2008 Restoration Thinning Project Plan and Results

Imagine Unit (Photo courtesy of Muckleshoot Indian Tribe)

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1.0 Background

Upland restoration thinning (RT) is the thinning of dense second-growth forest areas generally less than 30 years of age that have relatively low biological diversity and are in, or approaching, the competitive exclusion stage of forest succession. The RT program in the Cedar River Municipal Watershed (CRMW) was established by the Cedar River Watershed Habitat Conservation Plan (HCP) with the goal of developing complex habitat and accelerating the development of late-successional forest habitat characteristics. More specific objectives of RT include:

- reduce competition among trees;
- increase light penetration;
- stimulate tree growth;
- increase tree and understory plant species diversity;
- reduce long-term fire hazard;
- minimize the chance of catastrophic windthrow, insect, or disease outbreak;
- accelerate forest development past the competitive exclusion stage to a more biologically diverse stage, and/or;
- extend the stand initiation period such that more diverse species and stand structures become established.

The RT program focuses on those areas within the CRMW that have been harvested in the recent past (approximately 1970-present). The 50-year HCP committed fifteen years of funding to implement the restoration thinning program, within which time at least 10,480 acres of restoration thinning will have been treated.

2.0 Restoration Thinning Candidate Pool

All potential areas for RT were identified utilizing remotely-sensed LiDAR data to calculate average canopy height. Based on safety considerations, it was determined that the restoration thinning candidate pool would include stands of trees with an average canopy height of less than or equal to thirty feet (and greater than 3 feet tall to eliminate noise associated with the LiDAR data and shrub-dominated areas). The LiDAR analysis identified just over 12,000 acres in this pool.

A landscape-scale prioritization effort in 2005 identified areas with high priority for restoration based on proximity to high valued habitats such as old-growth forest, riparian areas, and wetlands. SPU staff ranked all the potential areas for RT using this prioritization scheme. We then collected field data to determine whether the current conditions warranted RT. All sites that would benefit from RT were then ranked, with the highest ranked sites treated first.

We also coordinate RT activities with the CRMW road decommissioning program, so some lower ranked sites may be treated before higher ranked sites if the access road is scheduled for decommissioning. Some of 2008 restoration thinning units were selected to compliment road decommissioning planned for 2009.

3.0 Objectives for 2008 Restoration Thinning

The prescriptions for 2008 RT treatments focused on the ecological objectives described in Section 1, but included the following additional objectives:

- Designing and implementing RT treatments to provide for varying forest stand structures and development pathways;
- Using slash treatments (lopping) in units with larger trees;
- Providing habitat connectivity/proximity to old growth and special habitats;
- Enhancing near term benefits to old growth and special habitats (wide spacing adjacent to older forest, snow gaps intended to promote increased seasonal filtration to adjacent wetlands);
- Minimizing habitat fragmentation;
- Improving elk and deer winter range habitat;
- Minimizing sediment production through road decommissioning and restoration.

4.0 Unit Summaries

2008 Restoration thinning consisted of 40 units receiving some treatment, totaling 696 acres. One unit (Imagine) was located in the lower municipal watershed, with the remainder located at higher elevations in the North Fork Cedar basin and the upper Lindsay Creek basin. Due to access and seasonal timing restrictions, work on these higher elevation units did not start until September. The units varied in size from 2 to 78 acres. The thinning was awarded to three different contractors.

The unit information, objectives, treatments, and post-treatment conditions are summarized in Table 1. Following is background information and maps for each unit.

Table 1. 2008 restoration thinning unit data

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
Imagine	35	30.1	1.4	3.5	Reduce conifer competition, decrease WH dominance, improve ungulate winter range habitat.	10,077 tpa (9,747 WH, 187 DF, 127 RC, 16 RA)	Thin 17 acres in two subunits to 134 tpa with three 100-ft diameter gaps. Thin 23 acres to 194 tpa plus four 100-ft diameter gaps. Priority to DF. No cutting of deciduous trees, WP, or RC. Cut no trees that are 6" dbh or greater. Lop and pile all slash in gaps.	Average tpa = 178, range 156 - 217
9	20	19.0	0.8	0.2	Reduce conifer competition, maintain/restore riparian forest adjacent to river. Avoid negative impacts to marbled murrelets or northern goshawks.	667 tpa (350 DF, 250 WH, 67 SF)	Thin to 170 tpa, No cutting of deciduous trees, WP, or RC. Cut no trees that are 6" dbh or greater. Leave tree priority: NF, DF, WH, SF. Leave thirteen 74-ft diameter skips. Create four 105 ft diameter gaps.	
18					Reduce conifer competition, decrease SF dominance. Increase structural heterogeneity in homogeneous stands. Limit surface erosion to streams and maintain shading. Avoid any negative impacts to marbled murrelets. Provide shaded habitat connectivity between old-growth and riparian forest.	9,563 tpa (9,250 SF, 313 WH)	For all subunits; No cutting of deciduous trees, western white pine, Alaska yellow cedar, western redcedar. Leave tree priority: noble fir, Douglas-fir, western hemlock, silver fir.	
Subunit 18.1	39	29.5	5.6	3.9			Thin to 194 tpa. Girdle trees 7-10" dbh. Cut no trees 10" dbh or greater. Leave twenty 74-ft diameter skips & one 50-ft skip along the stream. Create twelve 74-ft diameter & 22 105-ft diameter gaps. Lop and pile slash in gaps.	157 tpa (132 SF, 25 WH, 25 WRC)

Table 1. 2008 restoration thinning unit data (continued)

