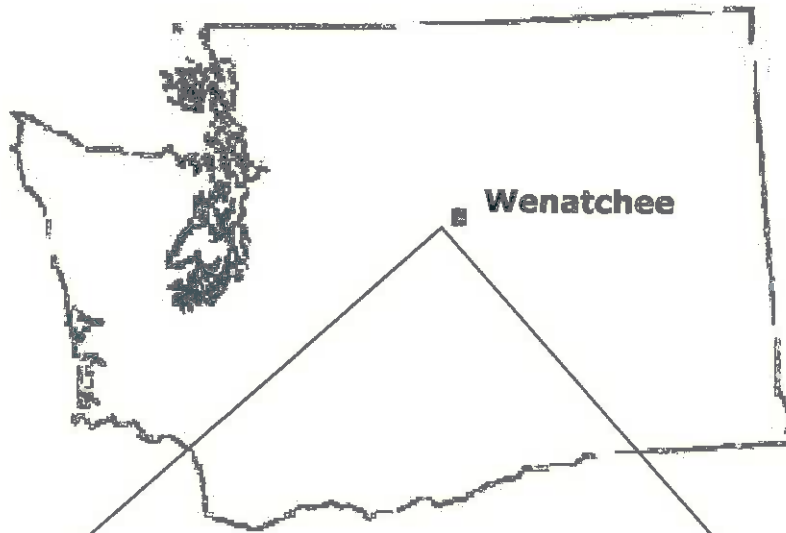


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APPENDIX:

"How Much Fertilizer in Slash?" by Chris Schnepf
Managing for Deer and Elk on Small Woodlands

FOREST STEWARDSHIP PLAN

Landowner

Wheeler Ridge, LLC
4597 Stemilt Hill Rd.
Wenatchee, WA 98801

Property Location

This property (sect. 17) is on Wheeler Hill, approximately 10 miles south of Wenatchee, WA in Chelan County, on the Kyle Mathison Amigos Rd.

Parcel #212017000000 640 acres


Plan Prepared By

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Richard Schellhaas

 10-16-15
Date

Description of Landowners Objectives

The intentions for this property are to manage for and maintain a healthy, sustainable forest with reduced risk from catastrophic fire and enhancement of habitat for wildlife as well as the production of commercial wood products. Approximately 277 acres may possibly be converted to cherry orchard.

Management Objectives

- A. Promote and maintain a healthy forest
- B. Lower risks from fire, insects and disease
- C. Maintain and encourage a tree species mix favoring seral species (ponderosa pine, western larch)
- D. Thin the stand "from below" leaving the largest, best-crowned trees
- E. Enhance wildlife habitat
- F. Ensure full stocking by reforesting non-stocked areas
- G. Recreational opportunities

Introductory Overview of the Property

This recent ownership has a variety of forested and open land types of different aspects, elevations and percent slopes with very scenic viewpoints draining into Squilchuck Creek at the northwest corner and Stemilt Creek and Orr Creek to the southeast. Approximately half of the area is on flat to gentle slopes along and south of Wheeler Ridge. This is the potential orchard land and is a combination of both commercial and non-commercial forest land. The remaining land northwest and northeast below Wheeler Ridge are steeper slopes (>50%) also with both commercial and non-commercial acres. All but the very steep slopes have been logged. There are numerous spur roads and skid trails.

Overall, approximately 80% of the area is forested with both single and multi-layered stands of both single and mixed species composition. The general overstory layers are approximately 100 years old with some regeneration becoming established following the last commercial entry. The radial growth rates have slowed to >15 ring per inch. There is mistletoe in both Douglas-fir and ponderosa pine overstories which is a threat to the young understory layer.

Size - 640 acres

Aspect - All aspects

Elevation - 2700' to 3800'

Slope - 0 - 70%

Plant Association - PSME (Douglas-fir)/SYAL (snowberry) & PIPO (ponderosa pine)/PUTR (bitter brush)/AGSP (blue bunch wheatgrass) (Lillybridge, et al 1995)

Site Class - III, IV & V

Site Index - 81' - 100', 61' - 80' & <60' (100 yr)

Tree Species - Ponderosa pine, Douglas-fir, western larch, grand fir

Stand structure - Single and multi-layered

Age class - Overstory 75 - 115 years old, understory 20 - 30 years old

Stocking level - 50 to >750 trees per acre.

Diseases - Douglas-fir and ponderosa pine dwarf mistletoe

Insects - Mountain and western pine beetles.

Water - Numerous "N" non- fish streams

Grazing - None

Past Management Activities

This property was previously owned by Washington State. Tree ring analysis shows there has been two major logging entries, one about 1932 and again in about 1996. Both of these entries have removed most of the large ponderosa pine.

This picture shows stumps of the early logging on the left and more recent logging in the center and right.



Description of Adjacent Properties

Parcels to the north are privately owned. Washington State owns the property to the east, south and west (Squilchuck State Park). The northwest corner is also privately owned. The state parcels to the east and south were commercially thinned along with this section in 1996. Squilchuck State Park has had no management and is grossly overstocked. The private lands are a mix of managed and non-managed areas.



Resource Descriptions and Management Practices

Category I: Forest Health, Wildfire, Invasive species

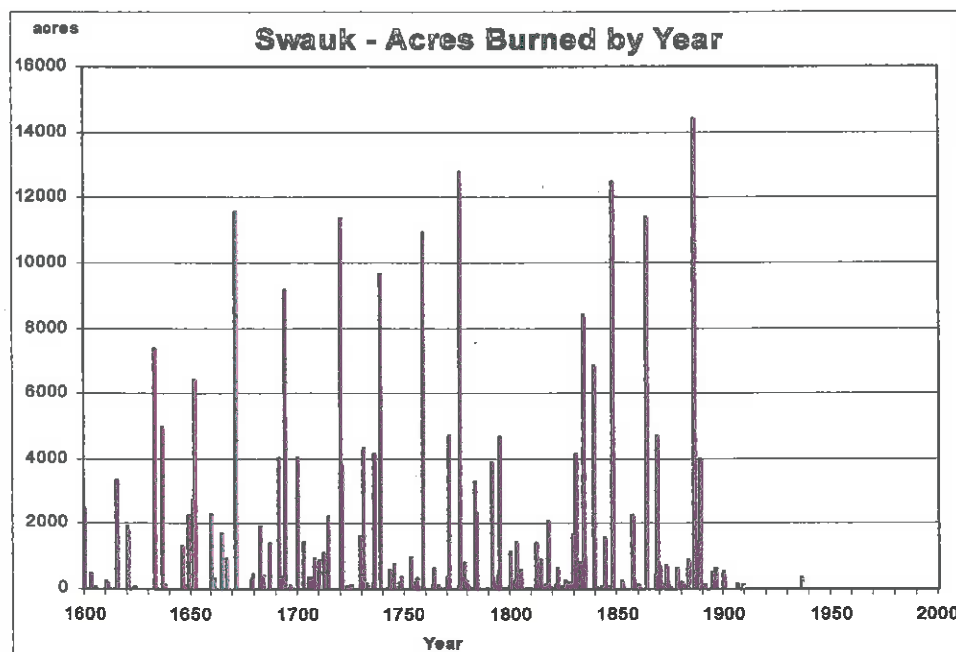
Resource conditions

Since fire suppression began around 1900, eastern Washington forests have been dramatically altered. Both stocking levels and species composition have changed (Everett et al 1996) with trees in this plant series increasing in density by 422% (Everett et al 2007). This increase in tree density has favored climax species. Western larch is one of several seral species and the only one to decline by 48% in these plant associations (Ohlson, Schellhaas 2001).

The change in species composition has created a forest health problem, putting these stands at risk to both insects and diseases that are attracted to low-vigor, stressed trees (Flanagan 1998). In turn there is an increase in both live and dead fuels, predisposing these sites to stand replacement fires (Agee 1993, Agee 1994, Schellhaas et al 2000). Forests like these along with others in Eastern Washington are no longer in sync with the inherent historical fire regimes (Everett et al 1996, 2000).

This stand and similar sites were once dominated by mature western larch and ponderosa pine and were maintained by frequent low to mixed severity fires every 5 – 12 years (Schellhaas et al 2002). Fire scars on remnant snags and stumps on these properties show the same fire pattern. Short fire frequencies suggest that these forests were historically dominated by species tolerant of fire such as western larch and ponderosa pine. Even low severity fires would often kill tree species that were more sensitive to fire (Schellhaas et al 2002).

The following graph shows fires which burned in Swauk Pass, where both low and mixed severity fires occurred, from 1600 to present. This shows an average fire free interval of 6.2 years.



Note the dramatic decrease in the number and sizes of fires after 1900 (fire suppression era). This is the trend for most Eastern Washington forests (Schellhaas 2007).

The following is a list of the most common major insects and diseases in eastern Washington forests for Douglas fir, ponderosa pine, western larch (Goheen, Willhite, 2006). Overstocked, weakened, unhealthy stands are prime targets for any of these insects or diseases. The ensuing dead or diseased stands subsequently become extreme fire risks. There are large patches of ponderosa pine and Douglas-fir dwarf mistletoe on this property.

Douglas fir is host to:

1. *Dendroctonus pseudotsugae* – Douglas fir beetle
2. *Scolytus unispinosus* – Douglas fir engraver
3. *Pseudohylesinus nebulosus* – Douglas fir pole beetle
4. *Choristoneura occidentalis* – western spruce budworm
5. *Orgyia pseudotsugata* – Douglas fir tussock moth
6. *Arceuthobium douglasii* – dwarf mistletoe
7. *Phellinus weirii* – laminated root rot
8. *Armillaria ostoyae* – armillaria root disease
9. *Heterobasidion annosum* – annosus root disease

Ponderosa pine are host to:

1. *Dendroctonus brevicornis* – western pine beetle
2. *Dendroctonus ponderosae* – mountain pine beetle
3. *Ips* spp – Ips bark beetle
4. *Arceuthobium campylopodum* – dwarf mistletoe
5. *Armillaria ostoyae* – armillaria root disease
6. *Heterobasidion annosum* – annosus root disease
7. *Cronartium comandrae* – comandra blister rust

Western larch is host to:

1. *Arceuthobium laricis* – dwarf mistletoe
2. *Hypodermella laricis* – larch needle blight
3. *Meria laricis* – larch needle cast
4. *Coleophora laricella* – larch casebearer

Management practices

Avoid mechanical injury to the trees boles during commercial thinning. This will help protect these trees from windborne spores that can cause butt and stem rot. Avoid concentrating green pine slash from February to July to reduce the chance of Ips bark beetle outbreak.

To protect these resources and neighboring properties it is recommended that the overstocked stands be commercially and non-commercially thinned and pruned (Barrett 1968, Barrett 1983, Cochran et al 1994). Thin the understory on a 12' to 16' spacing (300 – 170 trees per acre) and the overstory on a 25' to 30' spacing (70 – 50 trees per acre) leaving the largest, best crowned trees, favoring fire tolerant seral species (western larch and ponderosa pine). Prune all large crop trees to a height of 17' (O'Hara et al 1995) and leave 50% of live crown on smaller trees. Machine and/or hand pile and burn, or mulch, all slash to protect this stand and adjacent properties. Burning should be scheduled for late fall or winter. These treatments will help ensure the sustainability and good health of this stand.

Following a commercial thin, pre-commercial thinning is recommended, preferring the largest, best crowned trees and favoring seral species will help ensure improved radial and crown growth and remove diseased trees. Maintaining crop tree radial growth rates at <15 rings/inch will ensure more vigorous, healthy trees which in turn will help resist insect and disease attacks (Hall 1983). Thinning the stand will improve growth and forest health and lower the fire risk. Removing a majority of the understory trees and pruning the crop trees will help ensure that fire will remain on the ground by eliminating most ladder fuels. Ground fires are less intense and consequently emit fewer smoke emissions, are less hazardous for fire fighters and not as costly to suppress. A shaded fuel break along roads will help ensure lower fire risks from recreational use and provide more effective fire control efforts.

Category II: Soils

Resource conditions

There are two soil series within these parcels, Stemilt silt loam, 0 to 25 percent slopes (StD), Stemilt silt loam and 25 to 45 percent slopes (StE) (NRCS soil survey). Below is a table of erosion potential for different management activities per soil type.

Activity or Hazard	StD	StE
Site degradation potential	Moderate	Severe
Fire damage potential	Moderate	Severe
Harvest equipment operability	Moderate	Moderate
Off-road, Off-trail	Moderate	Severe
Haul roads and log landings	Moderate	Severe

Management practices

Management of these stands will reduce the risk of hot fire that could damage the soil. This management plan provides protective measures to follow during management activities to avoid erosion. It will adhere to measures described by the Small Forest Landowner Checklist as well as the Road Maintenance and Abandonment Plan (RMAP) jointly when completed and approved as part of a future forest practice application. It is recommended that logging, or any use of heavy equipment, be done on dry soils or frozen ground.

