

# Appendix C

## Silvicultural Treatments

### Introduction

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#### What is a silvicultural system?

A silvicultural system is a planned program of vegetation manipulation treatments during the whole life of a stand to meet specific management direction within the biological and ecological context of the land and landscape.

Included in this appendix are brief descriptions and illustrations of the silvicultural treatments proposed for implementation in the proposed alternatives. Complete documentation of the vegetation analysis and the silvicultural diagnosis and prescription process is included in the project file.

Timber harvest proposed includes a blend of traditional silvicultural treatments. These techniques incorporate even-aged stand management treatments that are characterized by stands comprised of trees that are approximately the same age. Both regeneration harvest and intermediate harvest treatments are identified.

Regeneration treatments designed for implementation in the project would retain all of the overstory ponderosa pine and western larch (which varies by stand depending on the existing numbers of these overstory trees) as well as all existing snags and coarse woody material. The larger diameter Douglas-fir within these stands would be retained to meet the desired numbers of live retention trees where ponderosa pine and western larch are not sufficient.

All of the proposed treatments emphasize retaining important stand components of leave trees, standing and down large logs, and hardwood trees; all of which help meet the present and future function and process of forest systems.

The timber harvest and fuels treatments proposed in the action alternatives are designed to meet one or more of the following objectives for vegetation management. All harvest, including stands identified for Old Growth Maintenance treatments are on lands identified as suitable for timber production in the Forest Plan.

- Reduce high tree densities and risk of crown fire;
- Promote and maintain fire-adapted vegetation;
- Enhance the potential of some stands to develop as old forest habitat;
- Reduce susceptibility of forest conditions to bark beetles and root rot;
- Replace stands with generally high levels of insect or disease-caused conditions with particular emphasis on restoration of western larch and ponderosa pine;
- Reduce fuels in the urban interface;

- Contribute timber products to the economy.

Various harvest methods are prescribed depending on individual stand conditions.

## Silvicultural Treatment Descriptions and Illustrations

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### A. Regeneration Harvest - Seed Tree Harvest

This regeneration harvest treatment leaves selected trees standing in a harvest area, either individually or in small groups.

Seed Tree Harvest would take place in stands that currently are not meeting target stand objectives. Examples of these types of stands are:

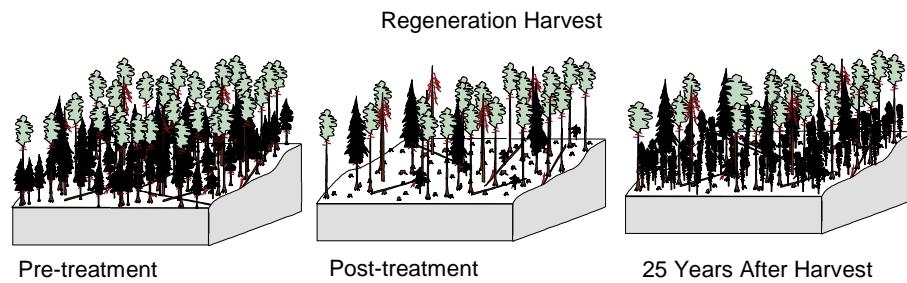
- Stands that have an overstory component of western larch and/or ponderosa pine, but without these species in the understory;
- Stands with elevated levels of root disease where intermediate harvest is not appropriate;
- Stands of primarily lodgepole that are at high risk of mountain pine beetle attack due to their age and density.

At a minimum, in the Seed Tree Units, 6 snags average per acre that are 12 to 20 inches DBH would be left. If existing snag densities are below these densities, substitute live trees would be left. All snags greater than 20 inches DBH would be left, where available. All standing dead cull western larch, ponderosa pine, and Douglas-fir trees 16 inches DBH or greater may be retained and all hardwood trees would be designated to be left. Generally, the snags to be left would be further than 150 feet from open roads and private land boundaries, and well distributed. Snags that pose a safety hazard to the Contractor's operation would be removed. All other merchantable trees would be harvested.

In the Seed Tree Units the minimum retention for down woody material would be, where available, 15 pieces average per acre 9 to 20 inches diameter and 10 pieces average per acre greater than 20 inches diameter. This amount of down woody material equates to 5 to 10 tons per acre. Generally, down woody material to be left would be further than 150 feet from private land boundaries. The Sale Administrator will work with the logger to minimize disturbance to large woody material through skid trail design and encourage avoidance when possible.

Underburning in some units would occur to prepare the site for regeneration of new seedlings and invigorate grasses, forbs, and shrubs.