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
Subunit 18.2	43	32.9	2.6	7.5			Thin to 134 tpa. Girdle trees 7-10 dbh. Cut no trees 10" dbh or greater. Cut no trees within inner gorge. Leave one 50-ft one 100-ft, & one 150-ft wide linear skips, fourteen 74-ft & six 105-ft diameter skips. Create fourteen 74-ft & six 105-ft diameter gaps.	150 tpa (117 SF, 25 NF, 8 WH)
Subunit 18.3	10	10.0	0.0				Cut all silver fir that are 5" and less in diameter. If no 5" and less trees are present, thin to 134 tpa. Leave 100-ft wide skips on each side of stream as on map.	300 tpa (225 SF, 75 WH)
Subunit 18.4	33	0.0	2.0	0.0			Create 20 74-ft diameter gaps. Girdle all trees 7" dbh and greater. Leave largest tree in each gap.	Not applicable
24					Reduce silver fir dominance. Increase structural heterogeneity in homogeneous stands. Maintain amphibian migration corridors.	2,500 tpa (1,583 SF, 750 NF, 167 WH)	For all subunits; No cutting of deciduous trees, western white pine, Alaska yellow cedar, western redcedar. Leave tree priority: noble fir, Douglas-fir, western hemlock, silver fir.	
Subunit 24.1	5	4.4	0.3	0.3			Thin to 194 tpa. Girdle trees 7-9" dbh. Cut no trees 9" dbh or greater. Leave one 74-ft & one 105-ft diameter skip. Create one 74-ft and one 105-ft diameter gaps.	220 tpa (170 SF, 50 NF)

Table 1. 2008 restoration thinning unit data (continued)

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
Subunit 24.2	33	30.7	1.7	2.0			Thin northern 150 ft adjacent to old-growth (2 ac) to 134 tpa. Lop slash in this area. Thin rest of unit to 194 tpa. Girdle trees 7-9" dbh. Cut no trees 9" dbh or greater. Leave eight 105-ft diameter skips & 50-ft wide stream skip. Create 17 74-ft diameter gaps.	no data
Subunit 24.3	13	11.0	1.0	1.0			Thin to 124 tpa. Girdle trees 7-10" dbh. Cut no trees 10" dbh or greater. Leave ten 74-ft diameter skips. Create 10 74-ft diameter gaps.	no data
Subunit 24.4	3	3.0	0.0	0.0			Thin to 222 tpa. Girdle trees 7-10" dbh. Cut no trees 10" dbh or greater.	233 tpa (all SF)
Subunit 24.5	4	3.6	0.2	0.2			Thin to 302 tpa. Cut no trees 7" dbh or greater. Leave two 74-ft diameter skips. Create one 105-ft diameter gap.	no data
Subunit 24.6	9	8.5	0.1	0.4			Thin to 302 tpa. Girdle trees 7-10" dbh. Cut no trees 10" dbh or greater. Leave four 74-ft diameter skips. Create one 74-ft diameter gap.	no data
Subunit 24.7	2	2.0	0.0	0.0			Thin to 203 tpa.	no data
Subunit 24.8	22	21.2	0.8	0.0			Cut all silver fir that are 5" and less in diameter within 100 ' of meadow edge. Thin southern 150 ft adjacent to old-growth to 134 tpa. Lop this slash. Thin remaining unit to 302 tpa. Create 52 30-ft diameter gaps.	290 tpa (260 SF, 20 NF, 10 WH)

Table 1. 2008 restoration thinning unit data (continued)

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
Subunit 24.9	15	14.0	0.0	1.0			Cut all SF smaller than 5" dbh. Leave five 105-ft diameter skips. Create one 20x20ft treed gap (leaving 109 tpa)	188 tpa (238 SF, 50 WH)
36					Reduce conifer competition, decrease SF and WH dominance, limit surface erosion to streams, stabilize summer temperatures adjacent to talus, protect adjacent northern goshawk nesting habitat and amphibian habitat connectivity. Increase spatial heterogeneity. Avoid impacts to murrelets and goshawks.	Averages 6,500 tpa (4,500 WH, 1,167 SF, 833 DF)	For all subunits; No cutting of deciduous trees, western white pine, Alaska yellow cedar, western redcedar. Leave tree priority: noble fir, Douglas-fir, western hemlock, silver fir.	
Subunit 36.1	8	6.9	0.8	0.3			Thin to 194 tpa. Cut only trees less than 6" dbh. Leave one 74-ft and one 105-ft diameter skips. Create six 74-ft & one 105-ft diameter gaps.	283 tpa (100 SF, 67 WRC, 50 WH, 33 DF, 33 NF)
Subunit 36.2	25	21.0	1.6	2.4			Thin to 222 tpa. Cut only trees less than 6" dbh. Leave two 74-ft, two 105-ft, one 235-ft diameter skips, plus two 50-ft wide stream skips. Create ten 74-ft & three 105-ft diameter gaps.	no data
Subunit 36.3	15	13.2	0.8	1.0			Thin to 134 tpa. Cut only trees less than 6" dbh. Leave one 74-ft, two 105-ft, one 235-ft diameter skips, plus two 50-ft wide stream skips. Create four 74-ft & two 105-ft diameter gaps.	150 tpa (67 SF, 50 WH, 33 DF, 33 NF)
Subunit 36.4	2	1.7	0.0	0.3			Thin to 170 tpa. Cut only trees less than 6" dbh. Leave two 50-ft wide linear skips.	no data

Table 1. 2008 restoration thinning unit data (continued)