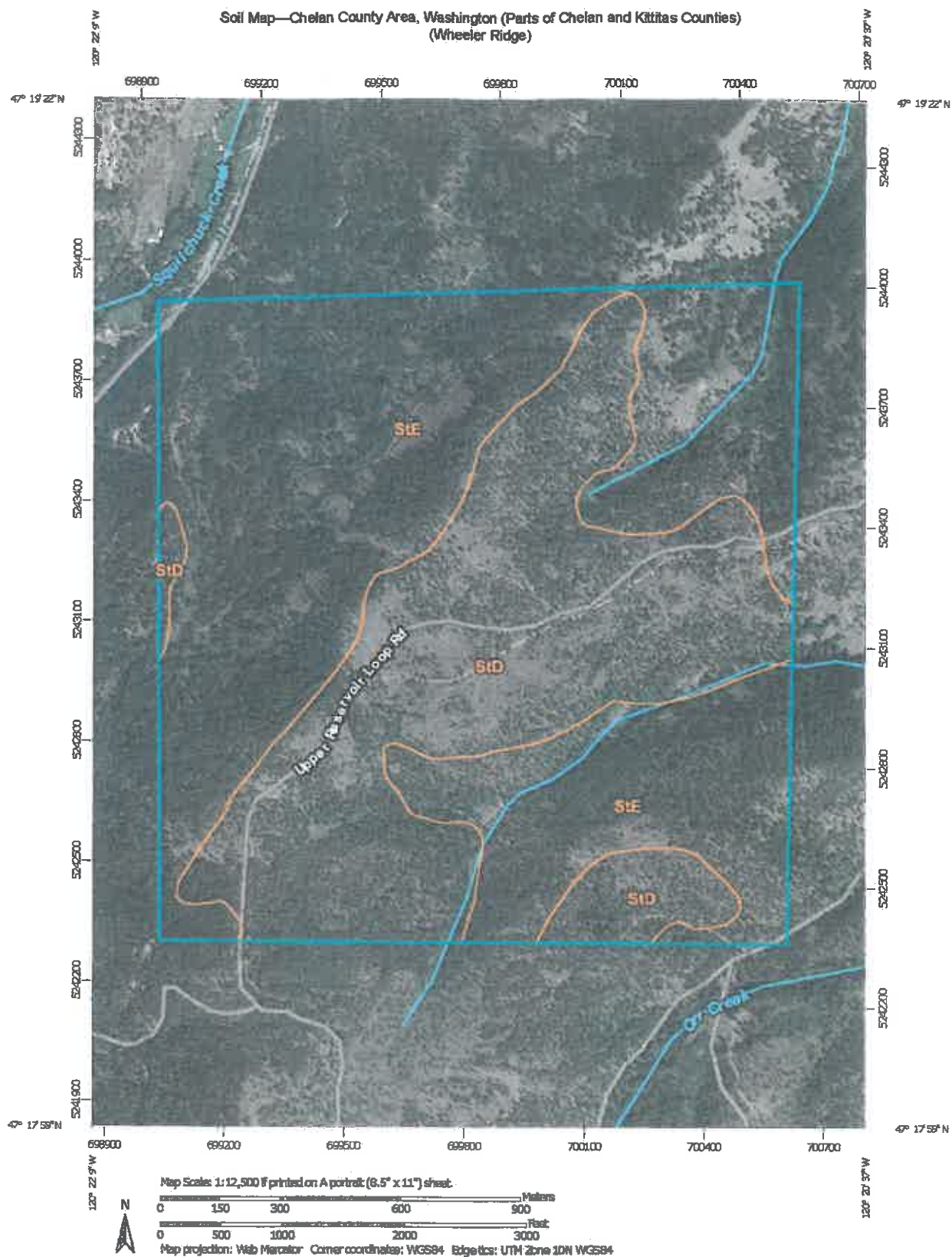
Leaving thinning and pruning slash on site for one year for nutrient recycling will add organic matter, nitrogen and potassium as well as trace nutrients to the soil. Soil organic matter works as a nitrogen reservoir, protects against erosion and makes the soil more porous for water uptake (Miller 1990, Sanchez 1998, Schnepf 2007). The landowner must weigh the risk of leaving slash on the site as a fire hazard versus nutrient loss from piling green slash. (See attached article "How Much Fertilizer in Slash" by Chris Schnepf in appendix.)

The brush and slash can be mulched or chipped and scattered immediately. If a mulching machine or chipper is used, the operator should avoid breaking up large logs. They will become a fire hazard. Also, the green slash should not be mixed into the soil. It should be left on the surface to avoid tying up nitrogen during decomposition (pers. comm. Chris Schnepf 12/6/07).

Once the management activities are complete, seed and cross drain skid trails. All other disturbed soils should also be reseeded with a native grass mix to stabilize the soil, reducing risk from erosion. This grass mix may also reduce the proliferation of invasive weed species.

Map Unit Legend

Chelan County Area, Washington (Parts of Chelan and Kittitas Counties) (WA607)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
StD	Stemilt silt loam, 0 to 25 percent slopes	259.6	40.5%
StE	Stemilt silt loam, 25 to 45 percent slopes	380.9	59.5%
Totals for Area of Interest		640.5	100.0%

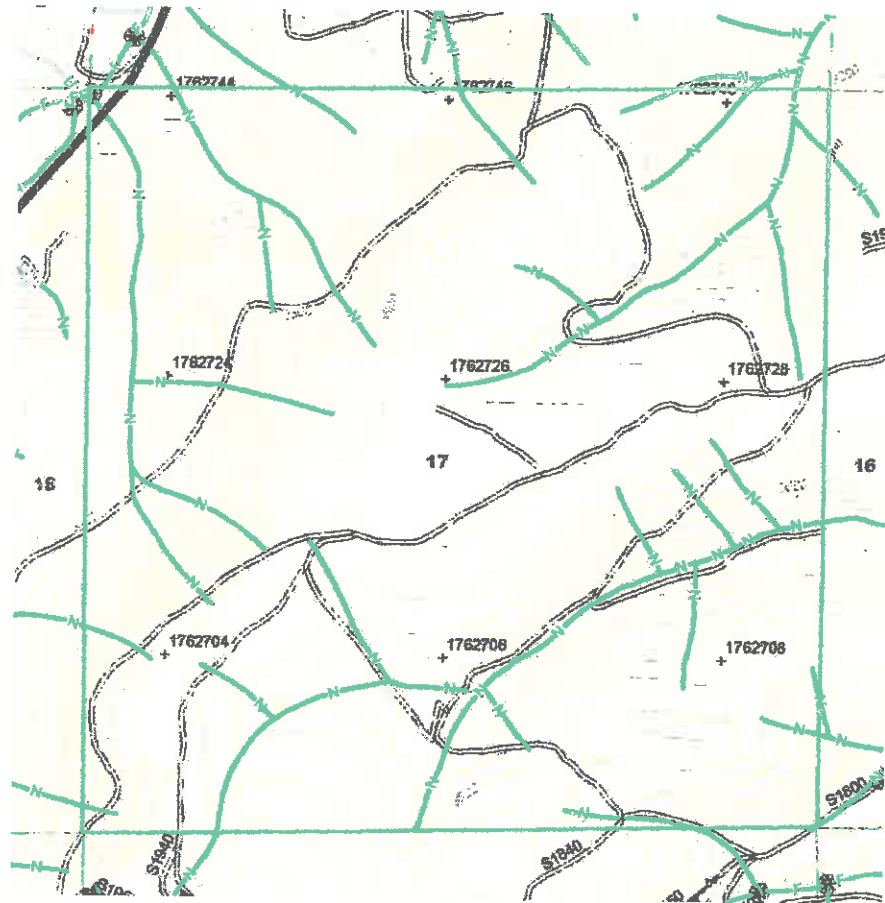


Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

8/20/2015
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Category III: Water, Riparian, Wetland, Fish



Resource conditions

This DNR water type map shows many "N" (non-fish) streams (in green). Streams on the north side of the main ridge flow into Squilchuck Creek and streams to the south flow into Orr Creek. These water types will have to be verified and/or changed prior to any commercial entries.

Management practices

Thinning and pruning the forest should reduce fire risk. A stand replacement fire could cause upland soil erosion, mud slides and sedimentation into Squilchuck Creek.

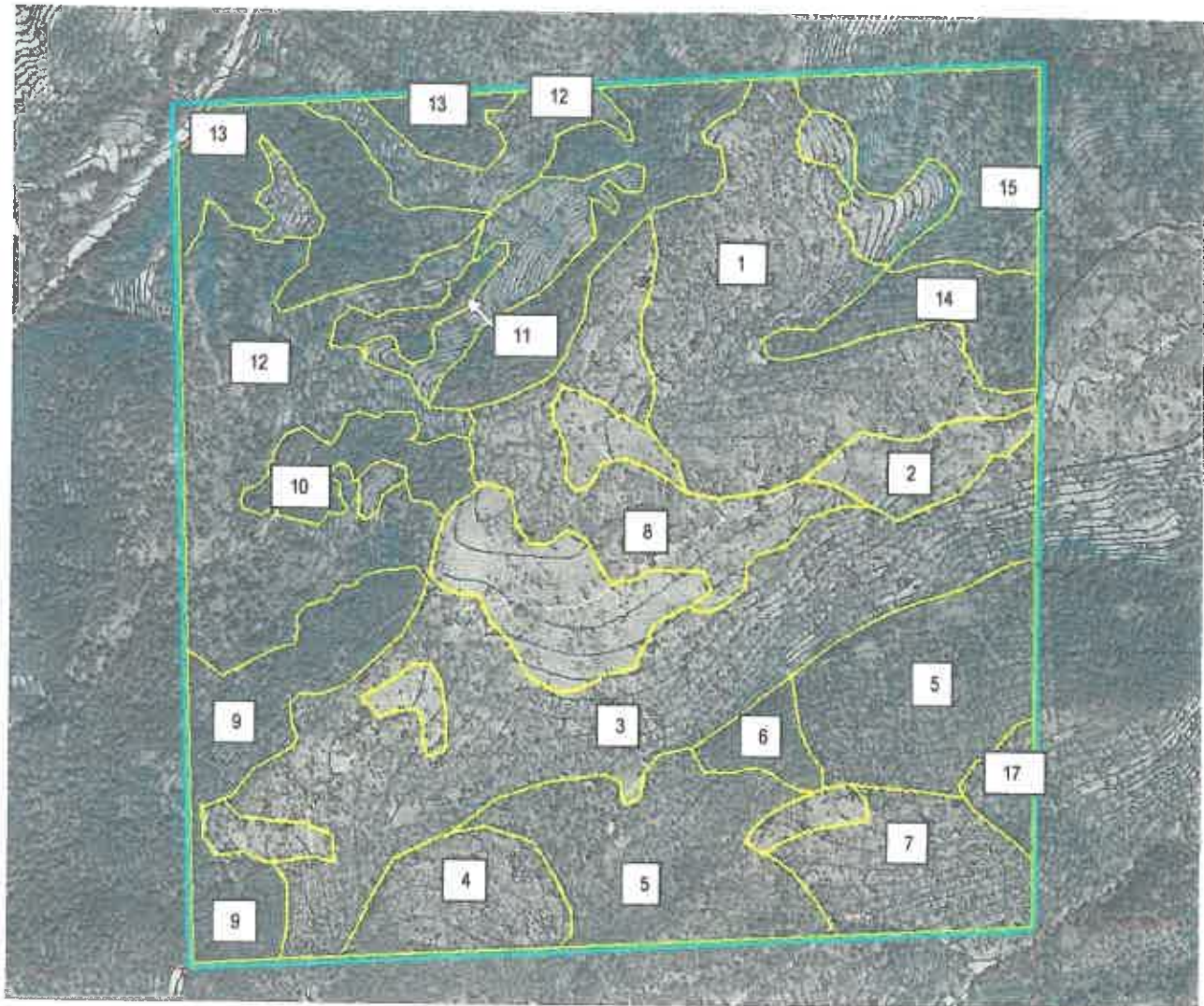
Riparian buffer zone requirements will be determined once the N streams have been accurately verified with a water modification field review. If any of these draws are determined to be seasonal streams, they would require a 30 foot equipment limitation zone. Perennial non-fish streams require a 50' buffer (WAC-222-30-022, p 30-23).

Historically, riparian areas burned on a frequency about half as often as the adjacent side slopes, but burned more severely (Agee 1994, Everett et al 2003). It would be a major loss to lose this valuable resource to fire.

Eastern Washington riparian management zones are intended to provide stand conditions that vary over time. They are designed to mimic eastside disturbance regimes within a range of functional conditions and maintain general forest health (WAC-222-30-0222, pg 30-17).

Category IV: Timber and Wood Products

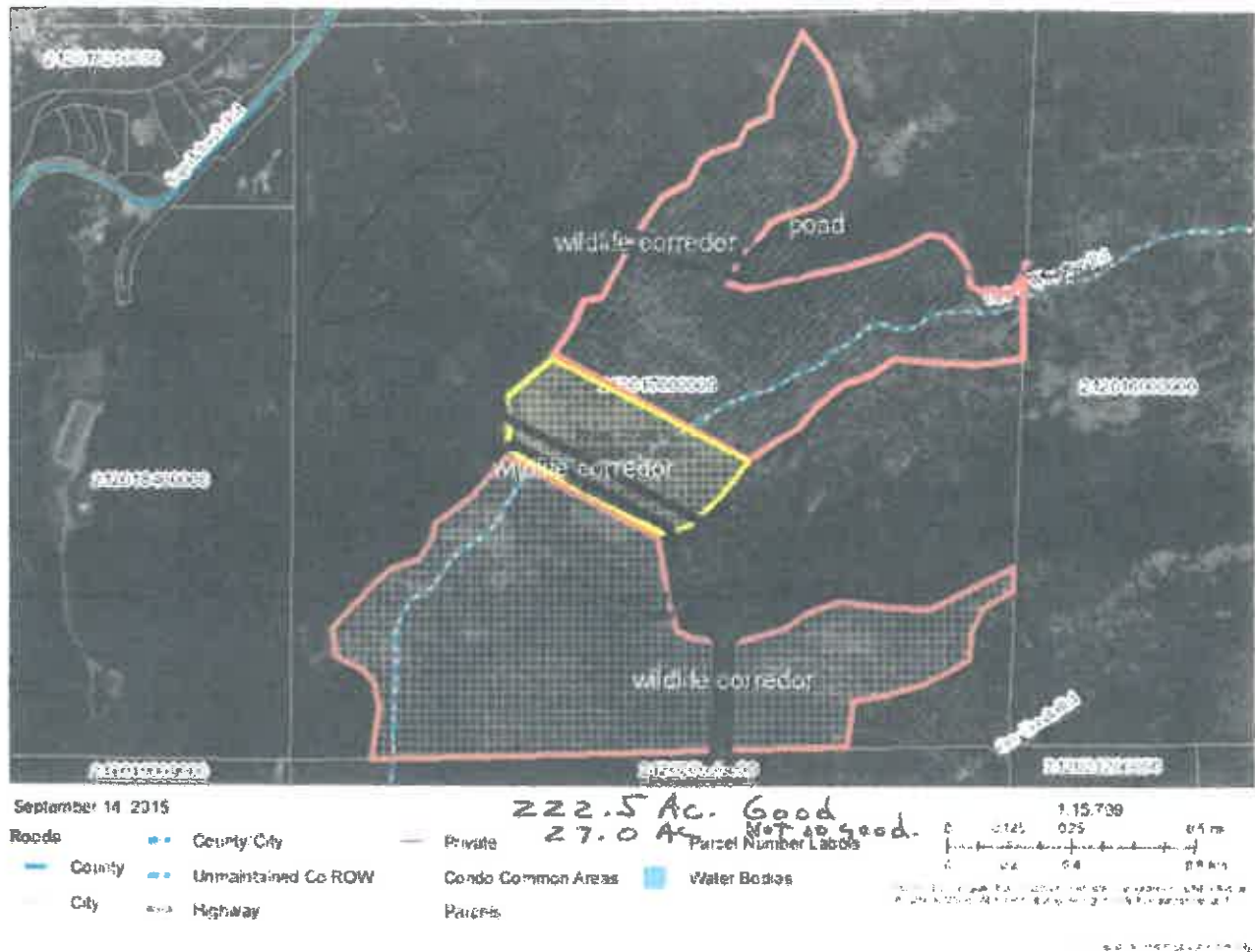
In July of 2015 stand data was collected from 62 1/20th acre systematic and random sample plots to determine stocking levels (trees per acre) by species, size class, heights and basal area. Current radial growth rates, ages, plant associations, insect and disease problems were identified. Site class and 100 year site index were determined by measuring total tree heights and age of dominant trees.



