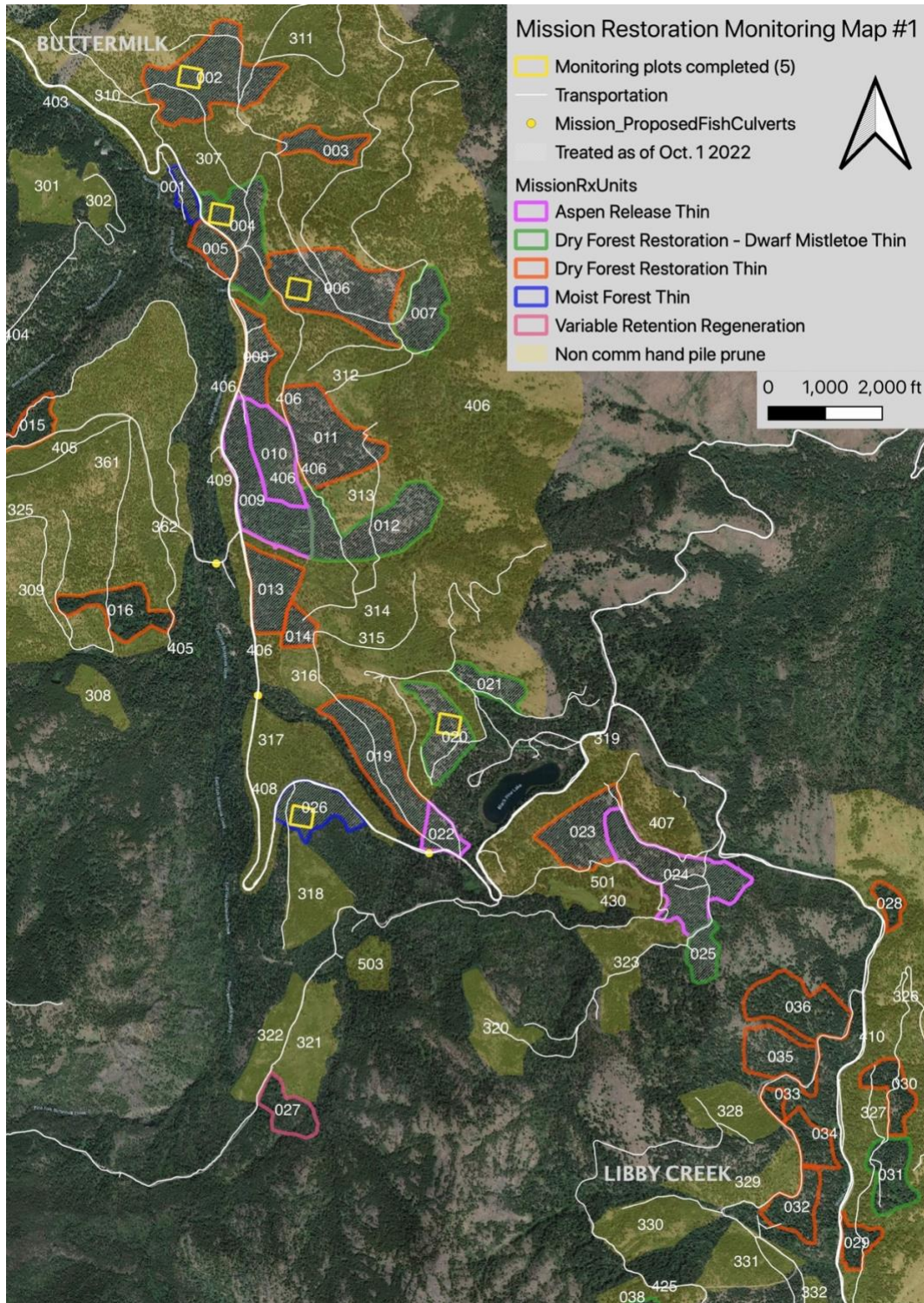


Treatment Monitoring Report #1 - Mission Restoration Project

Methow Valley Ranger District, Okanogan-Wenatchee National Forest - Winthrop, WA
Monitoring and report by Sam Israel, Methow Valley Citizens Council
October 28, 2022