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
61					Reduce conifer competition, decrease SF and WH dominance, increase structural heterogeneity. Provide shade along streams. Accelerate forest development along streams.		For all subunits; No cutting of deciduous trees, western white pine, Alaska yellow cedar, western redcedar. Leave tree priority: noble fir, Douglas-fir, western hemlock, silver fir.	
Subunit 61.1A	8						Cut all trees less than 7" dbh	130 tpa (70 SF, 40 WH, 20 NF)
Subunit 61.1B	35	20.7	8.0	6.3			Thin to 302 tpa. Cut only trees 7" dbh or less. Leave five 150--ft diameter skips & a 100-ft wide stream skip. Create 14 30-ft diameter gaps per acre, leaving all 8" and larger trees in gaps.	629 tpa (386 RA, 207 SF, 22 WH, 14 NF)
Subunit 61.1C	23	21.0	0.0	2.0			Cut all silver fir less than 5" dbh. Leave 100-ft wide stream skip.	363 tpa (194 SF, 131 WH, 25 NF, 13 RA)
Subunit 61.2	23	20.6	1.2	1.2			Thin to 194 tpa. Cut only trees 10" dbh and less. Girdle trees 7-10" dbh. Leave six 105-ft diameter skips. Create six 105-ft diameter gaps (2 gaps with one tree, two with two trees, two with three trees left).	390 tpa (250 SF, 50 WH, 30 NF, 20 RC)
Subunit 61.3	3	3.0	0.0	0.0			Cut all trees 7"dbh and less. Lop all slash.	183 tpa (133 WH, 33 SF, 17 NF)
Subunit 61.4A	28	25.0	1.5	1.5		4,060 tpa (3,760 SF, 120 WH, 100 NF, 60 DF, 20 WRC)	Thin to 134 tpa. Leave five 74-ft and five 105-ft diameter skips. Create five 74-ft and five 105-ft diameter gaps (in 105-ft diameter gaps cut only SF & WH)	133 tpa (72 SF, 50 NF, 6 DF, 6 WH)
Subunit 61.4B	2	2.0	0.0	0.0			Cut all trees 7"dbh and less. Lop all slash.	235 tpa (142 SF, 34 NF, 34 WH, 25 DF)
Subunit 61.4C	4	4.0	0.0	0.0			Cut all trees 7"dbh and less. Lop all slash.	

Table 1. 2008 restoration thinning unit data (continued)

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
Subunit 61.5	30	22.9	1.2	5.9			Thin to 194 tpa. Leave fifteen 74-ft diameter skips, and 100-ft and 150-ft wide linear skips. Thin unit between the linear skips to 15'x15' spacing +/- 10' with 33% of the trees spaced 5'x5' (1740 tpa), 33% of the trees spaced 15'x15' (194 tpa) and 33% of the trees spaced 25'x25' (70 tpa), spacing should vary from tree to tree. Create twelve 74-ft diameter gaps.	204 tpa (204 SF)
Subunit 61.6	0	0.0	0.0	33.0		4,093 tpa (2,611 SF, 1,250 WH, 111 MH, 56 DF, 56 NF)	Entire unit is skipped.	
Subunit 61.7	13	8.5	0.6	3.9			Thin to 134 tpa. Leave meadow skip areas. Create six 74-ft diameter gaps.	117 tpa (92 SF, 25 NF)
Subunit 61.8	78	69.8	1.4	6.8			Thin to 170 tpa west of main stream. Leave 100 -ft wide skip along stream & nine 105-ft diameter skips. Create seven 105-ft diameter gaps. Girdle all 8" and larger, cut all <8" trees. Leave one largest tree/gap.	217 tpa (133 SF, 67 WH, 17 RC)
Subunit 61.8A through E	17		4.8		Increase snow accumulation and retention adjacent to wet meadows to help maintain meadow hydrology and habitat characteristics		Create eight rectangular snow gaps 35'x150'. Leave four trees/gap. Girdle all 8" and larger trees, cut all <8" trees. Between the snow gaps, thin to 680 tpa.	
Subunit 61.9	15	12.7	0.8	1.5		7,417 tpa (6,750 SF, 875 WH, 83 NF)	Thin area south of skip to 170 tpa. Thin area north of skip to 134 tpa. Skip 100-ft wide linear area, plus leave four 74-ft diameter skips. Create four 74-ft diameter and two 105-ft diameter gaps.	142 tpa (125 SF, 17 RC)

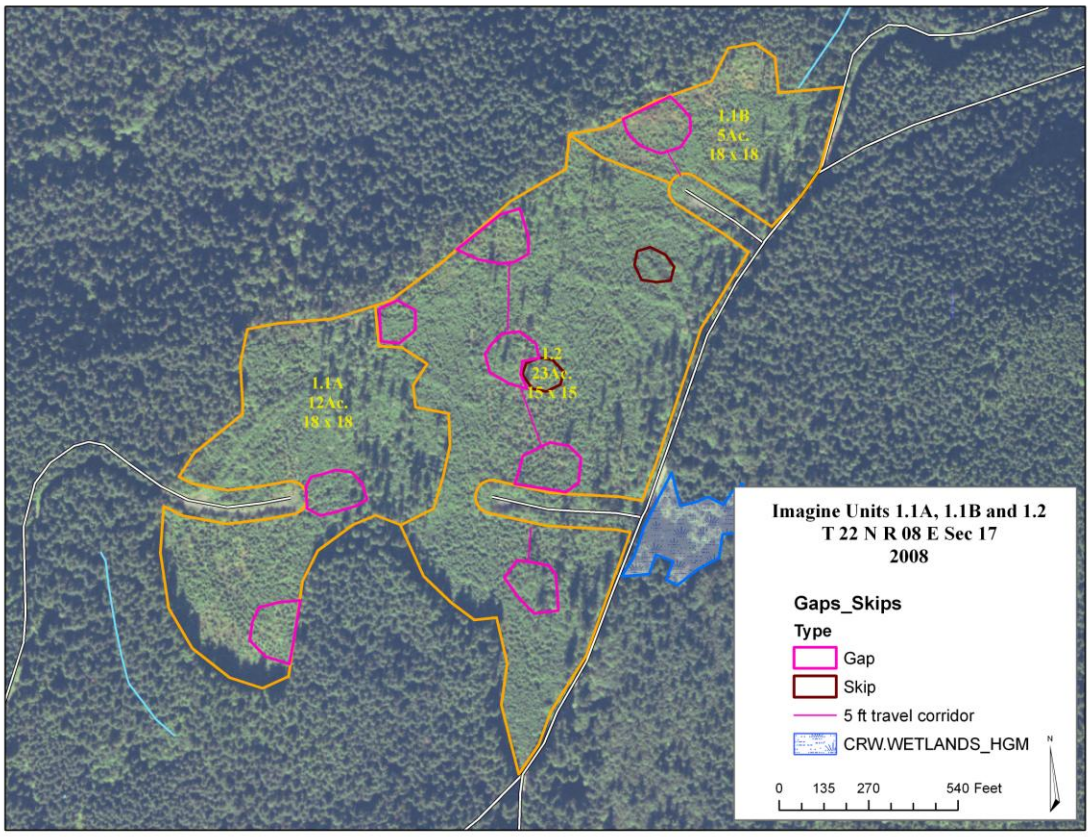
Table 1. 2008 restoration thinning unit data (continued)

