# 6/15/22 Field Trip

# Blue Mountains Forest Partners

For this field trip Blue Mountains Forest Partners (BMFP) and Malheur NF staff visited 4 sites to view and discuss post-treatment restoration work on the Blue Mountain Ranger District. The first two stops focused on aquatics while the last two focused on veg.

### 1st & 2nd stops:

Some context: The USFS is obligated to manage National Forests to meet the habitats needs for a variety of species. The riparian work we visited was undertaken to restore aquatic habitat for chinook salmon and ESA listed steelhead along Camp Creek. This creek was severely degraded over time due to logging and railroad construction along creek bottoms in the early 1900s, heavy grazing into the 1960s, and the USFS practice of removing woody debris from streams in the 1970s. Over decades the cumulative impacts from activities like these seriously degraded riparian processes that historically provided extensive, healthy aquatic habitats for a range species.

Camp Creek is in the Camp Lick CFLRP Project area. It flows into the Middle Fork John Day River and is considered critical habitat for chinook salmon and steelhead. Significant instream restoration work began in the drainage around 2012 and has proceeded in stages since then. The two sites we visited represent some of the key components of riparian restoration work implemented recently to address the kinds of legacy impacts described above. Our first stop looked at instream work while the second looked at riparian fencing. Key components of this work included:

- **Removal/breaching of the railroad grade:** The logging railroad grade built along Camp Creek in the early 1900s narrowed the flood plain and compromised hydrologic function. **Part of the restoration work involved removing large segments of the grade to facilitate "reconnectivity" of what was historically a larger and more dynamic flood plain**. Oregon's State Historical Preservation Office (SHPO) had to approve this activity as the railroad grade is considered historically significant because it was built in the early 1900s. SHPO signed off on the activity provided some segments were left intact. The Malheur included this in its scope of restoration work and will provide signage along the 36 Rd. to explain the railroad's historical significance for the area.

- **Placement of woody debris: Lots and lots and lots of large woody debris was placed instream and across the flood plain**. This work utilized larger whole trees—both cut, and those root wads left intact. This material was often placed across the primary stream channel to facilitate spreading and flooding during high water. This serves to reactivate old meanders and stream channels. Smaller wood and BDAs (or artificially constructed "beaver dam analogs") were placed across the flood plain in many of the old and

secondary stream channels. This serves to spread the water even more and slow it down to hold it later in the season. Finally, other larger and smaller trees are placed in the stream flows to provided additional cover for aquatic species. All these structures taken together increase hydrologic function across the flood plain and significantly increase creek, stream channel, and flood plain complexity. It should also enhance the area's aquatic food web and juvenile rearing capacity.

- **Plantings:** The FS and other volunteer organizations **planted thousands and thousands of riparian appropriate deciduous species, like willow and cottonwood, after the instream phase of work was completed.** This addresses the lack of riparian-appropriate species in the project area and facilitates a shift back to the type of vegetation that would have characterized the area historically. Over time this should help maintain cooler water temperatures and enhance the aquatic food web. The FS wants to plant a wider array of forbs and grasses after instream work is completed, and noted spring is the best time to do this work. Plantings like this have occurred in most Camp Creek riparian projects.

- **Fencing:** Many instream project areas **are fenced with either a high buck-and-pole or woven wire fence**. The riparian fence we visited is located downstream from our first stop and replaced the original fence that was built in 1970. It protects existing deciduous species and other streamside growth from ungulate pressure to help protect riparian growth and increase heterogeneity in aquatic ecosystems and streamside shade that helps maintain cooler water temperatures. Fences like this have been installed throughout the Camp Creek restoration work area.

**Additional topics:**

The FS noted there's been good bird and other wildlife response to this work. However, while the work has enhanced the aquatic environment in a variety of ways, steam temps remain lethal (too hot) during critical periods of the summer and continue to adversely impact juvenile salmon and steelhead survival rates.

Folks asked whether the size and species of trees placed instream made a difference. FS staff noted this depends on site location but that larger trees typically provided "more bang for the buck" because they worked better and lasted longer in terms of spreading water across the flood plain and reactivating old meanders and channels. During past aquatics field trips we heard that ponderosa pine and larch last longer as snags and downed wood compared to grand fir (say); and that for our area a dominant streamside deciduous component is a critical component of a healthy aquatic food web.