Blue lines are property boundaries. Yellow lines are approximate stand boundaries

A few remnant older trees of 180 & 300 years old are scattered across the landscape. Radial growth on the crop trees following the 1996 commercial thinning has slowed to over 25 rings per inch, putting these trees at risk for insect and disease attacks. Healthy trees should be growing at less than 15 rings per inch. All stands were logged in both 1932 and 1996 except stand 13.

Chelan County GIS map

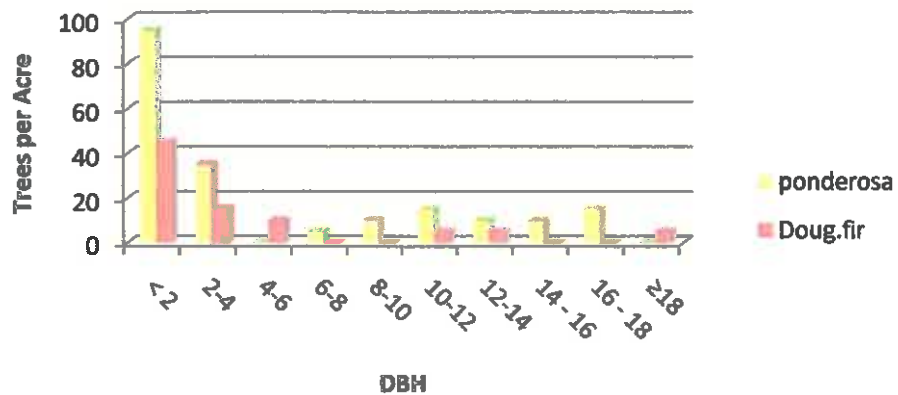


Stands 1, 2, 4, 8, & part of 3 & 5 may be converted to orchard land. This would entail clear cutting the marked areas and replanting to orchard. Wildlife corridors will be left uncultured to provide cover for wildlife movement across the planted area. Corridors shown above are estimated and final placement will be confirmed by wildlife biologist John Lehmkuhl.

Irrigated orchard land would act as an effective fuel break along the flat ridge line.

Stand Type 1
67 acres

Stand Type 1 Current Trees Per Acre



DBH	ponderosa	Doug.fir	Larch	Total
< 2	95	45	0	140
2-4	35	15	0	50
4-6	0	10	0	10
6-8	5	0	0	5
8-10	10	0	0	10
10-12	15	5	0	20
12-14	10	5	0	15
14 - 16	10	0	0	10
16 - 18	15	0	0	15
≥18	0	5	0	5
Total	195	85	0	280



Land Grade 6, Operability class 3
(Chelan County Assessor forest land classification for tax purposes)

Resource conditions

Stand 1 is on the flatter broad main ridge line of Wheeler Ridge on site class IV land with a site index of 61' to 80' tall trees (100 yrs) – a moderate growing site. As a result of the 1996 commercial thinning the current stand consists of 280 trees per acre (TPA) with 205 TPA less than 8" diameter at breast height (DBH) and 75 TPA greater than 8" DBH with a basal area of 100 square feet per acre.

Ponderosa pine is the dominant species at 70% with 30% Douglas-fir. A very small component of western larch is present as well. There is a good understory layer of sapling size <2" DBH and small pole size trees in the 2" – 6" DBH class of both species.

The radial growth on overstory crop trees has slowed to more than 25 rings per inch (RPI), putting these trees at risk to insect and disease attacks. The overstory has dwarf mistletoe in both main species, which will spread to the younger understory (note proximity of young Douglas-fir to mistletoe broom in this picture).



Management practices

Commercially thin/shelterwood harvest the overstory layer. Leave the largest, best-crowned, healthiest trees on a 30 to 40 foot spacing (48 to 27 TPA). Maintain a basal area of 80 sq. feet/acre. Remove any Douglas-fir with dwarf mistletoe. If feasible, time commercial harvest to take advantage of higher timber prices to help offset post harvest management costs.

Follow the commercial thinning with a non-commercial thin in the younger understory saplings (1" – 5" DBH, 15' to 20' tall). Thin these sapling patches on a 16' average spacing (170 TPA). Leave the largest, healthiest trees and prefer younger ponderosa pine and larch when available. Do not thin on a grid but rather on an average leaving some of the best trees closer or clumped (variable spacing) to increase heterogeneity across the landscape.

Also thin out the non-merchantable larger (>8") ponderosa pine trees that have short (poor) crowns, crooked or damaged boles (trunks) that will not make a commercial log. A few non-commercial larger trees can be left for wildlife use if they are conducive to nests.

Prune the overstory trees up to 16' and prune the saplings, leaving at least 50% of the live crown. Remove live and dead brush that may pose a threat as ladder fuels to the leave tree crowns. This broad ridge is ideal for a "shaded fuel break".

Slash from the non-commercial thinning, pruning and brush removal should be hand piled/burned on snow, or machine mulched (See attached article "How Much Fertilizer in Slash" by Chris Schnepf in appendix), or use "lop and scatter".

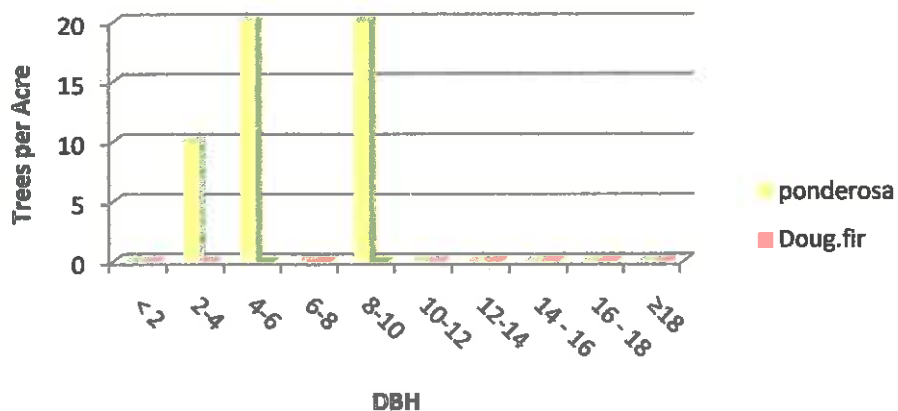
Apply for post harvest cost share contracts with DNR (Dept. of Natural Resources) or NRCS (Natural Resource Conservation Service) to help accomplish the post harvest goals.

Both thinnings should improve overall growth rates (height & diameter) and improve forest health. The goal is to have leave trees growing at about 10 rings per inch favoring healthy trees with good crowns and straight boles.

This stand may eventually be converted to orchard land. If not, reforest under-stocked areas with both ponderosa pine and western larch seedlings. Use 1-1 or 2-0 planting stock on a 14' x 14' average spacing (220 TPA)

Stand Type 2
12 acres

Stand Type 2 Current Trees Per Acre



DBH	ponderosa	Doug.fir	Larch	Total
< 2	0	0	0	0
2-4	10	0	0	10
4-6	20	0	0	20
6-8	0	0	0	0
8-10	20	0	0	20
10-12	0	0	0	0
12-14	0	0	0	0
14 – 16	0	0	0	0
16 – 18	0	0	0	0
≥18	0	0	0	0
Total	50	0	0	50



Land Grade 8

Resource conditions

Stand 2 is on a southerly slope below Stand 1 with only 50 TPA – all less than 9" DBH with heavy infestation of ponderosa pine mistletoe.

Dwarf mistletoe is an obligate parasite that forces the tree to pool its nutrient at the site of the parasite. This nutrient pooling creates large "brooms" on Douglas-fir, overgrown limbs on ponderosa pine, and in western larch the overgrowth breaks off weak limbs leaving small crowns. The parasite is spread by seeds. When the seeds ripen, they are under a great deal of water pressure so that when the pods burst, they shoot seeds up to 50 feet away. This puts the new seedlings and other surrounding trees of the same species at risk.



This is a very hot, dry site that is marginal to non-commercial for timber production. The trees are very short with a bitterbrush understory. A few larger trees were cut out of this site in the last logging entry.

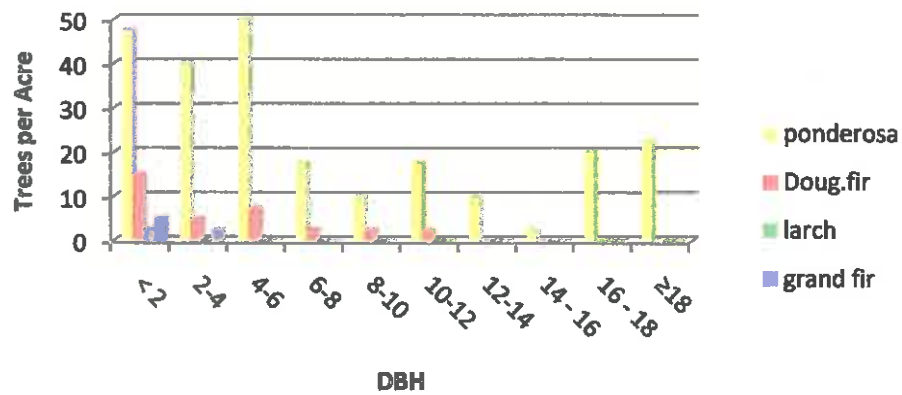
Management practices

Prune out the mistletoe and prune up limbs to allow an 8' ground clearance to reduce wildfire spread. Remove any brush that will act as ladder fuel.

This stand may eventually be converted to orchard land.

Stand Type 3 95 acres

Stand Type 3 Current Trees Per Acre



DBH	ponderosa	Doug.fir	larch	grand fir	Total
<2	48	15	3	5	71
2-4	40	5	0	3	48
4-6	50	8	0	0	58
6-8	18	3	0	0	21
8-10	10	3	0	0	13
10-12	18	3	0	0	21
12-14	10	0	0	0	10
14 - 16	3	0	0	0	3
16 - 18	20	0	0	0	20
≥18	23	0	0	0	23
Total	240	37	3	8	288



Land Grade 6, Operability class 3

Resource conditions

Stand 3 is along the south aspect of Wheeler Ridge with gentle (20%) to steeper (50%) slopes. This area drains into Orr Creek. It was commercially logged in the mid 1990's. The majority of this stand is Site Class IV and the Site index is 61' to 80' tall trees (100 yrs).

The current stand consists of an average 288 TPA with 198 < 8" DBH and 90 TPA > 8" DBH. Eighty three percent of the stand is ponderosa pine with 13% Douglas-fir, 3% grand fir and 1% western larch. This is a multi-layered, mixed species stand. There are patches of heavy mistletoe.

Management practices

Commercially thin/shelterwood harvest the overstory layer as in Stand 1. Leave the largest, best-crowned, healthiest trees on a 30 to 40 foot spacing (48 to 27 TPA). A 100' wide "shaded fuel break" should be created on the main ridge between Stands 3 and 9 (and possibly continue down to the road in Stand type 9). Maintain a basal area of 80 sq. feet/acre. Remove any Douglas-fir with dwarf mistletoe. If feasible, time commercial harvest to take advantage of higher timber prices to help offset post harvest management costs.

Follow the commercial thinning with a non-commercial thin in the younger understory saplings (1" – 5" DBH, 15' to 20' tall). Thin these sapling patches on a 16' average spacing (170 TPA). Leave the largest, healthiest trees and prefer younger ponderosa pine and larch when available. Remove grand fir. Do not thin on a grid but rather on an average leaving some of the best trees closer or clumped (variable spacing) to increase heterogeneity across the landscape.

Also thin out the non-merchantable larger (>8") ponderosa pine trees that have short (poor) crowns, crooked or damaged boles (trunks) that will not make a commercial log. A few non-commercial larger trees can be left for wildlife use if they are conducive to nests. Leave several of the broken snags and fallen logs for wildlife use.

Prune the overstory trees up to 16' and prune the saplings, leaving at least 50% of the live crown. Remove live and dead brush that may pose a threat as ladder fuels to the leave tree crowns.

Slash from the non-commercial thinning, pruning and brush removal should be hand piled/burned on snow, or machine mulched (See attached article "How Much Fertilizer in Slash" by Chris Schnepf in appendix), or use "lop and scatter".

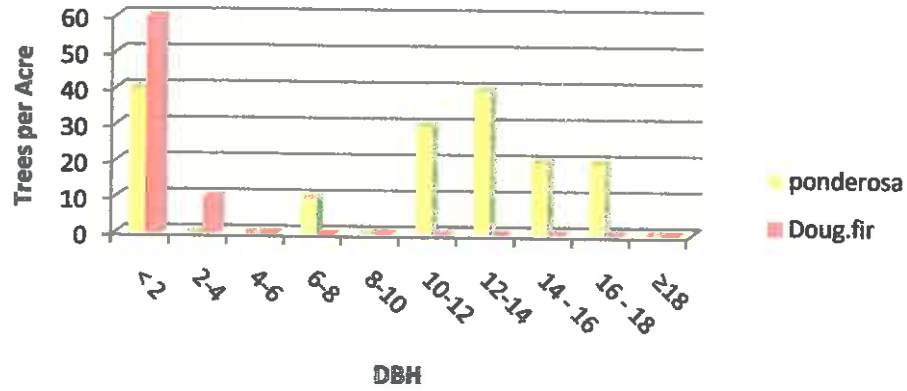
Apply for post harvest cost share contracts with DNR (Dept. of Natural Resources) or NRCS (Natural Resource Conservation Service) to help accomplish the post harvest goals.

Both thinnings should improve overall growth rates (height & diameter) and improve forest health. The goal is to have leave trees growing at about 10 rings per inch favoring healthy trees with good crowns and straight boles.