Map 1. Northern half of the Mission Restoration Project planning area

Summary

1. Three acre monitoring plots were installed in 5 different units with varying prescriptions in the Mission Restoration Project. All retained trees were tallied using a “Quick Map” method.
2. In all 5 units, vegetation treatments shifted the structure and composition of the forest. In some cases, density was reduced to below target levels and larger trees were not clearly favored. Both ladder fuels and dwarf mistletoe were significantly reduced. Some small- to medium-sized snags were retained.
3. In the monitoring plots, post-harvest spatial patterns could be characterized as having low variability. Two unit’s monitoring plots, unit 20 and 26, were found to have low tree densities and had very little to no variability. They consist of well-distributed, individual trees and openings. The monitoring plots in the other three units consisted of trees that were somewhat uniformly spaced. The proportion of widely spaced individual trees was high and the number of small clumps (2-4 trees) was low, while the number of medium and larger clumps was very low. While each of these 5 units had openings, those did not fall in the 3 acre monitoring plots. The plots are representative of areas outside of major openings.

Introduction

The Okanogan-Wenatchee National Forest Restoration Strategy provides guidance for restoration treatments that seek to increase forest resilience and achieve other ecological functions. The Strategy describes a desired management approach that, in its words, “aims to enhance the resilience and sustainability of forests through treatments that incrementally return the ecosystem to a state that is within a historical range of variability of conditions tempered by potential climate change impacts.” The Strategy also stresses the importance of monitoring that can inform adaptive management to continually improve management approaches.

To better understand ongoing forest health treatments and support adaptive management, the Wilderness Society provided funding to monitor the short- and intermediate-term changes resulting from treatments that are part of the Mission Restoration Project in the Methow Valley Ranger District. Of particular interest is the extent to which treatments resulted in spatially variable conditions created by clumps, openings, and complex patches. The monitoring evaluates stand-level forest structure, composition and the number of residual trees per acre. The primary goal of this monitoring effort and report is to provide a data-driven, objective assessment of treatments that can be used by partners to inform future projects. It should be noted that prescriptions have multiple objectives in addition to restoring the forest’s historical spatial pattern, retaining larger trees, releasing aspen, reducing ladder fuels, and reducing dwarf mistletoe. It is not always possible to achieve all of these objectives in every stand simultaneously. The results of this monitoring effort should be interpreted in this light.

Field Data Collection and Inquiry

A total of 5 treatment units were evaluated (Map 1). Unit selection was done after a thorough review of project documents and the subsequent DXP prescription. The 5 units span a range of dry forest thin treatment types and all of the units had been harvested. Aspen Release Thin, Variable Retention Regeneration and non-commercial fuel reduction prescriptions will be monitored in an additional report. To assess the post-harvest conditions, a method of field data collection called “quick mapping” was used to identify clumping levels, the number of trees per acre and the basal area. LeFevre et al (2020) and others have used similar monitoring protocols and methods to evaluate the treatment effectiveness of meeting the prescription’s stated objectives, such as achieving density, composition and spatial variability targets.¹ 3-acre plots are relatively effective in capturing the spatial variability and density of larger contiguous areas.

In each of the 5 units a 3-acre square plot was identified at random. In this case, a simple quick map obtained sufficiently accurate data to quantify basic stand-level spatial patterns. Clumps are groups of connected trees within a specified inter-tree distance measured from tree to tree. A 20’ fixed inter-tree distance, is the distance provided in EA project documents that defines clumping. Trees that have no neighbors within 20’ or do not share interlocking canopies, are termed an ‘individual.’ Retained Douglas fir trees over 7” dbh and ponderosa pine trees over 9” dbh were identified in the field using this fixed distance. For individual trees (no neighbors within 20’), dbh and species were recorded. For trees in clumps, tree count (clump size), an average diameter of those trees included in the clump and their species were recorded. Results includes a post-harvest TPA, an estimated residual basal area and a basic clumping score. Clumping scores correspond to the percent of trees retained in clumps inside the monitoring plot. Retained snags were identified in the monitoring plot. Detailed species lists are available upon request. Data were collected using the ICO APP. This APP was designed for Quickmap forest monitoring (see <https://scholarworks.umt.edu/ico/>).