Benefits of regeneration harvest would include establishing tree species that are less susceptible to fire, insects, and disease, providing for species that require open stands (both flora and fauna), and increasing early successional species diversity and diversity of forest structure over the landscape. Regeneration would enhance the restoration of western larch and ponderosa pine. Treatments are proposed on **79 acres** in Alternatives 2 and 3 and **14 acres** in Alternative 4.

**Figure C - 1. Regeneration Harvest**

Restoration planting would occur on units where previous management activities (past harvest, gravel extraction) have left the sites understocked with conifer trees. These sites would be planted to native species from local seed sources (primarily western larch and ponderosa pine). Site preparation would require hand scalping to remove grass and other vegetation from approximately 2 feet around each planting spot. In the gravel pit location, the soil would need to be decompacted by ripping or tilling to loosen soil so that tree roots would be free to grow. This treatment is proposed on 48 acres in all alternatives.

Hand planting of western larch and ponderosa pine would occur in all Seed Tree Harvest units to ensure that restocking of desired species occurs within the appropriate time frames. Natural regeneration of these species is dependent upon good seed crops, which can vary in occurrence over time.

#### **B. Intermediate Harvest – Commercial Thin, Salvage, Thin from Below – Commercial and Non-Commercial**

Intermediate harvest is proposed in stands where forest density and structure is interfering with growth in desired species and crown classes. The purpose is to release trees that will improve the composition, form, or growth of the residual stand, by removing trees that are susceptible to insect or disease, are growing poorly, or are contributing to fuels conditions that make the stands susceptible to ground to crown fire (ladder fuels). This treatment would develop a more open forest structure with a greater proportion of large fire-adapted species.

The following descriptions are examples of intermediate treatments proposed with this project. These treatments are designed to leave a stand that is sufficiently stocked to follow a normal development pattern until other treatments are considered appropriate. Thin From Below treatments and Salvage harvest are also included in this category and are described below.

Commercial Thin: The existing mature tree canopy closure would be reduced from 70 to 90 percent+, to an average of 50 percent or greater canopy closure within the ground-based and cable units. The target leave basal area would range between 70 to 100 square feet per acre, depending on the site. This equates to about 50 to 100 trees per acre, depending on the species and site. Generally, all dominant and most co-dominant crown classes would be retained, while some co-dominant and generally all intermediate and suppressed crown classes would be removed. The purpose of this treatment is to enlarge the growing space condition of desirable trees by reducing excessive tree competition for limited site resources, thereby modifying site conditions for improved tree crown and cone development, sustained vigor and growth, and overall forest health. This treatment simulates a low- to moderate-severity, mixed-lethal burn. Understory or jackpot burning may be implemented as a

secondary fuels treatment to recycle nutrients and restore fire as an ecological process. This treatment is proposed for **561 acres** in Alternatives 2 and 3 and **550 acres** in Alternative 4.

At a minimum, in Commercial Thin Units, 6 snags average per acre that are 12 to 20 inches DBH would be left. If existing snag densities are below these densities, substitute live trees would be left. All snags greater than 20 inches DBH would be left, where available. All standing dead cull western larch, ponderosa pine, and Douglas-fir trees 16 inches DBH or greater may be retained and all hardwood trees would be designated to be left. Generally, the snags to be left would be further than 150 feet from open roads and private land boundaries, and well distributed. Snags that pose a safety hazard to the Contractor's operation would be removed. All other merchantable trees would be harvested.

In the Commercial Thin Units the minimum retention for down woody material would be, where available, 15 pieces average per acre 9 to 20 inches diameter and 10 pieces average per acre greater than 20 inches diameter. This amount of down woody material equates to 5 to 10 tons per acre. Generally, down woody material to be left would be further than 150 feet from private land boundaries.