The Forest Service is happy with the vegetative response and channel reactivation that's occurred because of these efforts. Almost everyone noted how ugly instream restoration looks in the immediate aftermath; and how well it looks 2-3 years later. Still, almost everyone believed the FS could improve instream project work visuals simply by cutting off the large number of high posts (trees) driven vertically into the ground to hold and stabilize wood placement. Sounds like they plan to do this at some point.

Several BMFP members believe the FS should treat encroaching conifers more aggressively in these riparian projects. Significant lodgepole encroachment into dry and wet meadow areas adjacent to streams is one example of this. In the past the FS has left lodgepole untreated in such places based on the understanding that a rising water table caused by instream work would drown their roots and eventually kill them. This hasn't happened. It sounds like the FS will address this issue in future projects. However, they did share that larger trees should be left in place for future wood recruitment.

**3rd Stop:**

Our next stop was at Bear Timber sale unit 70 in the Big Mosquito Project area. This is a steeper slope, line-side (or cable) logging unit. Amanda Lindsay wrote the prescription to shift species composition to ponderosa pine and larch which are more drought, insect, and fire resistant. The prescription limited commercial harvest to trees 21" dbh or less. Iron Triangle logged the unit.

**As context for this stop:** Blue Mountain Biodiversity Project (BMBP) and Oregon Wild (OW) staffers visited this unit late last summer (2021) after it was logged. They identified old growth trees and others >21" that had been cut and removed, raised the issue with Amanda, and asked her if BMFP supported old growth logging. Shortly after that Amanda asked Mark Webb and Zach Williams to visit the site with her. They did so last fall and agreed it would be good for BMFP to visit the site this year to discuss the unit and associated issues.

As noted, the harvest prescription limited commercial harvest to trees 21" dbh or less. However, it is a line-side unit and OSHA requires that any tree within the landing area, or used to anchor the yarder by cable, is to be treated as a hazard tree, marked with blue paint and cut regardless of size. In fact, the safety rep explicitly told Iron Triangle to start cutting the anchor trees it was leaving intact. (OSHA regulations supersede federal regulations in this kind of situation and can't be ignored.) Apart from anchor and landing trees, the unit harvest followed the

prescription. Anchor and landing trees are typically identified by FS staff. (A couple of anchor tree stumps <21" dbh appear in the upper left and bottom right of the photo.)

**The upshot: Practically and legally speaking, it was impossible to treat this site and avoid cutting some old trees or large trees >21".**

This raised three key issues. First, was the treatment outcome worth the tradeoff involved in having to take some old and large trees? The answer to that question primarily turned on whether precommercial thinning (PT) alone could have achieved the desired outcome, and how well the commercial treatment did achieve the desired outcome. General sentiment was that ***PT could not*** have shifted species composition or reduced basal area in the ways needed to increase stand vigor and resistance to fire, drought and insects. Nor could PT have created the kind of openings larch recruitment requires. By contrast, commercial treatment per the prescription ***did achieve*** those outcomes (see photo below). Some people expressed regret that some large and old trees were cut to protect other large and old trees to facilitate this effort, but folks said the tradeoff for this site was worth it all things considered.

Second, given the prescription, expectations about how unit 70 would be treated make sense if one ignores or is unaware of how (say) safety regulations for cable logging impact how a prescription is implemented. Given that anchor and landing trees must be cut per OSHA safety regulations, the issue then becomes: can the FS do a better job clarifying potential impacts to better inform "expectations" individuals might develop based on project analysis? While the FS analyzed this project in the usual way, Amanda and others believe the FS can undertake additional steps during planning that increase transparency regarding potential impacts. One way to do this is to analyze a project "for the most impact" it might have and be sure to call out how safety regulations might affect ***how*** a

prescription is implemented. This would help better inform individual expectation on the part of interested members of the public.