Additional inventory plots need to be considered to verify that conditions within the 3-acre square monitoring plots are consistent with those found in the full spatial extent of the treatment units.

¹ LeFevre, Miles E., et al. "Evaluating restoration treatment effectiveness through a comparison of residual composition, structure, and spatial pattern with historical reference sites." *Forest Science* 66.5 (2020): 578-588.

Results

A summary of post-harvest conditions can be reviewed below, Table 1 entitled “Plot summary data.” Table 2 provides provisions from the DxP prescription for comparison to those in the Mission Restoration Project Environmental Assessment (EA) Appendix A, “Proposed Thinning and Prescribe Fires Treatments.”

Table 1. Plot summary data

Unit #	Post-harvest TPA	DxP TPA	EA TPA	Clumping score^	Residual BA
2	18	30-40	30-50	Low (14%)	35
4	17	20-30	30-50*	Low (12%)	21
6	17	30-40	30-50	Medium (31%)	40
20	12	20-30	20-30~	None	23
211 (26)	13	Unknown	40-50	None	16

*Assuming warm-dry PAG, ~assuming hot-dry PAG, ^ percent of trees clumped inside monitoring plot

Unit 2 is located along the northeast boundary of the Project Area and has been treated with the Dry Forest Restoration Thin prescription and as a Warm-Dry plant associations per the DxP prescription. The EA specifies post-harvest trees per acre (TPA) as a range from 30-50 residual trees. Actual post-harvest TPA is 18. The number of clumps is low to minimal and 12% or 7 trees out of 56 were retained in small, 2-3 tree clumps. This unit was mainly flat ground and included in the monitoring plot are a number of areas with significantly displaced soils from rutting. This unit was chosen for monitoring after it was decided that this unit looked more variable than others following an initial visual reconnaissance.

Unit 4 is located along the 4300 road and has been treated with the Dry Forest Restoration Thin with Dwarf Mistletoe Reduction prescription (DFDMT). A plant association is not defined and the DxP prescription designated this unit to be treated with the DFDMT prescription to achieve a 20-30 post-harvest TPA. Actual post-harvest TPA is 17 in this unit. The number of clumps is low to minimal and 14% or 7 trees out of 51 were retained in small, 2-3 tree clumps. This unit was located on flat ground and included some openings that were not captured in the monitoring plot.

Unit 6 is located adjacent to Unit 4, just above the 4300 Rd and has been treated the Dry Forest Restoration Thin prescription and as a Warm-Dry plant association per the DxP prescription. The EA specifies post-harvest TPA in the range from 30-50 and the DxP specifies a range of 30-40 residual trees per acre. Actual post-harvest trees per acre is 17 TPA. Clumping levels are low to medium and 31% or 19 trees out of 61 were retained in small, 2-3 tree clumps. The plot included one larger 5 tree clump composed of smaller diameter trees. There were no snags present in the monitoring plot. This unit was on a slope and included elevated levels of mechanical damage and bole rub. This unit was chosen for monitoring after it was decided that this unit looked more variable than others following an initial visual reconnaissance.

Unit 20 is centrally located adjacent to the Black Pine Lake and has been treated with the Dry Forest Restoration Thin with Dwarf Mistletoe Reduction (DFDMT) prescription. A plant association is not defined and the DxP designated this unit to be treated with the DFDMT prescription to achieve a 20-30 post-harvest TPA. Actual post-harvest tree per acre is 12. All of the 37 trees retained post-harvest are individuals, with no trees were left in clumps. 5 snags are included in the TPA count (so closer to 10 or 11 live TPA). Snags are small diameter and weakened trees. This unit was located along a gentle slope.