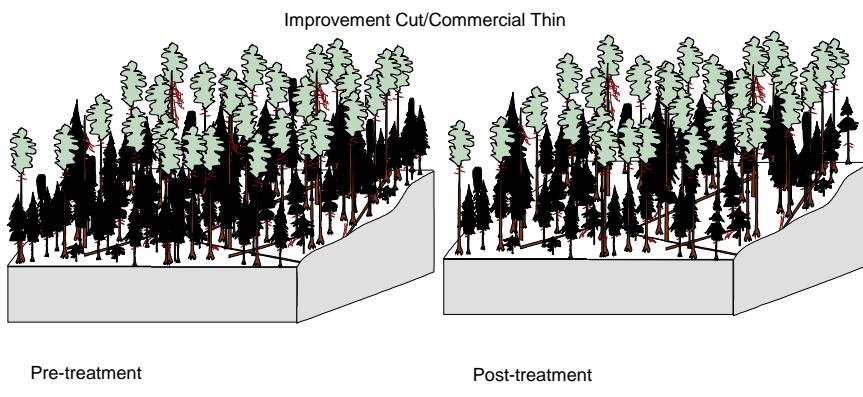
Thin From Below – Commercial: The existing mature tree canopy closure in the project area ranges from 0 to 100 percent with an average closure of 70 to 90+ percent. Within areas to be thinned from below, the resulting canopy closure would be reduced by no more than 10 percent, as the majority of trees to be removed are under the existing overstory canopy. The target leave basal area would range between 70 to 120 square feet per acre, depending on the site. This equates to about 50 to 100 trees per acre, depending on the species and site. Generally, all dominant and co-dominant crown classes would be retained, removing primarily trees in the intermediate and suppressed crown classes. The majority of trees to be removed are smaller diameter lodgepole pine, with occasional Douglas-fir where they exist immediately under the dominant overstory canopy. The purpose of this treatment is to enlarge the growing space condition of desirable trees by reducing excessive tree competition for limited site resources, thereby modifying site conditions for improved tree crown and cone development, sustained vigor and growth, and overall forest health. This treatment simulates a low to moderate severity, mixed-lethal burn. Understory or jackpot burning may be implemented as a secondary fuels treatment to recycle nutrients and restore fire as an ecological process. This treatment is proposed on **93 acres** in all action alternatives.

Thin From Below – Non-Commercial: The existing mature tree canopy closure in the project area ranges from 0 to 100 percent with an average closure of 70 to 90+ percent. Within areas to be thinned from below, the resulting canopy closure would be reduced by no more than 20 to 30 percent, as the majority of trees to be removed are under the existing overstory canopy. The target leave basal area would range between 90 to 110 square feet per acre, depending on the site. Generally, all dominant and co-dominant crown classes would be retained, removing primarily trees in the intermediate and suppressed crown classes, primarily between 2 and 6 inches diameter. Only lodgepole pine, under 7 inches in diameter would be removed, by cutting with chainsaws and removal by hand to the road. The purpose of this treatment is to enlarge the growing space condition of desirable trees by reducing excessive tree competition for limited site resources, thereby modifying site conditions for improved tree crown and cone development, sustained vigor and growth, and overall forest health. This treatment simulates a low- to moderate-severity, mixed-lethal burn. This treatment is proposed on **50 acres** in all action alternatives.

Old Growth Maintenance - The existing overstory would be retained, removing primarily trees in the intermediate and suppressed canopy layers to reduce fuels and fuel ladders, and to reduce competition with the desired overstory. Lodgepole pine and Douglas-fir would be the primary species removed to sustain the health and vigor of the western larch/ponderosa pine component, and to reduce the potential loss from fire. Mechanical treatments and prescribed fire would be used to reduce fuels, recycle nutrients, and restore fire as an ecological process. This treatment is proposed for **119 acres** in Alternatives 2 and 4 with **0 acres** proposed in Alternative 3.

To maintain appropriate snag densities in old growth units, at a minimum retain an average of 6 snags per acre 12 to 18 inches DBH. If existing snag densities are below these densities, substitute live trees where possible. All snags greater than 18 inches DBH will be left, where available. All standing dead cull western larch, ponderosa pine, and Douglas - fir trees 16 inches DBH or greater may be retained and all hardwood trees will be designated to be left. Generally, the snags to be left will be further than 150 feet from open roads and private land boundaries, and well distributed. Snags that pose a safety hazard to the Contractor's operation will be removed.

To maintain appropriate coarse woody material amounts in old growth treatment units, the minimum retention for down woody material would be, where available, an average of 15 pieces per acre 9 to 18 inches diameter, where available, and all pieces greater than 19 inches in diameter.



**Figure C - 2. Intermediate Harvest**

Salvage Harvest: The existing mature tree canopy would be reduced from the existing average of 70 to 80 percent canopy closure to approximately 50 to 60 percent canopy closure, removing trees primarily in the intermediate and co-dominant canopy. Lodgepole pine and some Douglas-fir would be removed to reduce stand density and fuel loadings. Mechanical treatments to reduce fuels would be implemented on **69 acres** in all action alternatives.

At a minimum, in Salvage Units, 6 snags average per acre that are 12 to 20 inches DBH would be left. If existing snag densities are below these densities, substitute live trees would be left. All snags greater than 20 inches DBH would be left, where available. All standing dead cull western larch, ponderosa pine, and Douglas-fir trees 16 inches DBH or greater may be retained and all hardwood trees would be designated to be left. Generally, the snags to be left would be further than 150 feet from open roads and private land boundaries, and well distributed. Snags that pose a safety hazard to the Contractor's operation would be removed. All other merchantable trees would be harvested.