And third, is there an alternative to cable logging that can effectively treat steep slopes and avoid the use of anchor trees? Winch-assist or tethered logging promises to do this. Tethered logging is occurring elsewhere in Oregon and across the Blues. (For an example, type 'winch-assist logging' in your browser and lots of examples will come up. Note that most if not all these examples occur on private or state land and clearcut the unit. Winch-assist logging on the Malheur will not clearcut units but increase work safety while implementing treatments that protect old trees and increase landscape resilience.) The Malheur is also analyzing for it in the Austin Project. In addition to avoiding the use of anchor trees, tethered logging is safer and can avoid some of the linear impacts or aspects associated with traditional cable logging. However, this system is spendy and requires a multi-million-dollar investment for new equipment. Iron Triangle recently made this investment for use on future projects. It remains to be seen if tethered logging is more cost effective than traditional cable logging.

Two final points here. First, Zach noted Iron Triangle averaged about 5000 board feet (bf) per acre in this unit (including the anchor and landing trees). Which is well below the 10,000-12,000 board feet per acre minimum westside operators say is needed to make cable logging pencil out. Which is to say, steep slope restoration efforts are costly. Second, the portion of Unit 70 we visited included a temporary road that was put in so the yarder could log over a high point (notice bottom left side of the photo above). We didn't discuss soil disturbance in the unit as a group, or what folks thought about the decommission effort, but Leslie Crawford (FS soil scientist) told me both the decommissioned road and line-side unit itself looked good from a soils perspective.

**4th Stop:**

For our last stop we visited a recently logged unit in the Ragged Ruby planning area. We stopped here because the treatment reflects the latest effort by Amanda Lindsay and the FS to draft prescription language that ***(1) is enforceable from a contracting officer's perspective, (2) relatively easy for operators to apply, and (3) better shifts species composition, reduces basal area/stand density, and improves stand structure in ways that make the site more resistant to fire, drought and insects.***

Amanda wrote this prescription by beginning with desired outcomes for the project and working back in terms of what trees are left. The goal was to

retain all old growth trees—those over 150 years old—and prioritize recruitment of early seral species like ponderosa and western larch. (The Silvicultural Prescription Amanda used for Ragged Ruby is attached. It's also long, reflects the amount of thought and work that goes into developing treatment prescriptions, and involves additional work to be "translated" into the harvest specs used in the contract.) Per normal practice, the FS used "designation by prescription" (or DxP) rather than marking individual leave or cut trees. The FS used the Van Pelt guidelines to identify old growth ponderosa pine, larch, and Doug-fir trees while they used a guideline Amanda and James Johnston developed on the Malheur NF to identify old growth grand fir and white fir.

Iron Triangle logged the unit. They took a week to calibrate their efforts and ensure the guidelines correctly identified tree age. The Van Pelt guidelines were developed in Washington on the east side of the Cascades but worked well for ponderosa pine and larch here. However, some adjustments were made to ensure old growth Doug-fir were retained. The grand and white fir guidelines worked well. Operators noted that adapting to different prescriptions can be challenging and time-consuming. This unit ended up at approximately 100 basal area, which seems high but on reflection appropriate given the desired outcomes and productive site.

We discussed how cut-to-length logging impacts compare to whole tree logging impacts. The latter involves first cutting them skidding the entire tree to a landing to be processed. It leaves the site much cleaner because the processing occurs at the landing. However, it impacts soils lots more. Cut-to-length logging cuts and processes the tree inside the unit after which it's loaded on a forwarder and moved to a landing. The processor places limbs, tops, and other debris on the ground for equipment to run on as it works. Cut-to-length typically leaves more slash spread across the site, and so higher fuel loads post-harvest, which impacts prescribed or managed wildfire operations. But it's much easier on the ground and soils. Iron Triangle and the FS increasingly prefer cut-to-

length operations, but it does require additional slash piling by an operator once the debris pushes 7-9 tons per acre.

Amanda and James believe this prescription worked well and set the site up nicely to survive future wildfire, drought, and insect infestations. The photos show this. The photos also show substantial recruitment of younger larch that should respond favorably to increased sunlight created by a much more open canopy.

Folks agreed the prescription worked and the site looks great. Operators and FS contract administrators also agreed it was a simpler prescription to apply relative to past ones.