Unit ID	Acres				Objectives	Pre-Treatment Conditions	Prescriptions	Post-Treatment Conditions
	Total	Thin	Gaps	Skips				
Subunit 61.10	11	8.7	0.6	1.7			Thin to 134 tpa. Girdle all 8" and larger trees, cut all <8" trees. Leave a 100-ft wide linear skip & four 74-ft diameter skips. Create six 74-ft diameter gaps.	125 tpa (75 SF, 50 NF)
Subunit 61.11	56		4.5	3.7			Skip entire western edge of unit. Create 27 74-ft diameter and nine 105-ft diameter gaps. Girdle all 8" and larger trees, cut all <8" trees. Leave one largest tree/gap.	
Subunit 61.12	14			1.0			Thin 33% of unit to 435 tpa, 33% to 194 tpa, and 33% to 109 tpa. Leave five 105-ft diameter skips.	

Imagine Unit (35 acres)

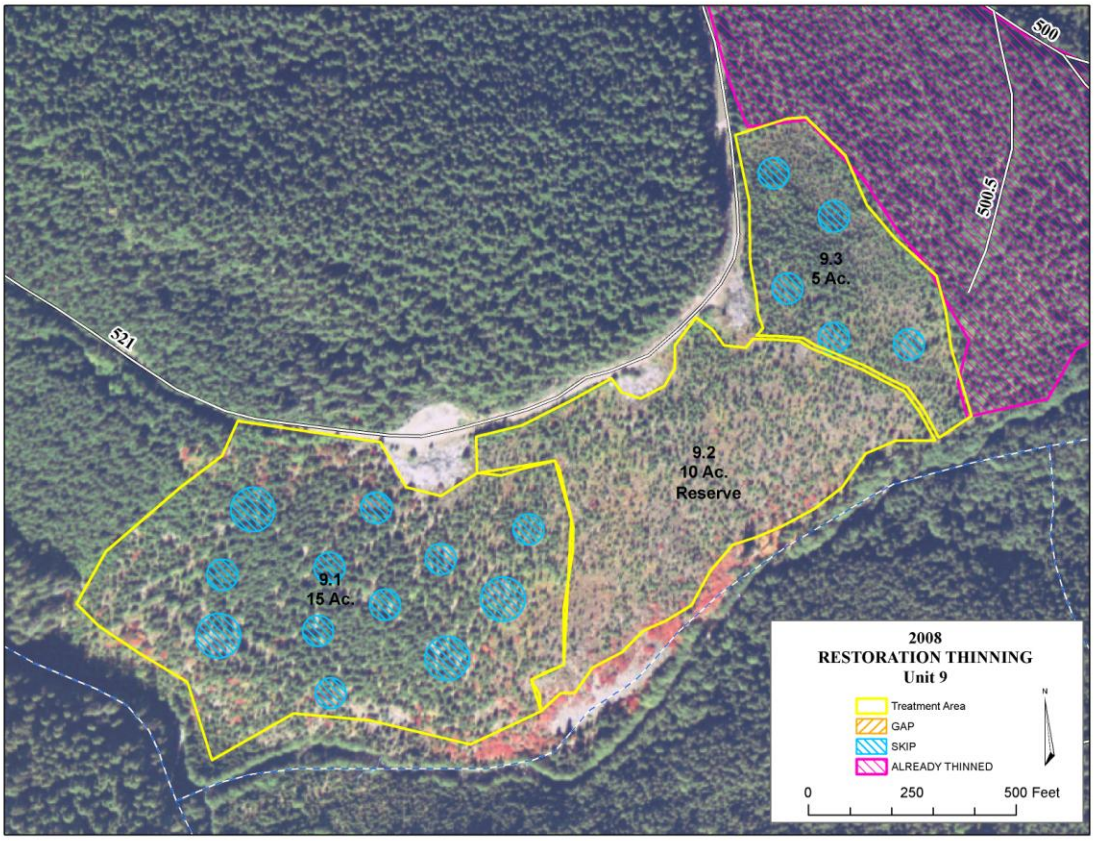
The area was initially harvested in approximately 1920 and trees were likely allowed to regenerate naturally. A commercial thinning occurred in 1986, with the objective of removing the suppressed and poor quality trees as well as spacing the remaining trees with the intention of a future commercial harvest. A commercial variable retention harvest occurred in 1994, when the stand was 74-years-old. This design left part of the stand in thinned wedges, with regeneration harvest in between. The thinned wedges suffered significant blow-down after the 1994 harvest, and salvage of the blown down trees occurred. The area was planted with Douglas-fir and western red cedar seedlings in 1995. Western hemlock naturally regenerated.