Unit 211 is located along the 4300 road and has been treated. It is unclear what prescription was used to treat this unit. This unit is not listed as part of the DxP prescription. This unit corresponds to the EA Unit 26, which specifies it to be a Moist Forest Thin prescription with a post-harvest TPA range of 40-50. Actual post-harvest trees per acre is 13. All of the 41 trees retained post-harvest are individuals, with no trees left in clumps. Unit 26 is linked to the project's purpose #3, vegetation composition and structure. This unit is located on a gentle slope.

Table 2. Plot data: post-harvest TPA, clumping levels, Environmental Assessment and DxP prescription provisions

EA Unit number	2	4	6	20	211 (26)
Unit size (acres)	48	20	40	12	unknown
Monitoring plot size (acres)	3	3	3	3	3
Post-harvest trees per acre, current condition	18	17	17	12	13
DxP TPA	30-40	20-30	30-40	20-30	unknown
EA approximate average number of trees per acre per	30-50	20-30, assuming hot-dry*	30-50	30-50, assuming warm-dry	40-50
Clump size bins and tree per target (Individuals, 2-4, 5-9,10-14, 15-30+)	49/32, 7/27,0/27, 0/21, 0/0	44/27, 7/23, 0/19, 0/8, 0/0	33/32, 13/23, 6/23, 0/14, 0/0	37/27, 0/19,0/19, 0/12, 0/0	41/45, 0/38, 0/38, 0/30, 0/0
Percent tree clumped	14%, assuming 35 TPA (DxP average)	12%, assuming 25 TPA (DxP average)	31%	None	None
Post-harvest BA estimate	36	21	40	23	16
Rx	Dry Forest Restoration Thin	Dry Forest Restoration Thin with Dwarf Mistletoe Reduction (DFDMT)	Dry Forest Restoration Thin	Dry Forest Restoration Thin with Dwarf Mistletoe Reduction (DFDMT)	Moist Forest Thin