*PBlue Mountains Forest Partners*

*"Blue Mountains Forest Partners is a diverse group of stakeholders who work together to create and implement a shared vision to improve the resilience and well-being of forests and communities in the Blue Mountains."*

# Sign-In Sheet: Aquatics and Mechanical Thinning Field Trip, 15 June 2022

| Name | Organization | Email Address |
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| Mark Webb | BMFP | |
| ML Welby | BMRD - Hydro | |
| Leslee Crawford | Malheur SO - Soils | |
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# Ragged Ruby Project

## Silviculture Prescription for Mechanical Treatments and Prescribed Fire

Prepared by:
Amanda Lindsay
District Silviculturist
/s/*Amanda Lindsay*

for:
Blue Mountain Ranger District
Malheur National Forest

December 7, 2020

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# Table of Contents

## List of Tables

# Introduction

This silvicultural prescription is a companion document to the Silviculture Report written for the Ragged Ruby Project. The area description and stand information in the report is incorporated by reference. The report identified treatment needs based on desired future conditions, management direction, vegetation, and resource data. This prescription for mechanical treatment and prescribed fire addresses the proposed action (alternative 2). The first section addresses the mechanical silvicultural practices such as timber harvest and non-commercial thinning. Marking guides are included in each section that involves commercial harvest. The second section addresses the use of prescribed fire. The mechanical treatment prescription section has taken into account the prescribed burning direct or indirect effects, such as tree mortality.

It is the intent of this prescription to meet requirements of Forest Service Handbook 2409.17 and Region 6 Supplement Number 2409.17-2000-1. Part of the requirements for silvicultural prescription are the following:

1. To develop the selected treatment alternative to achieve management direction that is technically correct and sound.
2. To clearly show how the selected treatment will develop a stand that will meet land management objectives.
3. To provide necessary direction for implementation of the selected treatment.
4. To provide necessary direction and guidance for implementation of monitoring the prescribed treatments.

# Mechanical Treatments

## General Wildlife Habitat Requirements

These general requirements will apply to all of the prescriptions in the Ragged Ruby planning area.

### Down Logs

The Forest Plan Amendment #2 (Eastside Screens; USDA Forest Service 1995) gives direction to leave a minimum number of down logs depending on the site.

**Table 1. Down log requirements by site**

| Site | Pieces/acre | Small end diameter (inches) | Piece length (feet) | Total lineal length (feet) |
|---|---|---|---|---|
| Ponderosa pine | 3 to 6 | 12 | > 6 | 20-40 |
| Mixed conifer | 15 to 20 | 12 | > 6 | 100-140 |
| Lodgepole pine | 15 to 20 | 8 | > 8 | 120-160 |

Leave as much existing large down wood (greater than 12 inches in diameter) as possible intact and undisturbed. In addition, leave all logs that are in draw bottoms, across rills and gullies, in areas disturbed by past activities, and in other areas that may be prone to erosion.

### Snags

Eastside Screens (USDA Forest Service 1995) requires that snags and green tree replacements be left at a level sufficient to maintain 100 percent of the potential population of cavity nesting birds. The 100 percent level is defined as:

14 trees/100 acres >= 20 inches DBH
225 trees/100 acres >= 15 inches DBH (>12 inches if larger trees are unavailable)
239 trees/100 acres – total number of snags (2.39/acre)

Snag numbers are to be maintained over 40-acre areas. Adjacent areas that are left unharvested may be used to calculate the number of snags to be left in the harvest units, with the number of snags within the unit meeting a minimum of half of the total number required to be left in the 40-acre area.

Retain all snags not considered a hazard to logging operations to meet wildlife needs and to ensure that the down log requirements will be met in the future. Snags considered a hazard to logging operations may be felled but are to be left on site to meet wildlife habitat needs.

### Green Tree Snag Replacement

All prescribed treatments will leave more than sufficient green trees available for future snag replacements as specified in the above section. Leave green tree replacements in groups wherever possible.

### Blue Grouse Habitat

To provide blue grouse winter roosts, retain large mistletoe-infected or wolfy Douglas-fir trees, where available, at 5 to 8 trees per acre along ridgetops and large scab openings.

## General Marking Direction

These general requirements will apply to all of the prescriptions in the Ragged Ruby planning area except where more detailed information is provided in the unit-specific prescriptions.

### Within Stand Variation

This silviculture prescription and the marking guides are based on stand analysis and are recommended to manage the stand's vegetation for desired attributes for timber growth, sustainability, resiliency, wildlife habitat, and other resources. Within each stand there are small inclusions that may be different than the balance of the stand. Many of these are too small to segregate and prescribe individually, or were missed during field reconnaissance.