Imagine was a unit that had been awarded but not completed in 2007. Five acres of restoration thinning was completed in 2007, with the remaining 35 acres completed in 2008. The prescriptions for the Imagine Units changed from 2007 to 2008, adding gaps, connecting corridors between the gaps, and slash treatment within the gaps for winter range improvement for ungulates. Bids were awarded on May 2, 2008 and the contract work was completed by August 5, 2008.



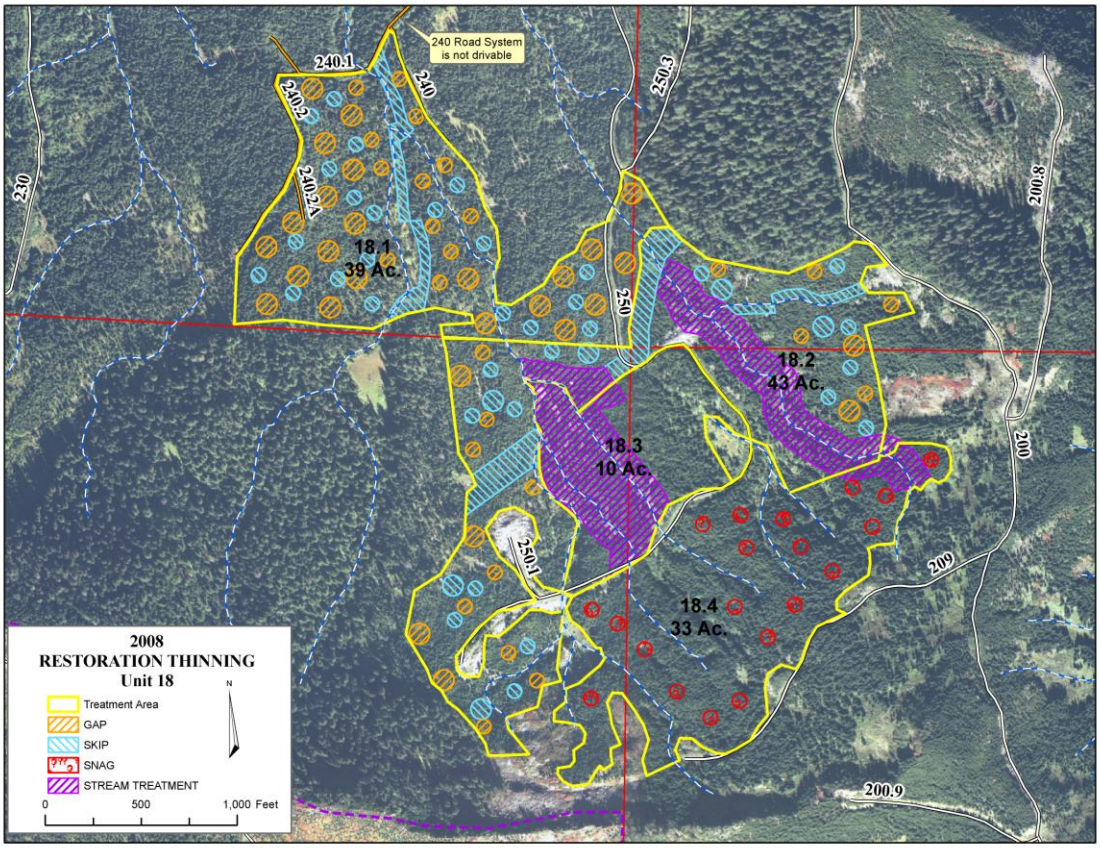
Unit 9 (30 acres)

Unit 9 (with three subunits) was clear-cut harvested by a USFS contractor around 1984 and apparently planted with Douglas fir seedlings about 1985 (specific planting information unavailable). About 80% of this section was clear-cut harvested, while the remaining 20% consists of original forest. Approximately eighty acres of old growth forest is located adjacent and directly to the north of these units. The southwestern boundary of Unit 9.1 is adjacent to an original forest riparian buffer on the North Fork of the Cedar River; however there is no riparian buffer in the portions of subunit 9.1, 9.2, and 9.3 that are adjacent to a tributary to the North Fork of the Cedar River.