A portion of this stand may eventually be converted to orchard land. If not, reforest understocked areas with both ponderosa pine and western larch seedlings. Use 1-1 or 2-0 planting stock on a 14' x 14' average spacing (220 TPA)

Stand Type 4
18 acres

Stand Type 4 Current Trees Per Acre



DBH	ponderosa	Doug.fir	larch	Total
< 2	40	60	0	100
2-4	0	10	0	10
4-6	0	0	0	0
6-8	10	0	0	10
8-10	0	0	0	0
10-12	30	0	0	30
12-14	40	0	0	40
14 - 16	20	0	0	20
16 - 18	20	0	0	20
≥18	0	0	0	0
Total	160	70	0	230



Land grade 6, Operability class 3

Resource conditions

Stand 4 is a north aspect on very gentle slopes along the SW property line with an average of 230 TPA, 70% ponderosa pine and 30% Douglas-fir. There are 120 TPA < 8" DBH and 110 TPA > 8" DBH. Radial growth has slowed to >20 RPI.

There is not much woody debris in this stand and little sign of dwarf mistletoe. There are obvious signs of elk beds and browsing in this stand.



Fire scarred stumps and snags throughout this ownership indicate the historical fire regime was one of frequent low severity fires every 7 to 10 years. The old remnant stumps also show the historical scorch levels at much less than they are today. Research shows that there were probably only 40 to 100 trees per acre and dominated by ponderosa pine throughout most of eastern Washington.

Management practices

Commercially thin this stand on a 25 to 30' average spacing (70 – 48 TPA). Maintain a basal area of 60 to 80 square feet per acre.

Non-commercially thin the small diameter trees on a 16' to 20' spacing. Leave the largest, healthiest trees and prefer younger ponderosa pine and larch when available.

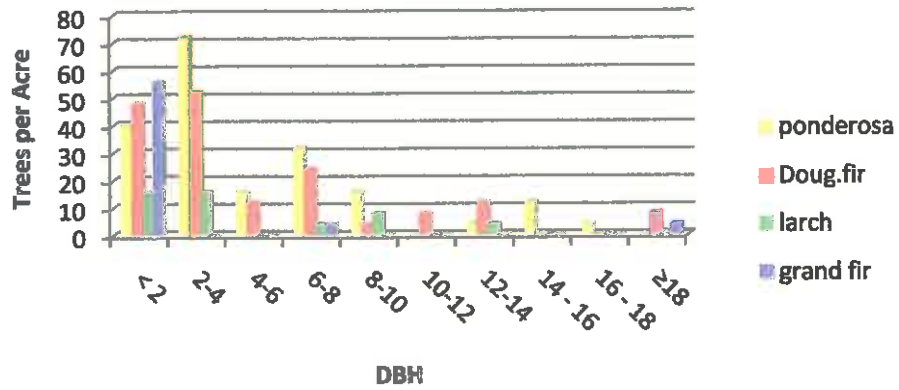
Prune the overstory trees up to 16' and prune the saplings, leaving at least 50% of the live crown. Remove live and dead brush that may pose a threat as ladder fuels to the leave tree crowns. Dispose of slash by machine mulching.

Leave several of the broken snags and fallen logs for wildlife use.

This nice stand may eventually be converted to orchard land.

Stand Type 5
70 acres

Stand Type 5 Current Trees Per Acre



DBH	ponderosa	Doug.fir	larch	grand fir	Total
< 2	40	48	16	56	160
2-4	72	52	16	0	140
4-6	16	12	0	0	28
6-8	32	24	4	4	64
8-10	16	4	8	0	28
10-12	0	8	0	0	8
12-14	4	12	4	0	20
14 - 16	12	0	0	0	12
16 - 18	4	0	0	0	4
≥18	0	8	0	4	12
Total	196	168	48	64	476



Land grade 6, Operability class 3

Resource conditions

Stand 5 is a mixed species, multi-layered forest with an average of 476 TPA. There is a good species mix with 41% ponderosa pine, 35% Douglas-fir, 10% western larch and 14% grand fir. The understory layer (2" – 4" DBH) of young seedlings and saplings has 300 TPA with a total of 392 TPA <8" DBH and 84 TPA >8" DBH. There are very dense patches of pole size trees, many with mistletoe.

The overstory layer is a result of the 1932 logging and is approximately 75 years old. Basal area is 80 – 120 square feet per acre.

The majority of this area is site class IV, but there are some site class III acres in the upper draw bottom.

Management practices

Maintain a basal area of 60 – 80 square feet per acre. Commercially thin the overstory ponderosa pine and Douglas-fir on a 30' spacing (48 TPA). Prefer western larch and ponderosa pine as leave trees. Remove Douglas-fir with mistletoe and grand fir.

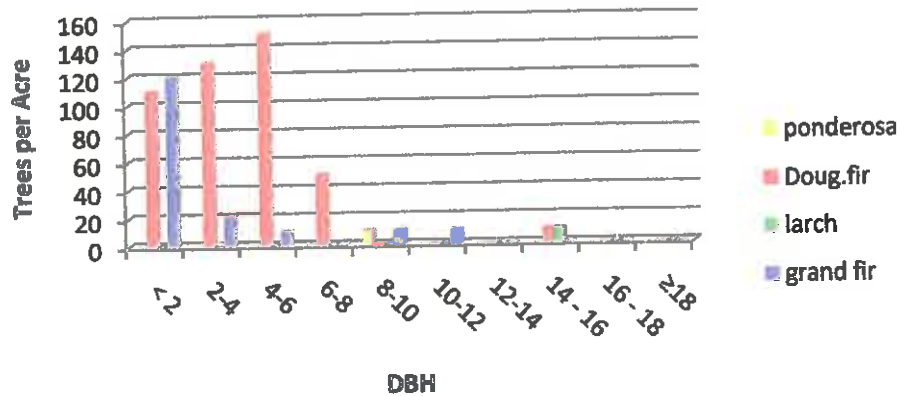
Follow up with non-commercial thin of the smaller diameter trees as described in Stand 1, again preferring any western larch and removing most grand fir.

A "shaded fuel break" should be constructed along the main ridge between Stands 5 & 7 by thinning on a 40' spacing, pruning and removing ladder fuels. Maintain this area to keep brush down and space open.

A portion of this stand may eventually be converted to orchard land.

Stand Type 6
8 acres

Stand Type 6 Current Trees Per Acre



DBH	ponderosa	Doug.fir	larch	grand fir	Total
< 2	0	110	0	120	230
2-4	0	130	0	20	150
4-6	0	150	0	10	160
6-8	0	50	0	0	50
8-10	10	0	0	10	20
10-12	0	0	0	10	10
12-14	0	0	0	0	0
14 - 16	0	10	10	0	20
16 - 18	0	0	0	0	0
≥18	0	0	0	0	0
Total	10	450	10	170	640



Land grade 6, Operability class 3

Resource conditions

A very dense, overstocked stand with 640 TPA, 590 PTA are <8" DBH with 70% Douglas-fir, 27% grand fir and only 1.5% each of ponderosa pine and western larch.

Most of these smaller diameter trees are suppressed, unhealthy trees rather than young, healthy regeneration. The Douglas-fir are heavily infested with dwarf mistletoe with poor crowns and growing at > 40 RPI; very stressed and unhealthy.

The stand has 90% crown cover limiting the amount of light reaching the forest floor which prevents ground vegetation from becoming established.

There are many dead and dying trees creating very heavy fuel loading which puts this stand at extreme wildfire risk.

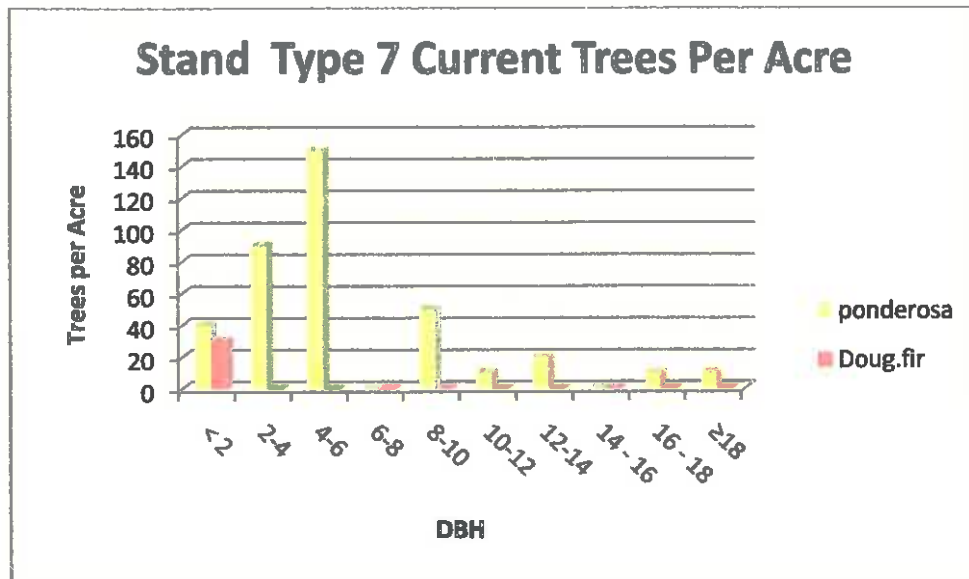
Elk beds and trails are evident in this stand.

Management practices

This stand has little to no commercial value and may be best used as wildlife habitat since it borders the main draw bottom and provides cover, shade and water access. The high fire risk could be offset by treating Stands 3 & 5 as prescribed.

If this stand is to be managed for timber production then it should be non-commercially thinned on a 20' spacing (100 TPA) leaving the largest, best crowned, healthiest trees. Prefer western larch, ponderosa pine and healthy Douglas-fir as crop trees. Remove the grand fir. This management will create a tremendous fuel load. The existing and created slash would need to be treated. Machine mulching is preferred.

Stand Type 7
24 acres



DBH	ponderosa	Doug.fir	Total
< 2	40	30	70
2-4	90	0	90
4-6	150	0	150
6-8	0	0	0
8-10	50	0	50
10-12	10	0	10
12-14	20	0	20
14 - 16	0	0	0
16 - 18	10	0	10
≥18	10	0	10
Total	380	30	410



Land grade 7, Operability class 3

Resource condition

Stand 7 is a dry south slope with Site class IV to Site class V areas. There are 410 TPA with 310 TPA <8" DBH and 100 TPA >8" DBH. Basal area is 100 square feet per acre. The stand is dominated by 93% ponderosa pines which are heavily infested with dwarf mistletoe. (Note the overgrown limb on this pine)



Management practices

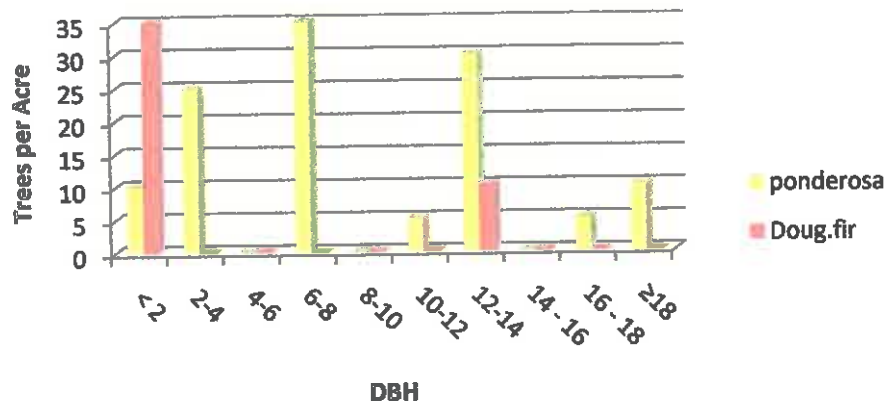
Non-commercially thin the understory trees less than 10" DBH on a 20' spacing. This will leave a stand of about 110 trees per acre with 40 larger trees per acre. Prune leave trees as previously described and dispose of slash. Leave a variety of snags, logs and a few slash piles for wildlife. Prune off as much mistletoe as possible and prefer clean trees as leave trees.

Use the main ridge between stands 5 & 7 as a "shaded fuel break".

In 20 to 30 years, commercially thin overstory on a 30' to 40' spacing (48 – 27 TPA) and reforest under-stocked areas with both ponderosa pine and western larch seedlings. Use 1-1 or 2-0 planting stock on a 14' x 14' average spacing (220 TPA). Concentrate western larch in the moister areas (Site class IV) of this stand.

Stand Type 8
39 acres

Stand Type 8 Current Trees Per Acre



DBH	ponderosa	Doug.fir	Total
< 2	10	35	45
2-4	25	0	25
4-6	0	0	0
6-8	35	0	35
8-10	0	0	0
10-12	5	0	5
12-14	30	10	40
14 - 16	0	0	0
16 - 18	5	0	5
≥18	10	0	10
Total	120	45	165



Land grade 7, Operability class 3

Resource conditions

Stand 8 is a marginal growing site made up of both Site class IV & V. Site class V is very poor with a Site index of <60' in height (100 yrs).

This area was also commercially logged in the mid 1990's leaving what amounts to a single layer of even aged trees with minimal young regeneration at an average of 165 TPA with 73% ponderosa pine and 27% Douglas-fir. There are 60 TPA >8" DBH and 105 TPA <8" DBH with a basal area of 40 to 100 square feet per acre. Radial growth has slowed to >20 RPI.

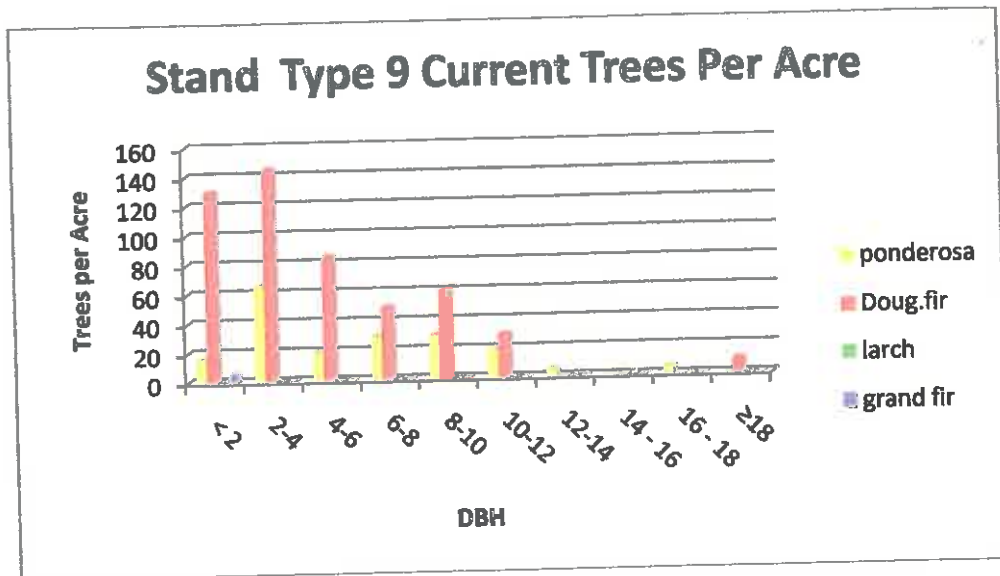
Management practices

Non-commercially thin the small diameter trees less than 8" DBH on a 20' spacing. Prune leave trees as previously described and dispose of slash. Leave a variety of snags, logs and a few slash piles for wildlife.