In the Salvage Units the minimum retention for down woody material would be, where available, 15 pieces average per acre 9 to 20 inches diameter and 10 pieces average per acre greater than 20

inches diameter. This amount of down woody material equates to 5 to 10 tons per acre. Generally, down woody material to be left would be further than 150 feet from private land boundaries.

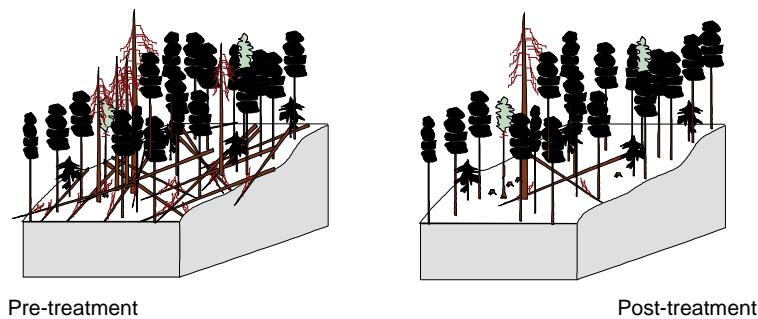


Figure C - 3. Salvage Harvest

### C. Pre-Commercial Thinning

This treatment is proposed in stands that are 40 to 50-year old past regeneration harvest and hand planted units which are beginning to stagnate due to excessive tree densities. The existing immature tree canopy closure would be reduced from 80 to 100 percent+, to a 50 to 70 percent canopy closure (average 60 percent) within the units. About 200 to 225 trees per acre would be retained of desirable species (in priority ponderosa pine, western larch, Douglas-fir and lodgepole pine).

### D. Ecosystem Burns

Ecosystem Burns have both habitat improvement objectives and fuel reduction objectives. Introducing fire onto the lower elevation portions of the prescribed burn areas would improve the conditions of important shrub fields and understory vegetation for many species of wildlife. The higher elevation portions of the proposed prescribed fire areas provide important whitebark pine habitat. Re-introducing fire into these stands may improve the capability of the area in providing important whitebark pine habitat for the grizzly bear.

Within areas where there are high concentrations of smaller trees and brush, chainsaw slashing of a portion of this material would be conducted before burning. This hand slashing would reduce ladder fuels and minimize the potential of excessive overstory tree mortality. Fuel breaks, consisting of a 20-foot space cleared of brush and dead fuels, may be constructed by hand around the perimeter of the burns. Both hand and aerial methods would be used for fire ignition.

Prescribed burning would be conducted in the spring or fall, when surrounding fuel conditions are moist (e.g., low fire danger). All non-consumed material would remain on site. No product removal would occur in the prescribed burn areas.

Two general stand types are included in this prescription, areas where shrubs/grasslands dominate, and areas where forested stands dominate. These two stand types are intermixed within the burn areas.

## **Shrub/Grassland Maintenance:**

This treatment method would use a cool, low to moderate intensity burn covering 70 to 90 percent of the area. The range of desirable conditions is:

- 50 to 80 percent mortality of overstory trees in grassland/shrubland areas;
  - Less than 20 percent mortality in heavily forested areas;
  - 50 to 80 percent consumption of understory trees and plants;
  - 20 to 30 percent consumption of down woody fuels.

The objectives are to:

- Rejuvenate at least 40 percent of the on-site shrubs; promote the growth of native grasses and forbs, increase the availability of snags for small animals and birds, and improve elk habitat by restoring the natural openings;
  - Slow the invasion of conifers into dry parks and shrub fields, and reduce the understory stocking of conifer seedlings and saplings; and
  - Improve the health and vigor of rejuvenated understory vegetation and residual trees.

## **Stand Maintenance:**

Stand maintenance would use a cool, low to moderate intensity underburn covering 70 to 90 percent of the area. The range of desirable conditions is:

- Less than 20 percent mortality in overstory trees;
  - Less than 20 percent consumption of understory trees and plants;
  - Less than 20 percent consumption of woody fuels;
  - Less than 10 percent duff reduction.

The objectives are to:

- Improve the health and overall vigor of rejuvenated understory vegetation and residual trees; and
  - Reduce fire hazards by reducing natural fuels less than 3 inches in diameter by 50 to 90 percent.

Illustrations included in this appendix are rough approximations of existing, desired, and future conditions. Graphics are not to scale and may not be exactly representative of actual conditions.

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