<p>EA Prescription provisions</p>	<p>Page 341</p> <p>Maintain and restore elements of historic forest stand structures including tree density, large and old trees, species composition, and spatial patterns (including tree clumps, individual trees, and canopy openings) to increase stand and landscape resiliency to natural disturbances including forest insect attacks, tree diseases, and wildfires. Desired residual tree density, species composition, and spatial patterns within stands are derived from data collected in reference stands located in the eastern Washington Cascades (Nature Conservancy et al. 2016; Ohlson and Schellhaas. 2002; Ohlson 1996) and previously implemented projects on the Methow Valley Ranger District.</p> <p>Dwarf mistletoe and root disease may be present in individual trees or small pockets and are not widespread throughout treated stands. Anticipated tree mortality caused by post-</p>	<p>Page 343</p> <p>This treatment is similar to the previously described dry forest restoration thin treatment with an emphasis on reducing Douglas-fir dwarf mistletoe infection levels in treated stands.</p> <p>The Dry Forest Restoration Thin harvest treatment would be applied throughout areas that are adequately stocked with vigorous and disease-free trees to meet density, species composition, and spatial pattern treatment objectives.</p> <p>Young and mature trees (with an estimated age of less than 150 years) 20 inches DBH and smaller infected with dwarf mistletoe would be harvested throughout treatment units to achieve dry forest restoration thin tree</p>	<p>Page 341</p> <p>Maintain and restore elements of historic forest stand structures including tree density, large and old trees, species composition, and spatial patterns (including tree clumps, individual trees, and canopy openings) to increase stand and landscape resiliency to natural disturbances including forest insect attacks, tree diseases, and wildfires. Desired residual tree density, species composition, and spatial patterns within stands are derived from data collected in reference stands located in the eastern Washington Cascades (Nature Conservancy et al. 2016; Ohlson and Schellhaas. 2002; Ohlson 1996) and previously implemented projects on the Methow Valley Ranger District.</p> <p>Dwarf mistletoe and root disease may be present in individual trees or small pockets and are not widespread throughout treated stands. Anticipated tree mortality caused by post-</p>	<p>Page 343</p> <p>This treatment is similar to the previously described dry forest restoration thin treatment with an emphasis on reducing Douglas-fir dwarf mistletoe infection levels in treated stands.</p> <p>The Dry Forest Restoration Thin harvest treatment would be applied throughout areas that are adequately stocked with vigorous and disease-free trees to meet density, species composition, and spatial pattern treatment objectives.</p> <p>Young and mature trees (with an estimated age of less than 150 years) 20 inches DBH and smaller infected with dwarf mistletoe would be harvested throughout treatment units to achieve dry forest restoration thin tree retention objectives (including heterogeneous</p>	<p>Page 344</p> <p>Conifers of merchantable diameter would be harvested to reduce subalpine fir/Engelmann spruce forest cover and promote Douglas-fir and lodgepole pine forest cover in two stands totaling an estimated 37 acres (units 26 and 27). This treatment would be applied in mesic and dry mixed conifer stands stocked with subalpine fir, Engelmann spruce, Douglas-fir, and lodgepole pine trees in multiple canopy layers (young forest multistory stand structure).</p> <p>Portions of these stands have experienced lodgepole pine mortality caused by mountain pine beetle attacks. With the exception of subalpine fir, the largest and most vigorous conifers (with regard to height, bole diameter and live crown volume) of the most preferred</p>
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<p>harvest fuels treatments would be taken into consideration during development of timber marking guidelines to achieve desired live tree density levels.</p> <p>Target numbers of trees to remain will vary within harvest units based on plant association group and would be reduced based on root disease and the presence of dwarf mistletoe. Hot-dry ponderosa pine and Douglas-fir 20-30 TPA, Warm-dry and warm-mesic Douglas-fir 30-50 TPA and Cool-dry Douglas-fir and subalpine fir 40-50 TPA.</p> <p>The desired spatial pattern or horizontal arrangement of residual trees within stands can best be described in terms of individual trees, tree clumps, and canopy openings (Churchill et al. 2014; Larson and Churchill 2012; Larson et al. 2012). A clump of trees is defined as two or more trees in close enough proximity that a portion of their crowns are interlocking. Approximately 65 percent of residual trees in dry forest</p>	<p>retention objectives (including heterogeneous spatial patterning of residual trees) and reduce the proportion of infected trees in treated stands.