Continue the fuel break along this ridge as in Stand 1.

This stand may eventually be converted to orchard land.

Stand Type 9
34 acres



DBH	ponderosa	Doug.fir	larch	grand fir	Total
<2	15	130	0	5	150
2-4	65	145	0	0	210
4-6	20	85	0	0	105
6-8	30	50	0	0	80
8-10	30	60	0	0	90
10-12	20	30	0	0	50
12-14	5	0	0	0	5
14 - 16	0	0	0	0	0
16 - 18	5	0	0	0	5
≥18	0	10	0	0	10
Total	190	510	0	5	705



Land grade 6. Operability class 3

Resource conditions

This is a very dense, mistletoe infested, single layer, even aged stand with an average of 705 TPA – 72% Douglas-fir and only 27% ponderosa pine. There are 545 suppressed TPA <8" DBH and only 70 TPA >8" DBH. There are very heavy fuels. Tree radial growth is 35 RPI.

This stand is on a very steep (60%) slope bordering Squilchuck State Park property which appears to have the same stand type. Due to the steep slope, very overstocked trees and heavy fuels, this stand is at extreme fire risk and is in poor forest health.

Management practices

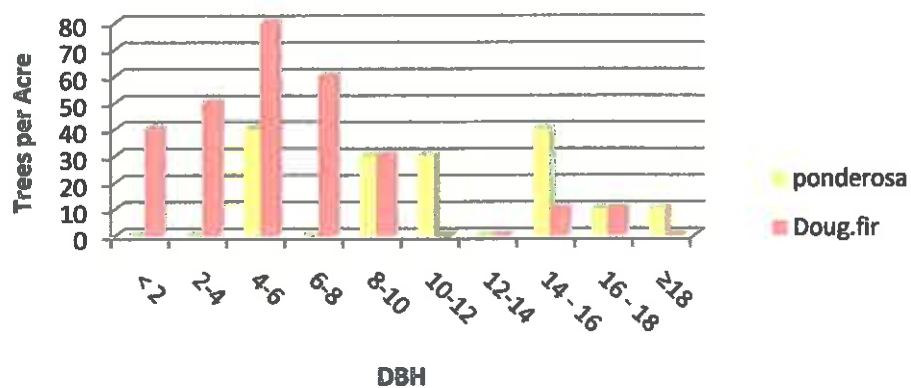
The strip between the road and ridge along Stand type 3 can be thinned as a continuation of the "shaded fuel break" leaving trees 30' to 40' (48 – 27 TPA) apart. Prune leave trees to 16' and remove brush that could act as ladder fuels. Maintain brush every few years to keep area open.

Non-commercially thin the small diameter trees below the road on a 20' to 30' spacing, removing as many mistletoe infested trees as possible. Leave ponderosa pine as preferred species. Prune and dispose of slash as previously described.

The steep slope and limited access here could make this very costly to treat. Applying for cost share funding could offset some of the expense.

Stand Type 10
16 acres

Stand Type 10 Current Trees Per Acre



DBH	ponderosa	Doug.fir	Total
< 2	0	40	40
2-4	0	50	50
4-6	40	80	120
6-8	0	60	60
8-10	30	30	60
10-12	30	0	30
12-14	0	0	0
14 - 16	40	10	50
16 - 18	10	10	20
≥18	10	0	10
Total	160	280	440



Land grade 6, Operability class 3

Resource conditions

Stand 10 is on the north side of Wheeler Ridge, draining into Squilchuck Creek. The upper area is on a steep (50%) slope with more gentle slopes below the road. There are blue painted trees left from the last logging entry.

The overstocked stand averages 440 TPA – 36% ponderosa pine and 64% Douglas-fir – with 270 TPA <8" DBH and 170 TPA >8" DBH. Basal area is 260 square feet per acre.

There is less mistletoe in this stand with a very nice crop tree selection of both species.

Management practices

Commercially thin/shelterwood harvest the overstory layer. Leave the largest, best-crowned, healthiest trees on a 30 to 40 foot spacing (48 to 27 TPA). Maintain a basal area of 80 sq. feet/acre. Remove any Douglas-fir with dwarf mistletoe. If feasible, time commercial harvest to take advantage of higher timber prices to help offset post harvest management costs.

Follow the commercial thinning with a non-commercial thin in the younger understory Douglas-fir saplings (1" – 5" DBH, 15' to 20' tall). Thin these sapling patches on a 16' average spacing (170 TPA). Leave the largest, healthiest trees and prefer younger ponderosa pine when available. Do not thin on a grid but rather on an average leaving some of the best trees closer or clumped (variable spacing) to increase heterogeneity across the landscape.

Also thin out the non-merchantable larger (>8") ponderosa pine trees that have short (poor) crowns, crooked or damaged boles (trunks) that will not make a commercial log. A few non-commercial larger trees can be left for wildlife use if they are conducive to nests. Leave a variety of snags and logs for wildlife.

Prune the overstory trees up to 16' and prune the saplings, leaving at least 50% of the live crown. Remove live and dead brush that may pose a threat as ladder fuels to the leave tree crowns.

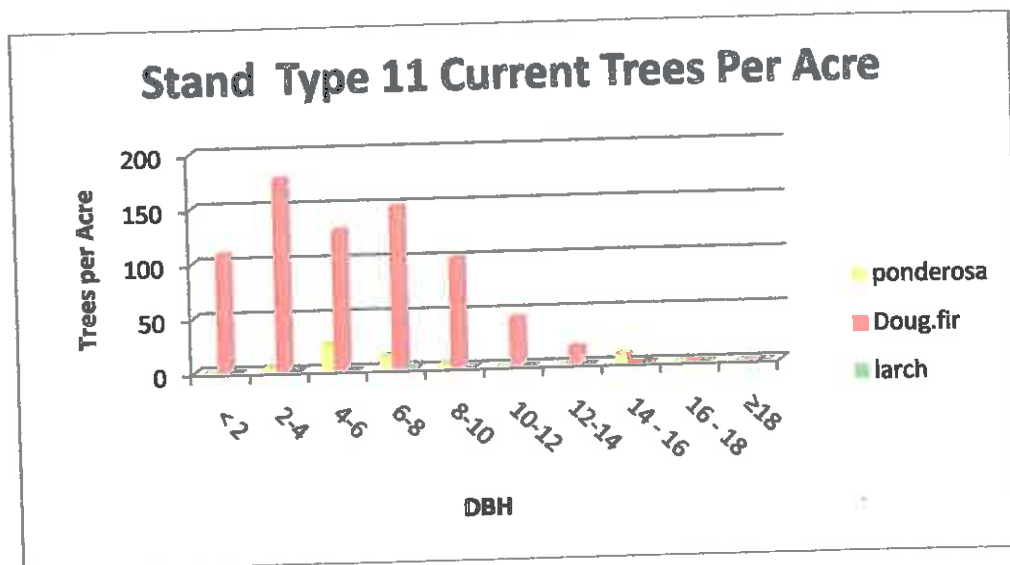
Slash from the non-commercial thinning, pruning and brush removal should be hand piled/burned on snow, or machine mulched, or use "lop and scatter".

Apply for post harvest cost share contracts with DNR (Dept. of Natural Resources) or NRCS (Natural Resource Conservation Service) to help accomplish the post harvest goals.

Both thinnings should improve overall growth rates (height & diameter) and improve forest health. The goal is to have leave trees growing at about 10 rings per inch favoring healthy trees with good crowns and straight boles.

Reforest under-stocked areas with both ponderosa pine and western larch seedlings. Use 1-1 or 2-0 planting stock on a 14' x 14' average spacing (220 TPA)

Stand Type 11
33 acres



DBH	ponderosa	Doug.fir	larch	Total
< 2	0	108	0	108
2-4	4	176	0	180
4-6	24	128	0	152
6-8	12	148	4	164
8-10	4	100	0	104
10-12	0	44	0	44
12-14	0	16	0	16
14 - 16	8	0	0	8
16 - 18	0	0	0	0
≥18	0	0	0	0
Total	52	720	4	776



Land grade 6, Operability class 3

Resource conditions

Stand 11 is on the north side of Wheeler Ridge. Although it borders some non-commercial land, it is extremely overstocked with an average of 776 TPA. There is only 6% ponderosa pine, 1% western larch, but 93% Douglas-fir that has areas which are severely infested with dwarf mistletoe.



Below the road is very steep (70%), with heavy fuel loadings of dead and down trees putting this area at extreme wildfire risk.

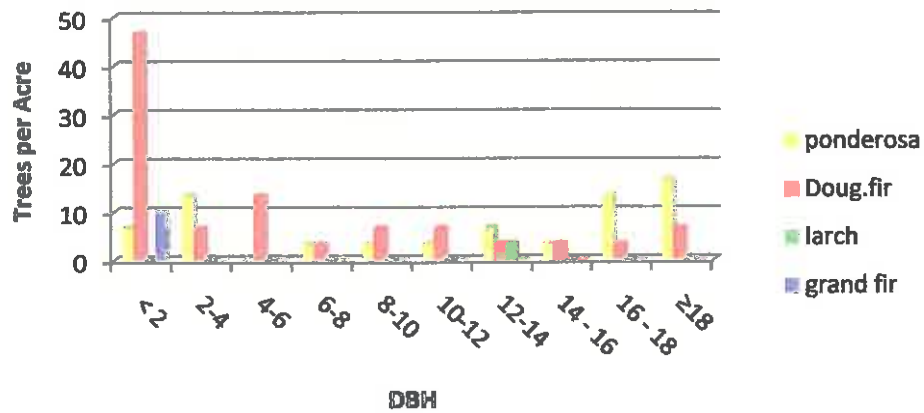
Management practices

The steep area below the road is so dense and diseased with limited crop trees that this stand should be clear cut and replanted; however, there may not be enough merchantable wood to justify the expense. Another option is to identify areas with potential crop trees and non-commercially thin those areas on a 20' to 30' spacing leaving all ponderosa pine and western larch along with any clean Douglas-fir – the rest could be left for elk, owl and squirrel habitat. The slash created from any thinning should be piled and burned or cut and scattered to reduce fire spread and intensity. Some small slash piles can be left in safe areas for wildlife habitat. Cost share funding could help offset these expenses.

Above the road should be commercially and non-commercially thinned to include a 100' "shaded fuel break" adjacent to stands 1 & 8 at the top of Wheeler Ridge. Prune all leave trees and dispose of slash. Keep area open and brush maintained.

Stand Type 12
68 acres

Stand Type 12 Current Trees Per Acre



DBH	ponderosa	Doug.fir	larch	grand fir	Total
< 2	7	47	0	10	63
2-4	13	7	0	0	20
4-6	0	13	0	0	13
6-8	3	3	0	0	7
8-10	3	7	0	0	10
10-12	3	7	0	0	10
12-14	7	3	3	0	13
14 - 16	3	3	0	0	7
16 - 18	13	3	0	0	17
≥18	17	7	0	0	23
Total	70	100	3	10	183



Land grade 6, Operability class 3

Resource conditions

Stand 12 is mostly on a steep slope running down into Squilchuck State Park on the west. There are many spur roads crossing through the stand. This is a patchy mix of dense, mistletoe infested Douglas-fir poles and areas of nicely spaced overstory trees and regeneration. Some areas were logged hard leaving low quality trees and brush.

Overall the stand averages 183 TPA with 38%ponderosa pine, 55% Douglas-fir, 5% grand fir and 2% western larch. There are 103 TPA <8" DBH and 80 TPA >8" DBH. Basal area ranges from 80 to 180 square feet per acre.

Management practices

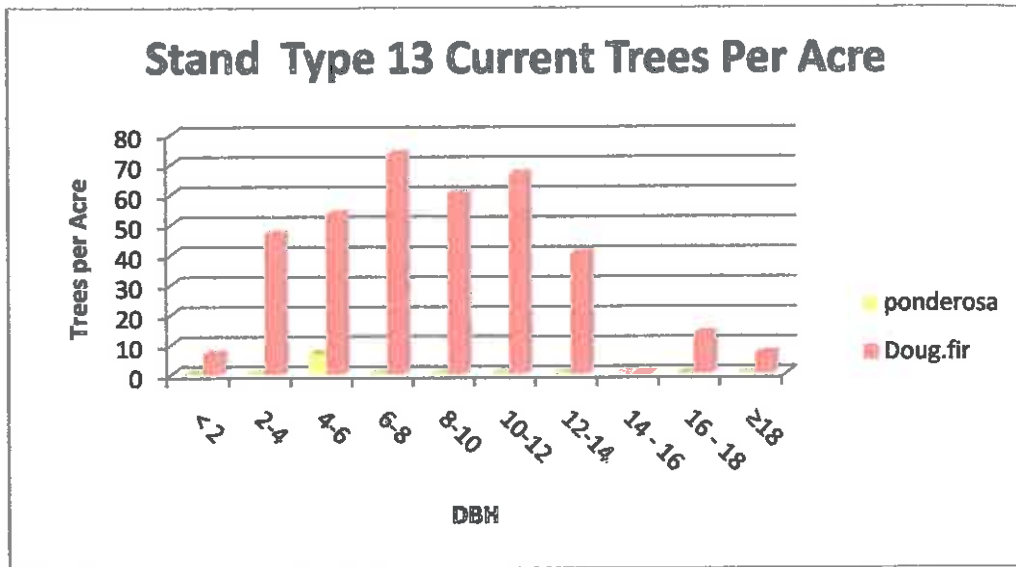
Non-commercially thin the overstocked Douglas-fir pole patches where good crop trees are available and remove mistletoed trees.