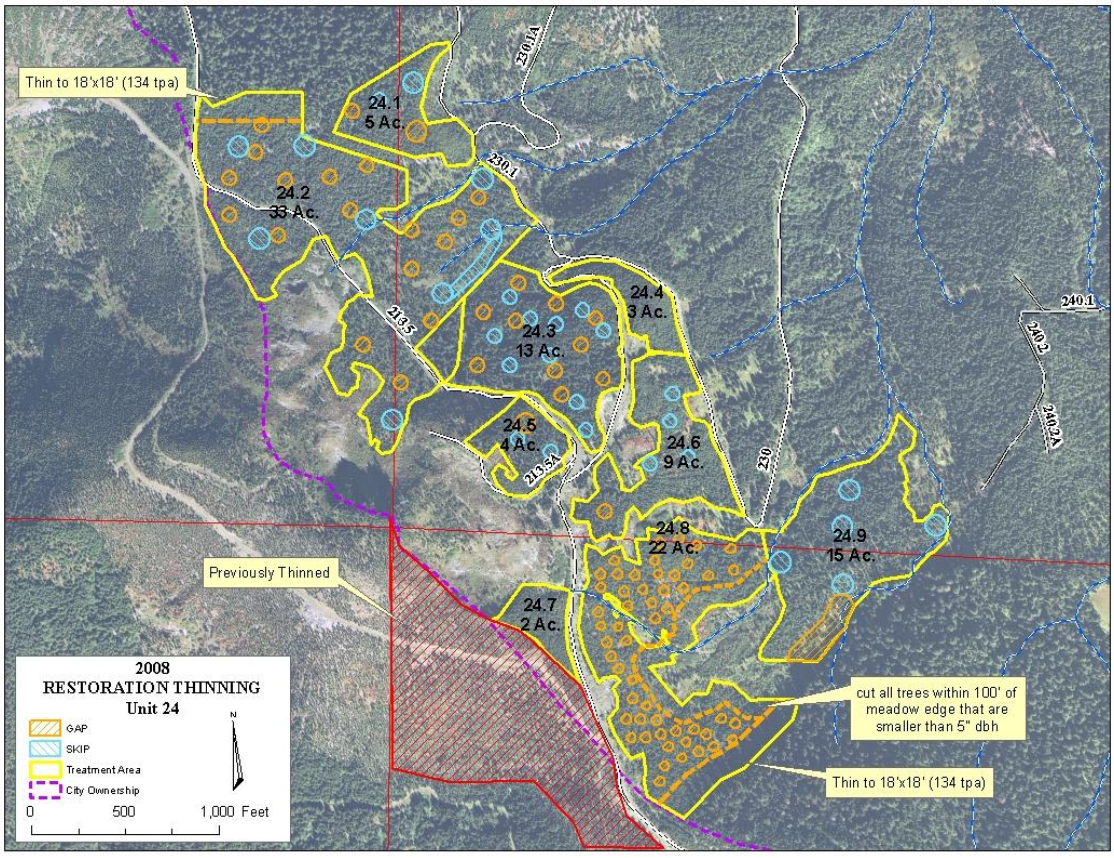
Unit 18 (125 acres)

Unit 18 (with four subunits) is located in the upper Lindsay Creek basin. The area was clear-cut harvested between the years of 1966 and 1972. The unit is dominated by silver fir, so likely these areas were allowed to regenerate naturally. Original (old growth) forest borders the unit to the north and west. All the sub-units that comprise Unit 18 have streams flowing through them, with associated riparian habitat. The gaps in Unit 18.2 were planted in October of 2008 with Douglas fir, western white pine, western red cedar and noble fir. The area tends to be deficient in snags. In unit18.4 small gaps were created by girdling all trees 7 inches or larger, to create snag patches. Within each of these small gaps, the largest tree was left. This prescription created numerous snags for the use in the short-term, plus canopy heterogeneity over the unit.



Unit 24 (106 acres)

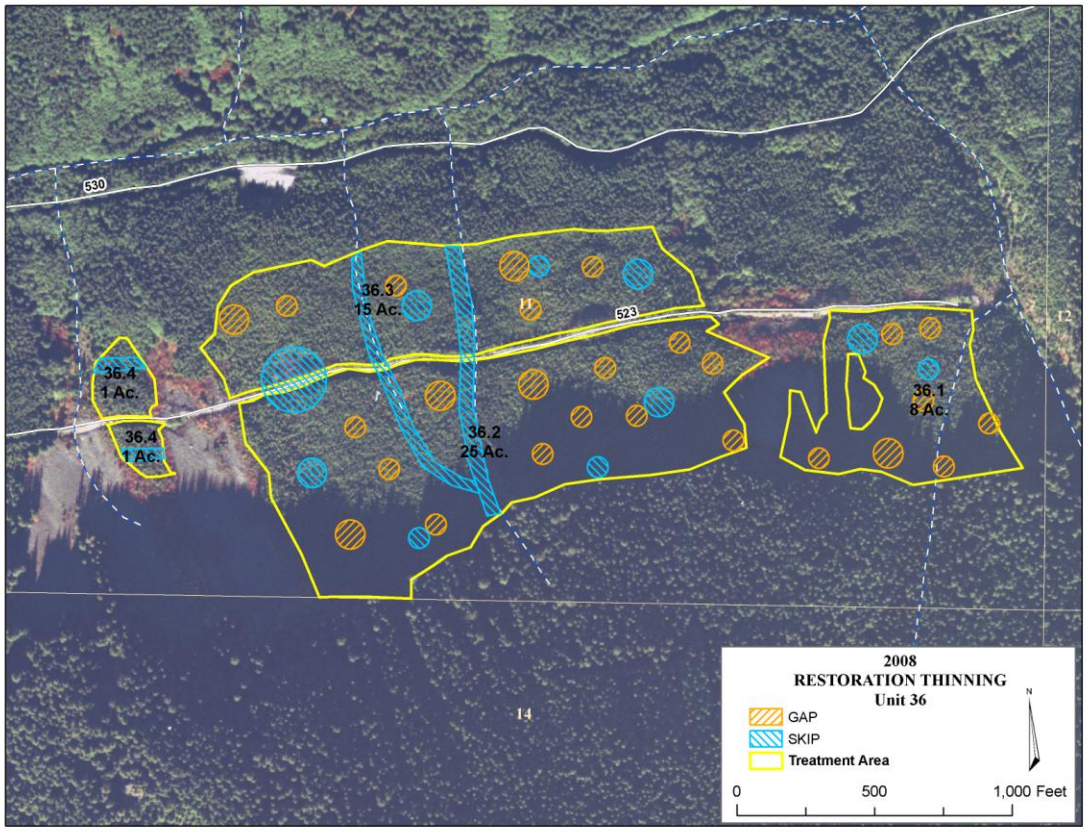
Unit 24 (with nine subunits) is located in the upper Lindsay Creek basin on the southern ownership boundary. Records indicate that the area was clear-cut harvested between the years of 1959 and 1978. The area is dominated by silver fir, therefore it is assumed that these areas were allowed to regenerate naturally. Old growth forest borders Unit 24 to the northwest and southeast. Some of the sub-units have streams and wetlands that are important amphibian habitat. In these areas, many small closely spaced gaps were installed, with the goal of greater snow accumulation and thus longer water retention in the wetlands during the summer.