When the marking guide is discovered by the marking crew to be inappropriate for a specific unit, the marking crew may adjust the marking to better meet the objectives of forest sustainability and resiliency as long as there is no direction to the contrary. When a different area of significant size is encountered, the marking crew should notify the silviculturist, who will give guidance on how to mark.

## Marking of Trees and Designation by Prescription

Leave tree marking with orange paint is recommended for commercial thinning prescriptions within this planning area because few trees will be marked, less paint will be used, the cost of marking will be reduced, and fewer marking personnel will be exposed to paint fumes. Where

designation by prescription or designation by description contracting methods are used, the silviculturist will work with the timber staff to draft contract specifications that meet prescription objectives and contract language requirements.

### Marking Supervision Requirements

A marking crew foreman with two or more seasons experience marking timber to a variety of marking guides in similar timber types is to supervise the marking. The environmental impact statement and attached specialist's input should be reviewed prior to marking so the objectives for the sale units are clear. If the marking crew supervisor is unsure of the application of the marking guide to the unit, they should contact the silviculturist for clarification and assistance.

It is requested that the marking crew foreman continually monitor the crew's marking quality, taking plots distributed throughout the unit as the marking progresses. Items to be submitted to silviculture include:

- Completed plot card showing leave tree basal area
- The location of leave patches and openings, identified on a map
- Other items that are required by the unit prescription

A random sampling of timber sales and prescriptions will be field checked by the silviculturists to ensure the resource objectives are being met by the prescriptions, marking guides, and actual marking. If substantial variation from the desired results are discovered, steps will be taken to correct the discrepancy.

### Designation by Prescription Requirements

When designation by prescription or designation by description is used, the contracting officer's representative and/or sale administrator will work closely with the silviculturist to train operators and inspect cutting compliance. In some cases, the silviculturist may be designated as a harvest inspector or contracting officer's representative on the contract to assist with inspections.

## Variable Density

The purpose of variable density, tree clumps, wildlife patches, and openings is to:

- Increase stand diversity and stocking variation
- Return stands to a clumpiness that is characteristic of the historical stand structure and fire regime
- Maintain an average basal area or an appropriate basal area range
- Break up the continuity of the canopy to reduce fuels in this profile
- Promote regeneration in areas of low density
- Maintain advanced regeneration, even though fire is expected to be used periodically
- Maintain or enhance wildlife habitat

### Tree Selection

Generally retain the largest, healthiest trees that will be defined as free from disease, of good form, with a single main stem, a full crown ratio above 30 percent, and capable of good growth when released. However, also retain some trees of poor form or that are infected with mistletoe or Indian paint fungus that will provide wildlife habitat.

Leave early seral trees (ponderosa pine, western larch, and in some areas, Douglas-fir) over grand fir or lodgepole pine. Leave rare species within a stand. Where a choice exists between grand fir with significant defects and sound trees of comparable size, leave the defective tree for wildlife habitat. Clump grand fir as much as possible to provide for vertical and horizontal structure.

## Snags and Downed Logs

Provide for 100 percent of the potential population level of primary cavity-excavator species by leaving all snags, except those that pose a safety concern. Do not mark any down logs for commercial removal.

## Old Growth

Mature trees are those that are noticeably older and are considered as a different cohort[1] than the rest of the stand. They often are noticeably larger, are self-pruning, generally have a rougher form, and are desired to retain and enhance as old forest stand structure.

Leave all trees that exhibit "old" tree characteristics. Old will be defined as approximately 150 years. "Old" tree characteristics will be defined for ponderosa pine and western larch using the Van Pelt (2008) guidelines. "Old" tree characteristics will be defined for grand fir and Douglas-fir using Johnston (2021). A summary of "old" tree characteristics are provided below. The rating systems for determining the general age of ponderosa pine, western larch, and Douglas-fir are provided in Appendix C of this document. The grand fir guide is provided in Appendix D. All trees will have a 21 inch diameter at breast height limit except for grand fir and Douglas-fir.