</p> <p>Vigorous trees with low infection levels (dwarf mistletoe infection ratings generally of 2 or less; Hawksworth 1977) would be retained where needed to achieve tree retention objectives. Infected trees 21 to 24 inches DBH with an estimated age of less than 150 years would be harvested on a case by case basis consistent with stand treatment objectives. Treatment objectives include reducing future susceptibility to Douglas-fir dwarf mistletoe infection in treated stands. Infected trees 21 inches DBH and larger would be retained as isolated individuals or discrete clumps with</p>	<p>harvest fuels treatments would be taken into consideration during development of timber marking guidelines to achieve desired live tree density levels.</p> <p>Target numbers of trees to remain will vary within harvest units based on plant association group and would be reduced based on root disease and the presence of dwarf mistletoe. Hot-dry ponderosa pine and Douglas-fir 20-30 TPA, Warm-dry and warm-mesic Douglas-fir 30-50 TPA and Cool-dry Douglas-fir and subalpine fir 40-50 TPA.</p> <p>The desired spatial pattern or horizontal arrangement of residual trees within stands can best be described in terms of individual trees, tree clumps, and canopy openings (Churchill et al. 2014; Larson and Churchill 2012; Larson et al. 2012). A clump of trees is defined as two or more trees in close enough proximity that a portion of their crowns are interlocking. Approximately 65 percent of residual trees in dry forest</p>	<p>spatial patterning of residual trees) and reduce the proportion of infected trees in treated stands.</p> <p>Vigorous trees with low infection levels (dwarf mistletoe infection ratings generally of 2 or less; Hawksworth 1977) would be retained where needed to achieve tree retention objectives. Infected trees 21 to 24 inches DBH with an estimated age of less than 150 years would be harvested on a case by case basis consistent with stand treatment objectives. Treatment objectives include reducing future susceptibility to Douglas-fir dwarf mistletoe infection in treated stands. Infected trees 21 inches DBH and larger would be retained as isolated individuals or discrete clumps with the removal of smaller Douglas-firs located within 50 feet to reduce</p>	<p>species present would be retained in clumps of various sizes to achieve the target or desired residual stocking level of approximately 40 to 50 trees per acre.</p> <p>Tree species retention preference in descending order is Douglas-fir followed by ponderosa pine, Engelmann spruce and lodgepole pine. Standing dead and down lodgepole pines in excess of snag and large woody debris retention objectives would be removed for firewood or other forest products. All trees greater than 24 inches DBH and all trees 21 inches DBH and larger with an estimated age of 150 years or greater (based on criteria described in Van Pelt 2008) would be retained.</p> <p>Live defective trees and dying trees would be retained as needed to provide cavity</p>
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<p>restoration thin harvest units would be retained in clumps of various size with a spacing of 20 feet or less between leave tree boles. Approximately 35 percent of residual trees would be retained as individual trees located more than 20 feet away from all other leave trees.</p> <p>Canopy openings would be comprised of those areas where the distance between residual tree boles is greater than 3 times the maximum “clumped” tree distance (60 feet). Canopy openings, generally expected to be one third acre in size or less, would occur on approximately 20 percent of treatment areas.</p> <p>Live defective trees and dying trees would be retained as needed to provide cavity dependent habitat. Complex patches which include large snags, live defective trees, large and old trees, or large dwarf mistletoe infected trees would be retained.</p>	<p>the removal of smaller Douglas-firs located within 50 feet to reduce the spread of dwarf mistletoe (Schmitt 1997).</p> <p>Removal of suppressed, diseased or dwarf mistletoe susceptible trees may result in post- harvest conifer stocking levels up to approximately 25 percent less than the respective dry forest restoration thin (DFR) desired residual tree stocking numbers displayed above.</p> <p>Canopy openings larger than two acres created by harvest and post-harvest fuels treatments would be assessed to determine if reforestation with pines or other non-susceptible species is needed to meet treatment objectives.</p>	<p>restoration thin harvest units would be retained in clumps of various size with a spacing of 20 feet or less between leave tree boles. Approximately 35 percent of residual trees would be retained as individual trees located more than 20 feet away from all other leave trees.</p> <p>Canopy openings would be comprised of those areas where the distance between residual tree boles is greater than 3 times the maximum “clumped” tree distance (60 feet). Canopy openings, generally expected to be one third acre in size or less, would occur on approximately 20 percent of treatment areas.