Commercially thin the overstory trees as in Stand type 1. Maintain a basal area of 60 to 80 square feet per acre. Install a "shaded fuel break" with 30' to 40' spacing along the west property line, on the ridge, where it borders the state park. Fuel breaks should have all brush removed, trees pruned to a 16' height, and area should be cleared every 5 years to keep it open.

In both thinning, clear cut areas where there are no crop trees (mistletoe infestation or poor crowns) and reforest with western larch (50%) and ponderosa pine (50%) as previously described.

Maintain the spur roads for fire access and hiking trails.

Stand Type 13
36 acres



DBH	ponderosa	Doug.fir	Total
< 2	0	7	7
2-4	0	47	47
4-6	7	53	60
6-8	0	73	73
8-10	0	60	60
10-12	0	67	67
12-14	0	40	40
14 - 16	0	0	0
16 - 18	0	13	13
≥18	0	7	7
Total	7	367	374



Land Grade 6, Operability class 3

Resource conditions

Stands 13 are in the northwest corner of the parcel, one borders Squilchuck State Park to the west and along Squilchuck Rd., the other is situated along the north property line. A strip of marginal to non-commercial land bisects the two patches.

The only logging here was the early entry in 1932. Although these stands were marked for later logging, no later entries were made. These are on steep (40% - 90%) north slopes with brushy draws and no access. Heavy elk use is apparent.

These 374 TPA stands are dominated by Douglas-fir (98%) with only 2% ponderosa pine. There are 187 TPA <8" DBH and 187 TPA >8" DBH. Basal area is 280 square feet per acre. Radial growth has slowed to >30 RPI putting these trees at high risk from insect and disease. The overstocking and steep slopes are an extreme wildfire risk.

Management practices

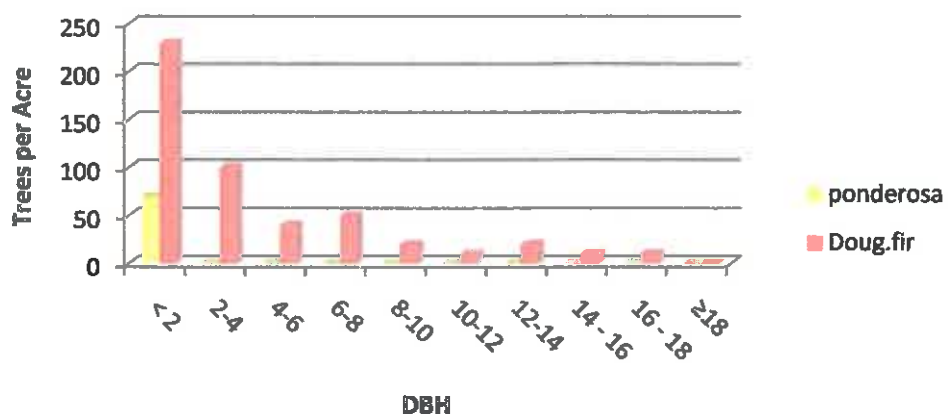
Commercially and non-commercially thin this stand as previously described to reduce the number of trees per acre and basal area. Develop a "shaded fuel break" along the west boundary with Squilchuck State Park down to Squilchuck Rd. This will tie in with the fuel break from Stand Type 12. A fuel break could also be placed along the north boundary private parcels. Coordinating management with neighbors to the north and state park to the west could help lower the risks from wildfire.

The more open non-commercial slopes bisecting these parcels can be used as natural fire breaks by non-commercially thinning some dense clumps, pruning leave trees and removing brush where needed.

Over time it is important to shift the species balance back to fire tolerant ponderosa pine and western larch. Isolated patches can be left un-thinned or pruned for wildlife cover, especially along the creeks.

Stand Type 14
16 acres

Stand Type 14 Current Trees Per Acre



DBH	ponderosa	Doug.fir	Total
< 2	70	230	300
2-4	0	100	100
4-6	0	40	40
6-8	0	50	50
8-10	0	20	20
10-12	0	10	10
12-14	0	20	20
14 – 16	0	10	10
16 – 18	0	10	10
≥18	0	0	0
Total	70	490	560



Land grade 6, Operability class 3

Resource conditions

Stand 14 is multi-layered with 88% Douglas-fir and only 12% ponderosa pine. There are 480 TPA <8" DBH with 70 TPA >8" DBH and basal area of 120 square feet per acre. Many on the overstory Douglas-fir have heavy infestations of dwarf mistletoe.

There is a large component of healthy young regeneration in this stand although it is seriously at risk for dwarf mistletoe infestation from overhead trees in some areas.

Management practices

Commercially thin this stand as in Stand 1 removing trees with dwarf mistletoe. This may entail several small overstory removal areas.

Follow up with non-commercial thinning of younger understory trees on a 16' to 20' spacing. Cut out all cull and poor crowned trees at this time as well. Leave a variety of snags, logs and malformed larger trees for wildlife habitat. Prune all leave trees to 50% live crown or 16' high. Dispose of slash.

Replant under-stocked areas with 50% western larch and 50% ponderosa pine to shift the species balance back to more historic conditions.

Stand Type 15
29 acres



Land grade 7, Operability class 3

Resource conditions

Stand 15 is in the NE corner of section 17. It is on extremely steep >70% slopes of marginal to non-commercial forest land. There are scattered timbered patches of ponderosa pine and Douglas-fir poles.

Most of the larger trees were logged off in 1996 leaving very poor quality trees. Both ponderosa pine and Douglas-fir saplings are getting established in the disturbed logging areas. The Douglas-fir saplings are being infected with dwarf mistletoe spreading from the diseased trees above them. Some of the dense Douglas-fir patches are totally diseased with mistletoe, they have poor crowns, very slow growth and there are no healthy trees. No potential commercial value is in these patches.

There is a spur road crossing through this stand with a spring on the road edge between stands 14 and 15. Elk sign is present in this area.

Management practices

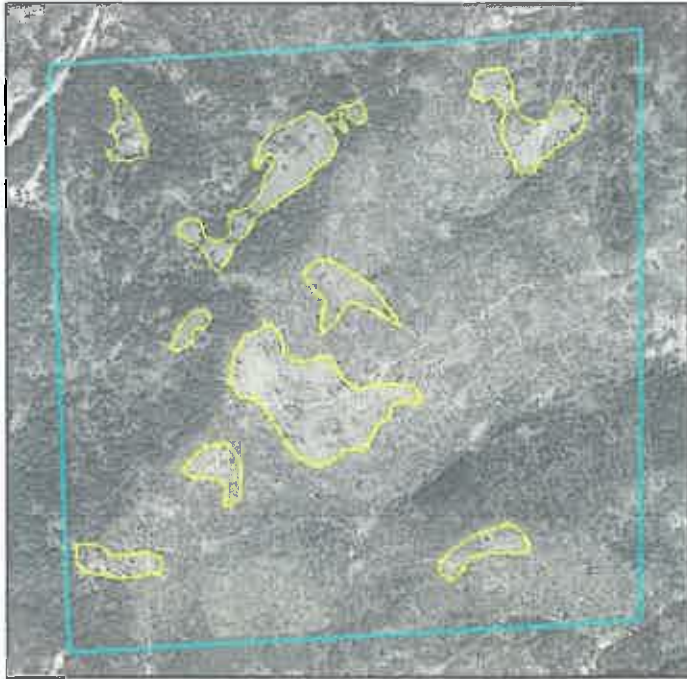
Due to the poor quality trees and lack of commercial potential, no management is recommended for this stand.

Take advantage of the natural openings and the spur road to act as a fuel break and keep them open and brush maintained.

The Douglas-fir patches (small stands) with very limited potential for producing quality timber trees should be left for wildlife habitat. Note the good cover potential for small mammals in this photo.



Stand Type 16
69 acres



Land grade 8

Resource conditions

This stand type consists of several scattered areas throughout section 17. These areas are a combination of either non-forested or non-commercial forest land due to dry, rocky, shallow soils. They cannot be successfully artificially reforested.

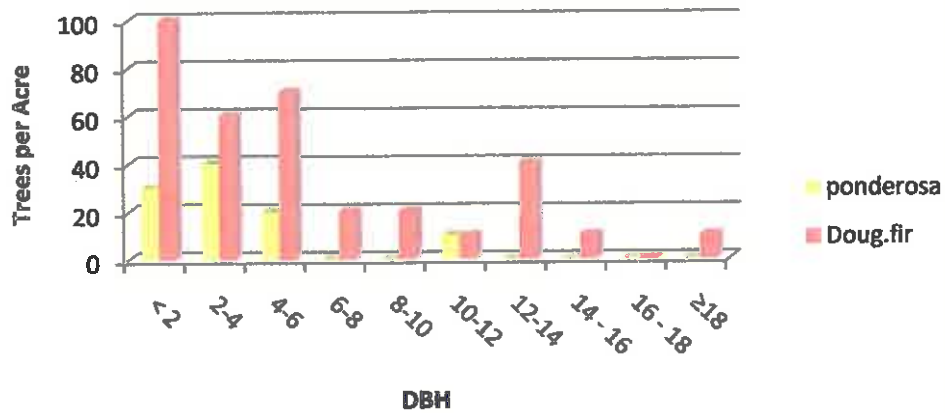
Management practices

No treatment. These areas can be tied into the planned fuel breaks.



Stand Type 17
5 acres

Stand Type 17 Current Trees Per Acre



DBH	ponderosa	Doug.fir	Total
< 2	30	100	130
2-4	40	60	100
4-6	20	70	90
6-8	0	20	20
8-10	0	20	20
10-12	10	10	20
12-14	0	40	40
14 - 16	0	10	10
16 - 18	0	0	0
≥18	0	10	10
Total	100	340	440



Land grade 6, Operability class 3

Resource conditions

Stand 17 is on an east slope draining into Orr Creek with 440 TPA dominated by 77% Douglas-fir and 23% ponderosa pine. There are 340 TPA <8" DBH and 100 TPA >8" DBH on Site class IV land.

The ponderosa pines are dying. Radial growth has slowed to >30 RPI.

Management practices

Maintain a basal area of 60 – 80 square feet per acre. Commercially thin the overstory ponderosa pine and Douglas-fir on a 20' to 30' spacing (108 – 48 TPA). Prefer healthy ponderosa pine as leave trees. Remove any trees with mistletoe.

Follow up with non-commercial thin of the smaller diameter trees as described in Stand 1, again preferring ponderosa pine as leave trees.

Below is a table of stands, the level of risk for forest health issues (insect and disease), wildfire risk and basic treatment prescribed. Stands at high fire risk should be a highest priority for treatment, followed by diseased stands. If the high risk stands are left untreated, they pose an extreme risk of a stand replacement fire (where 80% to 100% of the trees will be killed, habitat destroyed with potential for soil damage followed by severe erosion).

Stands 9 through 15 drain into Squilchuck Creek
Stands 1 through 8 and 17 drain into Orr Creek

Priority Table

Stand	TPA	Acres	Health risk	Fire risk	wildlife value	timber value	Treatment
1	205	67	High	Medium	browse	moderate	commercially/non-commercially thin/prune
2	80	12	High	Low	low	low	prune & remove mistletoe
3	288	95	High	Medium	browse	moderate	commercially/non-commercially thin/prune
4	230	18	Medium	Low	browse/beds	moderate	commercially/non-commercially thin/prune
5	476	70	High	High	browse/beds	good	commercially/non-commercially thin/prune
6	640	8	High	High	cover/beds	low	No treatment preferred
7	410	24	High	Medium	browse	low	Non-commercially thin/prune
8	165	39	Medium	Low	browse	low	Non-commercially thin/prune
9	545	34	High	High	currently limited	good	commercially/non-commercially thin/prune
10	440	16	High	High	browse/cover	good	commercially/non-commercially thin/prune
11	776	33	High	High	browse	low	Non-commercially thin/prune
12	183	68	High	Medium	browse/cover	good	commercially/non-commercially thin/prune
13	374	36	High	High	cover	good	commercially/non-commercially thin/prune
14	560	16	High	High	browse/cover	good	commercially/non-commercially thin/prune
15	marginal	29	Medium	Medium	cover/beds	low	No treatment
16	non-comm	69	Low	Low	low	low	No treatment
17	440	5	High	High	browse/cover	good	commercially/non-commercially thin/prune

Management of all these stands will significantly reduce the threat from wildfires, improve forest health, enhance wildlife habitat and provide recreational opportunities.

Category V: Property Access, Roads, Trails



Resource conditions

All roads on this property, especially Wheeler Ridge Road, are in poor condition. Erosion, hard usage by 4-wheelers and general neglect make most of the roads non-drivable.

Management practices

Keep main roads maintained and open for both management activities and fire access. These roads may also act as fuel breaks for fire. Thin 50 foot on either side of main roads on a 26' to 30' spacing (64 - 48 trees per acre). Prune trees so that limb tips are 8 foot above ground vegetation and dispose of slash. This will allow a safer area for fire fighters and equipment.

Following management activities, spur roads (particularly those near or through wildlife corridors) should be blocked by gates, berms/rocks, or ditches to restrict usage. Planned trails may utilize some of these roads which should divert much of the activity to maintained roads.

Category VI: Wildlife

Resource conditions

The southwest half of this section is designated Colokum elk calving habitat. There is evidence of heavy elk usage throughout this parcel.

Management practices

Scattered small thickets will not be thinned on a wide spacing to leave hiding and thermal cover for all wildlife species. Management activities should be timed to avoid nesting, fawning or calving season. The calving season for elk includes May and June.

Vegetation responses in areas where thinning has opened up the stand will create more heterogeneity allowing more grazing and browsing opportunities for a variety of small and large mammals. Pruning can help maintain forest in the "stand initiation" structure providing greater wildlife habitat diversity (Oliver 1994). Manage for structural stratification and diversity in these stands by leaving different size trees on a variable spacing scattered throughout the stand (uneven aged management). Leave younger regeneration trees along with openings to create more heterogeneity or patchiness. Planning for different stand structural layers will help create distinct plant communities attracting different types of birds and other wildlife. Thinning overstocked stands will encourage regeneration which provides excellent cover for elk and deer.

To ensure opportunities are available for both feeding and cavity-excavating birds, at least two snags ≥ 10 foot height and ≥ 10 inch diameter per acre will be left on site where available. Also, leave at least two logs per acre 20 feet in length with 12" diameter tops if available. Leave two green recruitment trees 30 feet high and 10" diameter with 1/3 live crown (Forest Practices Illustrated 2007). Some of the tall snags can be cut off at a height of 20 foot to help ensure snag longevity for cavity nesting animals and woodpeckers. Consider seeding several burn-piles with native forage so as to improve wildlife habitat.