Characteristics for old ponderosa pine trees defined by Van Pelt (2008) include:

- Bark color and fissure plate width
- Knot presence and size
- Crown form: A-shaped crown versus a flat topped crown

Characteristics for old western larch trees defined by Van Pelt:

- Bark color and fissure depth and width
- Knot presence and size on lower one-third of trees
- Presence and size of epicormics branches[2]
- Crown form: A-shaped crown versus structurally complex crowns

Characteristics for old Douglas-fir trees defined by Van Pelt:

- Bark hardness and fissure depth
- Knot presence and size on lower one-third of trees
- Presence and size of epicormics branches
- Crown form: A-shaped crown versus structurally complex crowns

Characteristics for old grand fir defined by Johnston:

- Bark color, platelet width, and fissure depth.
- Height to live foliage.
- Diameter of tree.

[1] A cohort is a group of trees that generally originated at the same time.
[2] An epicormic shoot grows from an epicormic bud, which lies underneath the bark of a trunk, stem, or branch of a plant.

Clear up to two times the dripline from large, old early seral trees. One to two healthy ponderosa pine or western larch may be left for future replacement.

### Implementation

In mixed conifer restoration stands, grand fir stumps will be treated with borax to reduce the spread of annosus. Treatment with borax may be waived during the winter months of November 15th through January 31st during freezing conditions. Stands designated for borax treatment are listed in Appendix A of this document.

# Preferred Silvicultural Prescriptions and Marking Guides

Below is a summary of the designated units for each of the silvicultural prescriptions. Following this summary is a detailed description of each prescription and the corresponding marking guides.

## Dry Pine Restoration

- **HTH-NCT (commercial thinning and non-commercial thinning) commercial thinning in mostly Warm Dry and Hot Dry to 60 square feet per acre:**

  Units 34, 35, 36, 38, 40, 42, 90, 92, 104, 110, 138, 154, 158, 160, 162, 212, 332, 340, 370, 372, 374, 456, 458, 460, 462, and 468

- **HTH-NCT (commercial thinning and non-commercial thinning) commercial thinning in mostly Warm Dry and Hot Dry to 50 square feet per acre:**

  Units 50, 74, 76, 80, 82, 84, 118, 144, 150, 156, 172, 178, 182, 184, 186, 188, 190, 202, 204, 274, 286, 292, 304, 306, 310, 326, 388, 400, 404, 408, 412, and 434

- **HTH commercial thinning in mostly Warm Dry and Hot Dry to 60 square feet per acre:**

  Units 30, 32, and 336

- **HTH commercial thinning in mostly Warm Dry and Hot Dry to 50 square feet per acre:**

  Units 44, 46, 48, 52, 54, 58, 60, 276, 296, and 396

- **HTH commercial thinning in mostly Warm Dry and Hot Dry to 40 square feet per acre:**

  Units 64, 66, 68, 70, and 72

- **NCT non-commercial thinning in mostly Warm Dry and Hot Dry stands:**

  Units 28, 39, 94, 98, 102, 106, 140, 142, 148, 278, 282, 300, 308, 314, 322, 364, 426, and 438

## Mixed Conifer Restoration

- **HTH-NCT (commercial thinning and non-commercial thinning) commercial thinning in mixed conifer stands based on leave tree criteria:**

  Units 4, 6, 10, 12, 14, 16, 18, 20, 24, 88, 108, 112, 120, 126, 128, 130, 131, 132, 134, 135, 136, 164, 166, 168, 170, 194, 196, 200, 206, 208, 210, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 242, 244, 248, 250, 254, 256, 258, 260, 262, 264, 270, 318, 338, 342, 344, 348, 350, 356, 362, 368, 420, 422, 442, 444, 448, 452, 454, and 464

- **NCT non-commercial thinning in mixed conifer stands:**

  Units 8, 22, 26, 95, 201, 240, 246, 252, 268, 272, 317, 354, 366, 376, 409, 430, and 446

## Dry Meadow and Scabland Flat Bunchgrass Restoration

- **HTH-NCT (commercial thinning and non-commercial thinning) commercial thinning in dry meadows and scabland flats based on leave tree criteria:**

  Units 78 and 180

- **NCT Non-commercial thinning:**

  Units 56, 86, 100, 122, 124, 146, 152, 174, 176, 183, 280, 284, 288, 290, 294, 298, 302, 312, 316, 320, 324, 328, 330, 334, 346, 360, 390, 392, 394, 398, 399, 402, 406, 410, 414, 416, 418, 424, 428, 432, 436 and 450

## Western White Pine and Whitebark Pine Restoration

- **NCT non-commercial thinning in the Dixie Butte and Greenhorn Mountain inventoried roadless areas:**

  Units 2, 352, and 488

## Aspen Restoration Treatments

- **Non-commercial felling of conifers:**

  Units A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, and A18

## Dry Pine Restoration

The objective for this prescription is to increase tree growth and resistance to insects and diseases, and decrease the risk of stand replacement fire through a reduction in stand density.