Unit 36 (50 acres)

Unit 36 (four subunits) is located in the North Fork Cedar River basin, approximately one mile from the North Fork/South Fork Cedar River confluence. Records indicate that the area was clear-cut harvested between the years of 1952 and 1979. There is a mix of species, including Douglas-fir, in this unit and it is unclear whether or not this area was allowed to regenerate naturally. Old growth forest borders the unit to the south. Additionally, talus slopes are scattered between the subunits. A mid-slope road (523 Road) bisects the unit and is scheduled to be decommissioned. To avoid disturbing potentially nesting northern goshawks and marbled murrelets, thinning began after the nesting season ended (August 31).

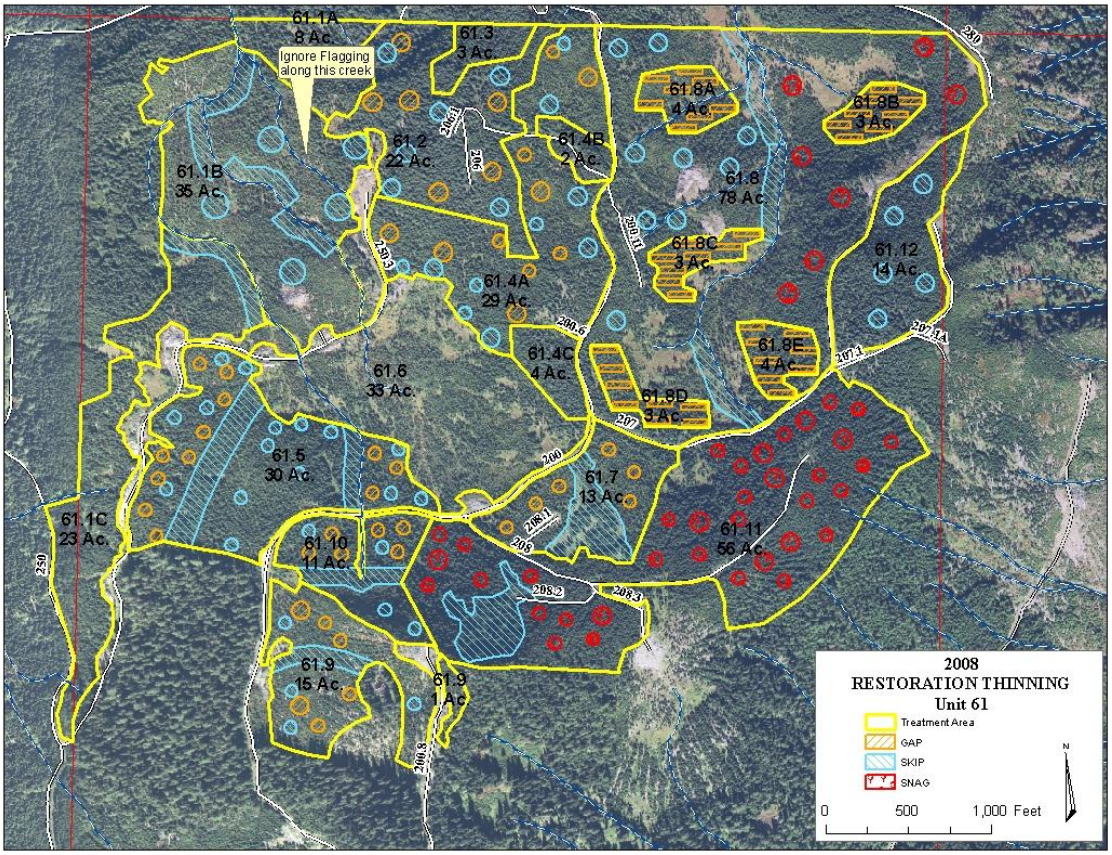
It is unknown whether or not Larch Mountain salamanders (a Federal Species of Concern and a Washington State sensitive species) reside in the talus slopes near the unit. This species is found in habitat with similar features elsewhere in the CRMW. Varying the tree spacing between the units and providing skips within these units is intended to provide both short and long term habitat for the salamanders as well as other species. Linear skips are designed to provide connectivity between the talus slopes.



Unit 61 (393 acres)

Unit 61 (21 subunits) is located in the upper Lindsay Creek Basin, and like Units 18 and 24, includes the headwaters of several tributaries to Lindsay Creek. Records indicate that the area was harvested between the years of 1969 and 1973. Currently, this area is dominated by silver fir, which likely regenerated naturally after harvest. Old growth forest borders several of the southern subunits. To avoid disturbing potentially nesting marbled murrelets, thinning began after nesting season ended (August 31). There are several streams, wet meadows, and small wetlands in the area that provide important amphibian habitat. Linear skips provide travel corridors between these habitats and the old-growth forest.

The area tends to be deficient in snags. In units with trees too tall to safely restoration thin (e.g., 61.11), small gaps were created by girdling all trees 8 inches or larger to create snag patches. Within each of these small gaps, the largest tree was left. This prescription created numerous snags for the use in the short-term, plus canopy heterogeneity over the unit.