Several elk/big game corridors are being planned by wildlife biologist John Lehmkuhl. These corridors will provide cover for animals moving through the orchard areas. Corridors will be designed to take advantage of natural movement paths such as draws and have limited road disturbance. They will connect undisturbed areas in Squilchuck State Park and private lands. Corridors will be wide enough to provide cover and unlimited movement with no bottlenecks or large exposed areas. These corridors will have restricted thinning and brush removal to allow maximum hiding during movement.



Some slash piles will be left on site for small mammal habitat, especially snowshoe hare, squirrels, chipmunks and voles.

A healthy small mammal population will support a variety of mammalian or avian predators such as bobcats or goshawks. Some of the non-commercial thinning poles can be stacked to simulate large logs.

Note the evidence of cone caches in this pole pile.

Category VII: Threatened and endangered species and cultural resources

Resource conditions

The property has not been surveyed for plants, arthropods, amphibians, bats or other species which may be on the state threatened and endangered species list. But, this is good habitat for many animal species. The majority of this section is within a 1.8 mile spotted owl circle (Bell). No harvest activities should be done between March and August which fits within good forestry practices.

There are no recorded archeological sites on this property (McLemore).

Management practices

Preserve trees which have active nesting sites, regardless of species. If any sensitive species are later discovered on this property, the landowner should immediately contact the Washington Department of Fish and Wildlife and/or Department of Natural Resources for instructions on maintenance of habitat.

The management activities planned for this parcel are intended to protect and enhance as many natural habitats as possible. By carefully removing some of the overstocked trees, re-vegetating with native grass species and returning the landscape to a state more closely resembling historic conditions, we hope to improve habitat for all wildlife species.

The State Department of Archaeology and Historic Preservation have these instructions should any artifacts be observed:

Please be advised that should archaeological materials (e.g. bones, shell, stone tools, beads, ceramics, old bottles, hearths, etc.) be observed during project activities, all work in the immediate vicinity will stop. The State Department of Archaeology and Historic Preservation (360-586-3065), the County planning office, and the affected Tribe(s) must be contacted immediately in order to help assess the situation and determine how to preserve the resource(s). Compliance with all applicable laws pertaining to archaeological resources (RCW 27.53, 27.44 and WAC 25-48) is required. Failure to comply with this requirement could result in criminal or civil penalties. If federal funds or permits are involved in the project, notification to the appropriate federal agency and the Advisory Council must occur in addition to the above-listed parties, per 36 CFR Sec. 800.12.

However, if ground disturbing activities encounter human skeletal remains, then all activity will cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance. The finding of human skeletal remains will be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner/coroner determines the remains are non-forensic, then they will report that finding to the Department of Archaeology and Historic Preservation (DAHP) who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains. (RCWs 68.50.645, 27.44.055, and 68.60.055)

Resource Category VIII: Aesthetics and Recreation

Resource conditions

This area is heavily used by big game hunters and campers. A DNR green dot road runs through the property. All roads are actively used by 4-wheelers, mountain bikes, horses and hikers.

Management practices

A trail system is being planned for the area that will tie into the state park.

Management activities prescribed will increase resource sustainability, lower fire risks, increase scenic activities and wildlife habitat.

Managing for a stand of large trees (>20" DBH) and pruning of trees will open up the forest, adding to the visual character of the site, giving one the feeling of being in an "old growth" forest. Leaving larger crop trees on a wider spacing will make the area more "park like".

Preserve old snags, logs and stumps, especially ones with fire scars. These are the legacy of this forest and could aid in educating the public of the historical conditions and fire regimes in similar forests. Photo points could be maintained for educational purposes (i.e. school field trips) that would help display forest development over time and the implications and benefits of active forest management.



VI. Planned Management Activities

(these are general guidelines)

- 2016** Submit a water type modification to correct/confirm DNR water typing. This will have an impact on riparian and wetland management zones.
- Flag property boundaries, wildlife corridors and management units. Submit a forest practice application for commercial thinning.
- 2016 - 2020** Commercially thin stands as listed in the timber section. Commercial thinning to be done on dry (late summer or fall) or frozen ground. Protect wildlife habitat and corridors. Have haul roads graded and drain dipped for erosion control (Dept. of Nat. Resources) and develop shaded fuel breaks.
- All thinning to be completed on an "average spacing" – not a grid. Leave some good trees closer together to create small patches or clumps for variability.
- 2020** Apply for cost share funding through DNR or NRCS to help accomplish non-commercial thinning, pruning, and slash disposal.
- Monitor growth and diseases. Reforest non-stocked areas with 1-1 or 2-0 ponderosa pine and western larch seedlings on an average 14' x 14' spacing.
- Treat invasive weeds and reseed disturbed areas with native grasses and forbs.
- 2025** Maintain fuel breaks.
- 2035** Seed tree harvest overstory trees at 10 – 20 TPA (66' – 47' spacing) based on radial growth and crown closure. Follow with non-commercial thinning of young stands on a 12' to 16' spacing (300 – 170 TPA). Prune and dispose of slash. Reforest non-stocked areas with 50% western larch, 50% ponderosa pine.
- 2060** Consider commercial or non-commercial thinning of the younger stands to maintain adequate spacing between crowns.

Landowner Signatures

LANDOWNER APPROVAL SIGNATURE (REQUIRED)

I/we approve of the contents of this plan and intend to implement the described management activities to best of my/our ability.



Landowner Signature(s) and Date Signed

Plan Approval Signatures

DNR FOREST STEWARDSHIP PLAN APPROVAL (IF APPLICABLE)

This plan meets the requirements for a Forest Stewardship Plan.



10-16-15

WA State Department of Natural Resources Authorized Representative Date

Print Name: *CHUCK WYTKO*

Affiliation: *LANDOWNER ASSISTANCE PROGRAM MANAGER*

Address: *713 Bowers Rd, ELLensburg, WA 98926*

Phone: *509-925-0963*

E-mail: *chuck.wytko@dnr.wa.gov*

USDA-NRCS CONSERVATION ACTIVITY PLAN APPROVAL (IF APPLICABLE)

This plan meets the requirements for a USDA-NRCS Conservation Activity Plan.

Signature of USDA-NRCS Authorized Representative

Date

Print Name:

Title:

Affiliation:

Address:

Phone:

E-mail:

CURRENT USE TIMBER MANAGEMENT PLAN APPROVAL (IF APPLICABLE)

This plan meets the requirements for a Timber Management Plan for current use property tax programs.

Signature of Authorized County Government Representative

Date

Print Name:

Title:

Affiliation:

Address:

Phone:

E-mail:

Forestry Definitions

DBH (dia class)	Diameter of tree at 4.5 feet above ground on uphill side	
Basal Area	The area in square feet of a cross section of a tree bole 4.5 feet above ground	
Site Class	Rating of a site's potential growth ranging from I – V; from very wet fast growing sites (site class I & II) to very dry, slow growing sites (site class V)	
Site Index	A numerical rating of site quality. The average height in feet of dominant and co-dominant trees by age class (50 or 100 years)	
Site Preparation	The removal of slash/brush/vegetation in preparing a site for planting	
Shade Tolerant	Tree species that regenerate and grow well in shade such as grand fir	
Climax species	Tree species that successionaly dominate a stand due to lack of disturbance such as grand fir	
Seral species	Tree species that are shade intolerant and disturbance dependent such as ponderosa pine and western larch	
Fire regime	Cycles and patterns of fire influence by species composition, topography and climate	
Mixed severity fire	A combination of both low and high severity fires	
Shaded fuel break	A designated area of land managed with widely spaced trees to help slow the spread of fire and lower the intensity. This provides for safer fire suppression by fire fighters. These areas need to be kept maintained and open	
Stocking	Number of trees per acre by species and size classes	
Crop Tree	A tree to be grown to maturity for the final harvest, selected for species, quality and growth potential	
Riparian	Pertaining to the area along the banks of a river, stream or lake	
Radial growth	Number of years has taken the tree to put on 2" of diameter growth. Reported in rings per inch or RPI	
Buffer (RMZ, WMZ)	A protective strip of land or timber adjacent to an area requiring attention or protection such as riparian areas or wetlands	
Shelterwood harvest	Removal of most of the overstory trees leaving enough to shade and "shelter" the newly emerging seedlings and saplings.	
Tree Size Classes	Seedling	0.1 – 1.9" diameter
	Sapling	2.0 – 4.9"
	Poles	5.0 – 8.9"
	Small Timber	9.0 – 15.9"
	Medium Timber	16.0 – 24.0"
	Large Timber	> 24.0"

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APPENDIX

How Much Fertilizer in Slash?

Chris Schnepf

There has been much discussion among foresters and fire managers over the last ten years regarding the nutrient value of slash. Understanding this is critically important in making decisions about treating slash to reduce fire hazard or harvesting small trees and slash for methanol, co-generation, or other bio-fuels.

Moisture is the most influential factor limiting tree growth in most Idaho forests. But inadequate nutrients limit growth as well. Adding nutrients increases tree growth on most Inland Northwest forests, particularly fertilizers containing nitrogen, potassium, sulfur, and boron, though the size of the response from different fertilizer mixes varies considerably by site. Idaho's forest soils are not usually deficient in phosphorus (one of the "big three" plant nutrients whose weight is listed on the label at the bottom of fertilizer bags).

Presumably, repeatedly removing nutrients from these forests in the form of trees and slash will produce an opposite effect (reductions in tree growth). How much of a reduction has not been studied thoroughly, but one way of looking at it is to study the nutrient content of slash. How much nutrient capital is removed when green slash is burned or hauled away for bio-fuel? The standard response to this has been to note that roughly half of a tree's above-ground nutrients are tied up in the tree's crown. The Intermountain Forest Nutrition Cooperative has been studying this question to develop more precise estimates of the nutrient content of trees on different types of sites.

For example, one case study projected the nutrient content of trees in an 80 year old stand in northeastern Oregon, on grand-fir habitat type, with basalt parent material (see Figure 1). The stand in the example has 102 ft² of basal area/acre, and a species composition by volume of: 82% grand fir, 6% Douglas-fir, 2% ponderosa pine, and 11% other species. This type of stand would be fairly common on the lower to mid-elevation sites in northern Idaho. In the crowns of this stand, there would be 122 lbs of nitrogen/acre and 101 lbs of potassium/acre. An equivalent amount of fertilizer would cost roughly \$100-120 an acre to apply – more if you added micronutrients such as sulfur or boron. Note that an additional 79 lbs of nitrogen/acre and 136 lbs of potassium/acre would be removed from the site if you took all the merchantable logs.

Figure 1. OVERSTORY NUTRIENT COMPONENTS (lbs/acre)

ROCK TYPE: Basalt, VEGETATION SERIES: Grand Fir

Amount in standing crop before any cut

Nutrient	Foliage	Small Branches	Coarse Branches	Total Crown	Unmerch bark	Merch Bark	Unmerch wood	Merch Wood
Biomass	5798.0	2331.8	14076.0	22205.8	983.3	20062.7	11446.8	57462.6
N	58.891	14.001	48.629	121.521	2.677	54.593	4.917	24.448
K	38.283	12.543	50.357	101.183	2.743	56.766	16.086	79.378
P	7.129	3.238	13.263	23.630	0.782	16.109	4.560	22.783
Ca	75.908	21.956	89.570	187.435	8.302	172.207	21.406	106.043
Mg	6.426	3.110	12.423	21.959	0.618	12.604	4.108	20.332
S	3.687	1.163	4.514	9.365	0.241	4.964	1.230	6.169
Mn	0.733	0.523	2.366	3.621	0.282	5.928	0.557	2.744
Fe	0.385	0.613	1.136	2.133	0.086	1.728	0.656	3.238
Zn	0.112	0.085	0.422	0.618	0.027	0.549	0.169	0.824
B	0.224	0.036	0.123	0.383	0.009	0.179	0.053	0.263
Cu	0.009	0.039	0.270	0.317	0.013	0.254	0.104	0.517
Source: Intermountain Forest Nutrition Cooperative								

Nitrogen naturally re-accumulates in forests from atmospheric precipitation and from nitrogen-fixing plants and microbes. But this occurs slowly. A University of Idaho study on a north Idaho cedar site found that nitrogen re-accumulated at a rate of roughly four lbs per acre per year annually. Potassium and other nutrients also re-accumulate, but even more slowly, mostly from parent material weathering and a miniscule amount from atmospheric precipitation. The same study found potassium re-accumulating at roughly two and one-half pounds per acre per year annually. The amounts are variable by site, but the loss of potassium and micro-nutrients would be even more critical on rock types that were lower in these nutrients, and slower to decompose.

Letting slash over-winter on site will capture many of the nutrients as they leach from the slash, though how much has not been studied precisely. In operations with very light slash accumulations, you might not even need to treat the slash very aggressively. For more information check a Woodland Notes article entitled "Tons of Slash" archived on the UI Extension forestry web site ([Vol. 14, No. 1 - Fall/Winter, 2002-2003](#)).

Nutrients are a critical dimension of your forest's health and growth. As you work to reconcile nutrient issues with fire hazard, contact your local IDL fire warden for assistance.

Thanks to the staff from the Intermountain Forest Tree Nutrition Cooperative for information and comments on this article



Woodland Fish & Wildlife

Managing for Deer and Elk on Small Woodlands

Fran Cafferata Coe, Cafferata Consulting, Hillsboro, OR

Both deer and elk play important roles in the ecology and culture of the Pacific Northwest. These iconic animals can provide both substantial benefits to woodland owners through viewing and hunting, but can also be considered pest due to the damage they are known to cause. There are many pressures on habitat for these species. The most important thing that small woodland owners can do to maintain habitat for deer and elk is to keep their land in forest use.

Elk Species in Oregon and Washington

There are two subspecies of elk in Oregon and Washington: Roosevelt Elk (*Cervus elaphus roosevelti*) and Rocky Mountain Elk (*Cervus elaphus nelsoni*). Distinguishing between these two subspecies

is difficult, but generally Roosevelt elk are found west of the Cascades while Rocky Mountain elk are found east of the Cascades. Roosevelt elk are also darker and slightly smaller than Rocky Mountain Elk.