The site-specific goals for this prescription include:

1. Increase stand diversity, stocking variability, and clumpiness through variable-density thinning.
2. Increase soil moisture for hardwood and forage improvement in units that have Mollisol soils.

This prescription is recommended when the existing stand is overstocked to the point where tree vigor is declining, predisposing the stand to insect attack and uncharacteristic fire events that can occur due to buildup of fuels and crown density. This prescription can also be used if it is desired to maintain a healthy stand to a later age or to grow larger trees for timber or other resource objectives, such as visual corridors and old growth replacement stands. This prescription should only be applied when crop trees (leave trees) are of a desirable species and can be expected to respond to the thinning and live to the expected rotation age of the stand.

In dry ponderosa pine stands, thinning is generally to be applied from below, or in other words, the smaller trees are removed and the larger, better growing, trees are retained. There will be some exceptions to this to increase structural diversity and to increase the proportion of early seral

species within stands. This reduces the fire hazard by removing ladder fuels and reducing crown density so crown fires cannot be sustained.

The commercial thinning prescription may be modified to achieve other goals along with reducing stand density, reducing fire hazard, and improving forest health. Mollisol soils are prevalent across much of what are currently dry ponderosa pine stands in the Ragged Ruby planning area. These stands were historically more open woodland environments and some supported hardwood species and abundant forage. Thinning may be utilized to reduce conifer density and increase available soil moisture for hardwood survival and regeneration, and for forage production.

A follow-up non-commercial thinning may occur where there are sufficient small trees remaining following commercial thinning. Units that are likely to need non-commercial thinning are defined below. Slash from harvest and non-commercial thinning will be treated to 10 to 12 tons/acre by hand or grapple piling and burning in order to better mimic natural ecosystem fuel loads and reduce fire hazard.

- **Commercial thinning in dry ponderosa pine to 60 $ft^2$/acre**

  Units 30, 32, and 336

In general, these units are in the mid elevations and on warmer, drier slopes of the planning area. A commercial thinning to 60 $ft^2$/acre was chosen because these stands are generally more productive but are still composed of mostly ponderosa pine. These stands would have historically been dominated by ponderosa pine and most Douglas-fir and grand fir would be considered ingrowth.

- **Commercial and non-commercial thinning in dry ponderosa pine to 60 $ft^2$/acre**

  Units 34, 35, 36, 38, 40, 42, 90, 92, 104, 110, 138, 154, 158, 160, 162, 212, 332, 340, 370, 372, 374, 456, 458, 460, 462, and 468

These units were chosen for the additional non-commercial thinning because a larger portion of each unit is stocked with trees smaller than merchantable size. Non-commercial thinning to 20’ x 20’ spacing is planned after the commercial thinning to reduce the stocking level (tree selection guidelines are discussed in detail in the non-commercial thinning section).

- **Commercial thinning in dry ponderosa pine to 50 square feet per acre:**

  Units 44, 46, 48, 52, 54, 58, 60, 276, 296, and 396

These stands were chosen for commercial thinning to 50 $ft^2$/acre because they are generally less productive and lower in elevation than those listed for the 60 $ft^2$/acre treatment.

- **Commercial and non-commercial thinning in dry ponderosa pine to 50 $ft^2$/acre**

  Units 50, 74, 76, 80, 82, 84, 118, 144, 150, 156, 172, 178, 182, 184, 186, 188, 190, 202, 204, 274, 286, 292, 304, 306, 310, 326, 388, 400, 404, 408, 412, and 434

These units were chosen for the additional non-commercial thinning because a larger portion of each unit is stocked with trees smaller than merchantable size. Non-commercial thinning to 20’ x 20’ spacing is planned after the commercial thinning to reduce the stocking level (tree selection guidelines are discussed in detail in the non-commercial thinning section).