</p> <p>Live defective trees and dying trees would be retained as needed to provide cavity dependent habitat. Complex patches which include large snags, live defective trees, large and old trees, or large dwarf mistletoe infected trees would be retained.</p>	<p>the spread of dwarf mistletoe (Schmitt 1997).</p> <p>Removal of suppressed, diseased or dwarf mistletoe susceptible trees may result in post-harvest conifer stocking levels up to approximately 25 percent less than the respective dry forest restoration thin (DFR) desired residual tree stocking numbers displayed above.</p> <p>Canopy openings larger than two acres created by harvest and post-harvest fuels treatments would be assessed to determine if reforestation with pines or other non-susceptible species is needed to meet treatment objectives.</p>	<p>dependent habitat. Complex patches which include large snags, live defective trees, large and old trees, or large dwarf mistletoe infected trees would be retained.</p> <p>No aspen or other deciduous broadleaf trees would be harvested. Aspen clones one quarter acre and larger in size included within harvest units 26 and 27 would receive the Aspen Release (Aspen) harvest treatment previously described in this document.</p>
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<p>DxP Rx provisions</p>	<p>Page 147</p> <p>Trees 21"-24" may be cut if they are competing with a larger tree, with in 20 feet of a larger tree or has mistletoe infection Hawksworth 2 or greater.</p> <p>Remove all Douglas-fir infected with mistletoe (Hawksworth rating 3 or greater) between 7 and 23.9"</p> <p>Thinning from below, remove all additional trees to reach the desired TPA listed in Table 3 below. Average TPA shall be determined on a per unit basis. When Douglas fir mistletoe is present with in the subdivision, 75% of the leave trees per acre target will be acceptable. When thinning, trees incorporated with the fence lines may not be cut.</p> <p>The contractor may, at their expense designate trees prior to cutting.</p>	<p>Page 147</p> <p>Trees 21"-24" may be cut if they are competing with a larger tree, with in 20 feet of a larger tree or has mistletoe infection Hawksworth 2 or greater.</p> <p>Remove all Douglas-fir infected with mistletoe (Hawksworth rating 3 or greater) between 7 and 23.9"</p> <p>Thinning from below, remove all additional trees to reach the desired TPA listed in Table 3 below. Average TPA shall be determined on a per unit basis. When Douglas fir mistletoe is present with in the subdivision, 75% of the leave trees per acre target will be acceptable. When thinning, trees incorporated with the fence lines may not be cut.</p>	<p>Page 147</p> <p>Trees 21"-24" may be cut if they are competing with a larger tree, with in 20 feet of a larger tree or has mistletoe infection Hawksworth 2 or greater.</p> <p>Remove all Douglas-fir infected with mistletoe (Hawksworth rating 3 or greater) between 7 and 23.9"</p> <p>Thinning from below, remove all additional trees to reach the desired TPA listed in Table 3 below. Average TPA shall be determined on a per unit basis. When Douglas fir mistletoe is present with in the subdivision, 75% of the leave trees per acre target will be acceptable. When thinning, trees incorporated with the fence lines may not be cut.</p> <p>The contractor may, at their expense designate trees prior to cutting.</p>	<p>Page 147</p> <p>Trees 21"-24" may be cut if they are competing with a larger tree, with in 20 feet of a larger tree or has mistletoe infection Hawksworth 2 or greater.</p> <p>Remove all Douglas-fir infected with mistletoe (Hawksworth rating 3 or greater) between 7 and 23.9"</p> <p>Thinning from below, remove all additional trees to reach the desired TPA listed in Table 3 below. Average TPA shall be determined on a per unit basis. When Douglas fir mistletoe is present with in the subdivision, 75% of the leave trees per acre target will be acceptable. When thinning, trees incorporated with the fence lines may not be cut.</p> <p>The contractor may, at their expense designate trees prior to cutting.</p>	<p>No Moist forest thin units or provisions are included in the contract.</p>
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		<p>The contractor may, at their expense designate trees prior to cutting.</p> <p>Cut all trees with Douglas fir mistletoe less than 24.0" DBH</p>		<p>Cut all trees with Douglas fir mistletoe less than 24.0" DBH</p>	
Names and date	SI, MD 9/22	SI, KD 10/1	SI, MD 9/22	SI, KD 10/1	SI, MD 9/22

*updated to reflect site condition

Photos



Unit 2 post-harvest monitoring plot



Unit 2 post-harvest monitoring plot and greater unit



Unit 4 post-harvest monitoring plot



Unit 6 post-harvest monitoring plot



Unit 6 post-harvest monitoring plot



Unit 20 post-harvest monitoring plot



Unit 20 post-harvest conditions



Unit 211 (26) post-harvest monitoring plot



Unit 211 (26) post-harvest condition