Elk will use forests of all ages, but are most commonly associated with young stands (clearcuts) where food is most abundant. Closed-canopy forests are used for forage in late summer, shelter, and as hiding cover from predators. Principal predators include mountain lions, bears, wolves, and people. Preferred forage for Roosevelt elk includes huckleberry, vine maple, big-leaf maple, salmonberry, western redcedar, forbs and grasses. Rocky mountain elk are known to eat grasses and forbs in the summer, grasses in the spring and fall, and grasses, shrubs, tree bark and twigs during the winter, especially aspen (RMEF 2013).

Elk breed in the fall with spectacular herd behaviors including bugling and fighting among dominant males. Bulls gather cows and calves together in small groups called harems. To attract females, the males wallow in mud and coat themselves with urine. Males will also bugle and rub trees, shrubs and the ground with their antlers to attract cows and intimidate other bulls. Bulls will also aggressively guard their harems from other bulls. Cows produce one calf every year to every other year, depending on physical vigor. Twins are rare.

Deer and Elk are ungulates. Ungulates are large hoofed mammals.



Rocky Mountain Elk. Photo by ODFW



Roosevelt Elk. Photo by ODFW

A publication by the Woodland Fish and Wildlife Group June, 2014. Publications by the Woodland Fish and Wildlife Group are intended for use by small woodland owners across the Pacific Northwest. Some resources here are state specific, but should be generally useful to landowners throughout the Pacific Northwest.

Deer Species in Oregon and Washington

There are two species of deer in Oregon and Washington: mule deer and white-tailed deer, each with one or more subspecies. The following table compares the deer species in Oregon and Washington.



Left to right: Mule deer, White-tailed deer, Blacktailed fawn. Photos from ODWF.

Deer Species in Oregon and Washington

	Mule deer		White-tailed deer		
Variety	Rocky Mountain mule deer <i>Odocoileus hemionus</i>	Columbian black-tailed deer <i>Odocoileus hemionus columbianus</i>	Columbian white-tailed deer <i>Odocoileus virginianus leucurus</i>	Northwest white-tailed deer (Oregon) <i>Odocoileus virginianus ochrourus</i>	White-tailed deer (Washington) <i>Odocoileus virginianus idahoensis</i>
Physical Description	Large mule-like ears, generally three quarters of the head in length. They have a white rump patch and a small white tail with a black tip. Antlers typically branch twice.	Wide triangular tail with a black top and white underside. Antlers typically branch twice.	Similar to black-tailed deer, but has a longer tail that is brown rather than black on top and white underside. Antlers usually branch off of a single main beam.	Slightly larger than Columbian white-tailed deer with longer tail that is brown on top and white underside. Antlers usually branch off of a single main beam.	Slightly larger than Columbian white-tailed deer with longer tail that is brown on top and white underside. Antlers usually branch off of a single main beam.
Range	Widespread east of the Cascades.	Widespread west of the Cascades.	Small pockets along the Columbia River and one population near Roseburg, Oregon	Most of Willamette, Union, and Baker counties; parts of Umatilla and Grant counties.	NE WA from Methow to Spokane, SE WA Blue Mts. Rare in Yakima Valley, absent N. to Chelan.
Predators	Wolves, mountain lions, coyotes, bears and people.	Mountain lions, bobcats, bears, coyotes, dogs and people.	Coyotes, mountain lions, bears and people.	Coyotes, mountain lions, bears and people.	Coyotes, mountain lions, bears and people.
Habitat	Winter habitat is in low-elevation areas with minimal snow that provide vegetation for forage. Summer habitats are commonly in agricultural areas and high-elevation mountains.	Young to old forest stands. Prefers young forest stands for feeding and fawning. Older stands are used for cover from predators.	Prefers white oak woodlands. Historically, inhabited wet meadows, grasslands, and riparian and oak woodlands.	Riparian valleys, mixed hardwood areas and agricultural lands.	Riparian valleys, mixed hardwood areas and agricultural lands.
Food Needs	Primarily forbs and the leaves and twigs of woody shrubs, especially young shrubs following vegetation disturbances, such as fire, storms, or logging.	Primarily forbs and the leaves and twigs of woody shrubs but consumes many plant species.	Feeds mostly on grasses and forbs; occasionally woody vegetation.	Feeds mostly on grasses and forbs; woody vegetation and agricultural crops.	Feeds mostly on grasses and forbs; woody vegetation and agricultural crops.

Cover

Recent studies regarding thermal cover (dense vegetation to provide warmth) for deer and elk have shown that the availability of thermal cover has little influence over survivability of elk. However, biologists do recommend providing and maintaining cover for deer and elk as it provides security and protection from predators (Wisdom and Cook 2000). Biologists also suggest that land managers who are interested in promoting healthy elk populations should focus on providing forage opportunities.

Providing dense forest vegetation on winter range in eastern Oregon and Washington may be an important strategy in some areas, especially for visual security from predators. In areas where deer and elk regularly congregate in winter, reducing or eliminating disturbance from humans may be the most important way we can help them through winter months.

Forage

The availability of high-quality forage has profound effects on deer and elk survivability and reproductive success. In general, deer and elk require the most quantity and quality of forage during the late spring and summer. Landowners have an opportunity to provide quality



Grasses and forbs as shown in this picture provide excellent forage for deer and elk. Photo by Kendel Emmerson.

foraging opportunities by making nutritious forage available at the right times of the year (particularly in summer).

What species of plants are nutritious for deer and elk?

Salal, Oregon grape, and most ferns (especially bracken fern and sword fern)

are not good forage species for deer and elk as they lack the nutrition deer and elk need. Instead, deer and elk need high protein and mineral-rich grasses, forbs and shrubs common to open areas following fire, storm events or logging.

In moist west-side forest ecosystems, vegetation preferred by elk tends to utilize a harvest site following clearcutting or thinning of trees, encouraged by the increase in sunlight that reaches the forest floor. Cook (2005) found that clearcutting, site preparation, planting and herbicide application produced a large flush of early-successional vegetation with good representation of species preferred by elk and deer during summer and fall. The average digestibility of forage was highest in the early years of this study, although even during some of the early years of this study, forage in some locations was inadequate to provide high-quality nutrition. Given the importance of summer forage, land managers may also want to consider using wildlife specific seed mixes in disturbed areas.



Fruit-bearing shrubs such as this hazel are important species for deer and elk. Photo by Mike Dykzeul.

Species of Plants Nutritious for Deer and Elk

	Mule deer	Black-tailed deer	White-tailed deer	Roosevelt elk	Rocky Mountain elk
Trees	Serviceberry Mock orange Bitter cherry Willow	Vine maple Hazelnut Cascara Western redcedar	Crabapple Bitter cherry Willow species Western redcedar Serviceberry	Aspen Cottonwood Vine maple Willow species Big-leaf maple Hazelnut Cascara	Aspen Chokecherry Cottonwood Rocky Mountain maple Willow species
Shrubs	Red twig dogwood Ninebark Golden currant Wild rose Thimbleberry	Trailing blackberry Thimbleberry Huckleberry Wild rose	Trailing blackberry Wild rose	Trailing blackberry Thimbleberry Huckleberry Wild rose	Current Huckleberry Oceanspray Red-twig dogwood Serviceberry Wild rose
Forbs, Grasses, and Legumes	Trefoil Alfalfa Twinnflower Oat Bluegrass Clover	Clover Alfalfa Orchard grass	Cat's ear Alfalfa Clover	Bear grass Cat's ear Clover Cow-parsnip Oxalis Pearly everlasting Queen's cup beadlily Northern bedstraw False Solomon's seal	Alfalfa Clover Dandelion Sweet clover

Many seed mixes are available, and choosing a deer and elk-friendly mix could go a long way toward providing much-needed forage. Also, as the conifers on a site begin to close canopy, the deciduous component of the vegetation starts to dwindle, and over the next 20 to 30 years the site becomes dominated by less-nutritious evergreen shrubs and forbs. Land managers may want to consider practices such as thinning to increase forage for deer and elk within closed canopy stands.

What about deer and elk friendly forage mixes?

There are many places to find forage mixes for wildlife. It's a good idea to check to make sure you are getting locally sourced, weed free mixes. There are both native and nonnative mixes available and costs vary widely among

sources and seed mixes. If you're not sure about the mix you are thinking of using, check with Rocky Mountain Elk Foundation or a local wildlife biologist. Here are some sample forage mixes from the Washington State Department of Natural Resources:

Sunmark Seeds:
<http://www.sunmarkseeds.com/>

Heritage Seedlings:
<http://www.heritageseedlings.com/>

Native Seed Network:
<http://www.nativeseednetwork.org/>

Bailey Seed:
<http://www.baileyseed.com/>

Rainier seeds:
<http://www.rainierseeds.com/product-sand services.html>

Grass-Legume Seed Mix for Timber Harvest Areas

Species	Percent by weight
Clearcut Mix	
Perennial Ryegrass	2
Annual Ryegrass	2
Orchard grass	4
Fescue	1
White Clover	2
Birdsfoot trefoil	5
TOTAL	16 lbs/acre
Commercial Thin Mix	
Fescue	17
Big Trefoil or Birdsfoot trefoil	2
Annual Ryegrass	1
White Dutch clover	2
TOTAL	22 lbs/acre

Grass-Legume Seed Mix for Eastside Timber Harvest Areas

Species	Percent of total
Sherman big blue grass	4
Regar meadow brome grass	20
Paiute Orchard grass	18
Tall fescue	10
Timothy grass	11
White clover	10
Small burnett	5
Ladino clover	10
Medium red clover	9
Alfalfa	3
TOTAL	100

What about damage from deer and elk?

Conifer forests in the Pacific Northwest are certainly susceptible to deer and elk browse, primarily during stand initiation following harvest or natural disturbance. During the first five years of tree growth, deer and elk forage on the terminal and lateral shoots of young seedlings. In some cases, seedlings are completely uprooted, usually indicative of elk. Trees may also be trampled or broken by deer and elk moving through or bedding down in a stand. Browse and other sources of seedling mortality are expected by land managers; however, severe and repeated browse can lead to significant economic loss and noncompliance with reforestation standards.



Exclosures like the one shown here is one way to keep elk out. This method is most useful for small areas. Photo by Thomas Stokely.

Strategies for dealing with deer and elk damage involve three basic methods: Repellent, exclosure or armoring, and tolerance. Several commercial repellents are sold to deter deer browse. They generally act on one or more modes of action including irritation, conditioned aversion and flavor modification. Research conducted at the National Wildlife Research Center (NWRC) has shown that habituation to odor limits the effectiveness of repellents that are not applied directly to food sources, while topically applied irritants and animal-based products produce significant avoidance. While repellents may provide temporary relief in some situations, they are not a long-term solution to deer and elk browse. The durability and effectiveness of repellents can be

affected by environmental factors such as air temperature, rain, snow and wind.

Physical barriers range from protection of individual trees with devices such as tubing to exclusion of large areas with fencing. Fencing is an option for excluding deer and elk but is usually avoided because it is cost-prohibitive. However, it can be a good option for smaller areas such as riparian plantings. Research has shown that not just any fence will exclude deer and elk. Fences must be sturdy enough to withstand breakthrough by running ungulates and tall enough to prevent jumping (minimum 8 feet). It is extremely important that if you do build a fence that you build it at least 8 feet tall. Shorter fences are dangerous for deer and elk, especially the young, as they can



Elk are known to cause damage to Douglas-fir plantations. Photo by Ken Bevis.



Vexar tubing can help protect Douglas-fir seedlings in some locations. Photo by Mike Tucker.

become entangled in these lower fences when trying to cross. In a research study conducted on commercial forests with historic browse damage, NWRC scientists found that survival of Douglas-fir seedlings inside and outside fences was similar after two years; however, seedling heights were reduced significantly outside fences due to browsing by deer and elk. Additionally, NWRC scientists found that survival and heights of seedlings planted with scented bud caps were no different than untreated seedlings. Landowners may wish to consult with a wildlife biologist or stewardship forester for site specific animal control recommendations.

What silvicultural methods can I use to promote habitat for deer and elk?

Early seral vegetation provides forage and habitat for deer and elk, as well as many of the other wildlife species associated with young forest habitats in Oregon and Washington. Land managers whose objectives include providing habitat and forage for deer and elk may want to consider the following silvicultural treatments:

- Where thinning is prescribed, thin timber stands to or below 50 percent crown closure to allow sufficient sunlight to reach the ground surface for early seral vegetation to become established.
- Retain any natural meadows and openings and remove encroaching conifers from these open areas. Note that power-line easements make great openings and often provide habitat for deer and elk.
- In managed or thinned stands, create gaps of 1 to 5 acres on sites with east, south or west facing slopes and on slopes less than 30 percent and away from open roads.
- In created gaps, plant native shrubs that provide fruit, nuts, berries or browse for wildlife.
- Protect preferred forage species during forest operations.



White-tailed deer with fawns. Photo by Ken Bevis.

- Seed all disturbed soil including skid trails, yarding corridors, landings and decommissioned roads with a seed mix of native grass and forb species that will provide high forage value for deer, elk and other species.

These management prescriptions may not make sense for all landowners or all landscapes, but they will generally help provide better habitat for deer and elk.

Summary:

Managing for both healthy forests and healthy deer and elk herds is challenging. As the human population increases and the demand for human habitat rises, there will be more pressure to convert forested areas to other uses. Remember, keeping lands as working forests is the number one thing that land managers can do to promote wildlife habitat, including habitat for deer and elk.

More specifically, deer and elk require the right kinds of nutrition at the right times of year. Land managers whose goals include healthy deer and elk herds may consider what actions they can take to provide forage opportunities for ungulates on their lands. Conversely, managers may look at ungulate distribution across the state and take appropriate actions to discourage deer and elk from their lands. Damage to trees resulting from deer and elk is one of the biggest challenges facing landowners today. There are many ways of dealing with

deer and elk damage, and more studies are needed to determine the actual cost to landowners resulting from deer and elk browse. Understanding the needs of deer and elk, and how they change throughout the year is an important step toward achieving individual management objectives. Your forests, regeneration sites, meadows and streams can be managed to help provide excellent habitat for deer and elk through thoughtfully planned timber harvest, planting, vegetation management, and other stewardship activities.



Mule deer buck. Photo by Jim Ward.

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About The Woodland Fish and Wildlife Group

The Woodland Fish and Wildlife Group is a consortium of public agencies, universities, and private organizations which collaborates to produce educational publications about fish and wildlife species, and habitat management, for use by small woodland owners in the Pacific Northwest.

Currently available publications can be viewed and downloaded, free of charge, at the organization's website:

www.woodlandfishandwildlife.com

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Water features are important for many species of wildlife - including elk. Photo by Scott Fitkin.