5.0 Summary Information about Skips and Gaps

The 2008 treatments incorporated numerous small skips (areas of no treatment) and gaps (small areas where most or all trees are cut or girdled) (Table 2). The skip density within a unit ranged from 4% to 100% of the unit acres. The gap density within a unit ranged from 1% to 33% of the unit.

Table 2. Percentage of each unit in skips and gaps

Unit	Acres	Percent Skip	Percent Gap
Imagine	35	0%	11%
9.1	15	11%	0%
9.2	10	100%	0%
9.3	5	10%	0%
18.1	39	10%	14%
18.2	43	17%	6%
18.3	10	0%	0%
18.4	33	0%	0%
24.1	5	6%	6%
24.2	33	6%	5%
24.3	13	8%	8%
24.4	3	0%	0%
24.5	4	5%	5%
24.6	9	4%	1%
24.7	2	0%	0%
24.8	22	0%	0%
24.9	15	7%	0%
36.1	8	4%	10%
36.2	25	10%	6%
36.3	15	13%	5%
36.4	2	15%	0%
61.1a	8	0%	0%
61.1b	35	18%	23%
61.1c	23	9%	0%
61.2	23	5%	5%
61.3	3	0%	0%
61.4a	28	5%	5%
61.4b	2	0%	0%
61.4c	4	0%	0%
61.5	30	20%	4%
61.6	33	100%	0%
61.7	13	30%	5%

61.8	78	9%	2%
61.8a	4	0%	25%
61.8b	3	0%	33%
61.8c	3	0%	33%
61.8d	3	0%	33%
61.8e	4	0%	25%
61.9	15	9%	5%
61.1	11	15%	5%
61.11	56	7%	8%
61.12	14	7%	0%

4.0 Costs

In 2008 a total of 696 acres was treated at a total cost of $140,488, for an average per acre cost of $202 (Table 3).

Table 3. Bid prices per unit

Unit	Acres	Bid per acre	Bid per unit
Imagine	35	$164.00	$5,740.00
roadside slash	5	$290.00	$1,450.00
gap creation and gap slash treatment	4	$390.00	$1,560.00
Imagine corridor	<1	$340.00	$340.00
Total Imagine	**35**		**$9,090.00**
9.1	15	$211.00	$3,165.00
9.3	5	$211.00	$1,055.00
Total Unit 9	**20**		**$4,220.00**
18.1	39	$321.00	$12,519.00
18.2	43	$206.00	$8,858.00
18.3	10	$178.00	$1,780.00
18.4	33	$125.00	$4,125.00
Total Unit 18	**125**		**$27,282.00**
24.1	5	$268.00	$1,340.00
24.2	33	$197.00	$6,505.00
24.3	13	$267.00	$3,471.00
24.4	3	$220.00	$660.00
24.5	4	$263.00	$1,052.00
24.6	9	$228.00	$2,052.00
24.7	2	$164.00	$328.00
24.8	22	$298.00	$6,556.00

24.9	15	$184.00	$2,760.00
Total Unit 24	**106**		**$24,724.00**
36.1	8	$275.00	$2,200.00
36.2	25	$275.00	$6,875.00
36.3	15	$275.00	$4,125.00
36.4	2	$275.00	$550.00
Total Unit 36	**50**		**$13,750.00**
61.1A	8	$174.00	$1,392.00
61.1B	35	$174.00	$6,090.00
61.1C	23	$184.00	$4,232.00
61.2	23	$184.00	$4,232.00
61.3	3	$424.00	$1,272.00
61.4A	28	$194.00	$5,432.00
61.4B	2	$424.00	$848.00
61.4C	4	$424.00	$1,696.00
61.5	30	$218.00	$6,540.00
61.7	13	$174.00	$2,262.00
61.8	78	$154.00	$12,012.00
61.8 A,B,C,D,E	17	$232.00	$3,944.00
61.9	15	$210.00	$3,150.00
61.1	11	$204.00	$2,244.00
61.11	56	$54.00	$3,024.00
61.12	14	$218.00	$3,052.00
Total Unit 61	**360**		**$61,422.00**
	696		**$140,488**

5.0 Lessons Learned

Communication with the contractors could improve. There were three different restoration thinning contractors in 2008. During the pre-work meetings, two of the contractors had foremen attend, while the third did not. The discussions of the complex prescriptions and how they should be implemented occurred at the pre-work meeting, and this information was not consistently transferred to the foreman. Because of this lack of communication within the thinning companies, additional explanations and examples of what was intended had to occur while some of the thinning units were being cut and mistakes had to be remedied.

Communication with the compliance contractors is critical to the success of the project. Including these contractors as participants in the pre-work meetings, coordinating schedules, and keeping up to date with all issues relating to restoration thinning is critical. As we incorporate more complexity into the prescriptions, traditional compliance

sampling methods may not capture the results we intended. Determining how to sample complex prescriptions efficiently and effectively continues to be challenging.

An individual devoted exclusively to flagging boundaries was valuable. It was best to flag all unit boundaries unless they were bounded by a road or a well-defined forest stand type change.

Electronic data collection was designed this year by the compliance contractor. The design included both on screen compliance calculations and tpa status by species calculated in real time as data are collected. This streamlined data transfer and improved efficiency, as well as giving the compliance contractor instant glance of compliance status while in progress.

A separate compliance method to capture the frequency of the skip and gap installations was also included in the data collection design. Skip and gap tally points were collected at each plot and at points midway between plots with a minimum of 10 tally points per unit with skips and gaps.

It continued to be important to check skip and gap sizes to ensure they were installed as prescribed. It was obvious upon inspection that some contractors were being consistent in measuring skip and gap size and others were not.