- **Commercial thinning in dry ponderosa pine to 40 $ft^2$/acre**

Units 64, 66, 68, 70, and 72

These units were chosen for commercial thinning to 40 $ft^2$/acre because they were historically more open woodland environments. These units tend to have Mollisol soils that indicate they were historical grassland with few, scattered ponderosa pine.

## Marking Direction

The objectives are to leave the larger, early-seral species trees that are insect, disease, and fire resistant; remove the understory that has developed after fire exclusion; and increase tree spatial variability to restore tree spacing and clumping closer to historical conditions. Follow these guidelines for leave tree selection:

- Generally thin from below to an average of 40, 50, or 60 $ft^2$/ac as defined in the unit table.
- Leave trees in this preference order: western larch, ponderosa pine, Douglas-fir, grand fir, and lodgepole pine.
- Where trees lower on this preference list are rare in the unit, the minority species should be retained in the stand to provide for species diversity.
- Leave trees lower on the preference list over trees that are heavily infected with dwarf mistletoe.

Variable density thinning is to be applied as indicated in the basal area table (Table 3) below.

**Table 2. Basal area**

| Percentage of stand | 40 $ft^2$/acre average | 50 $ft^2$/acre average | 60 $ft^2$/acre average |
|---|---|---|---|
| 10 | 10 | 20 | 30 |
| 15 | 25 | 35 | 45 |
| 50 | 40 | 50 | 60 |
| 15 | 55 | 65 | 75 |
| 10 | 70 | 80 | 90 to 110 |

*When wildlife leave patches 1 to 5 acres in size are required they will be taken out of the unit first, then the above percentages are to be applied to the portions of the unit that is actually thinned.

The average density for each stand may be varied up to 50 percent to select the best leave trees. Generally, leave the high stocking in pockets of old trees that are naturally dense, areas that are more fertile, and areas where trees are healthy.

Leave patches will be located only in units designated for both commercial and non-commercial thinning that are greater than 25 acres in size. Leave 5 to 15 percent of each of these units for wildlife hiding cover, preferably in areas of dense regeneration. In units adjacent to private property leave 5 percent for hiding cover. Patches will be 1 to 5 acres in size. These patches may be identified by the wildlife biologist before marking. For units not designated by the wildlife biologist, patches will be mapped and given to the silviculturist.

Openings with few or no trees are permissible between 0.25 and 2 acres in size. Openings may be created where no healthy trees are available to leave. Openings should not exceed 10 percent of each treatment unit.

A tree clump will be defined as a group of trees in which the inter-tree distance is 20 feet or less, measured from tree center to tree center (Churchill et al. 2013). Tree clumps should have a minimum of 3 trees and can have 20 trees or more. Clumps should be composed of similar sized

and aged trees of the same species. Clumps should be retained to provide vertical and horizontal diversity. Retain "character trees" or wildlife trees within clumps. Retain a minimum of three to four tree clumps per acre. Leave more than the minimum whenever possible if the stand lends itself to more clumps of trees.

Some of these units may fall within foreground and middleground visual corridors. Leave areas may be placed in these areas to accomplish forest plan standards for foreground and middleground retention.

## Mixed Conifer Restoration

This prescription is recommended when the mixed conifer stand historically was maintained by relatively frequent, mixed-severity fire and is not sustainable due to current occupancy by late seral species that are susceptible to mortality caused by wildfire, insects, and disease. The objective for this prescription is to restore density, structure, and species composition in mixed conifer stands closer to historical ranges.

The goals of this prescription are to:

1. Increase forest resiliency to disturbances from insects, disease, and fire by reducing forest density, surface fuels, and ladder fuels.
2. Retain a more historical and desirable species composition where early seral species are most prevalent and are in an environment suitable for natural regeneration, but where late seral species are also a key player and exist in the most appropriate places.
3. Provide for structural diversity at different spatial scales to provide for quality wildlife habitat while also meeting the goals of reducing stand density and decreasing fire hazard.

This prescription is based off leave tree requirements. All trees that are not specified to be left may be harvested.

Non-commercial thinning will occur following commercial thinning. Slash from harvest and non-commercial thinning will be treated to 10 to 12 tons per acre by hand or grapple piling and burning in order to better mimic natural ecosystem fuel loads and reduce fire hazard.

- **Commercial and non-commercial thinning in mixed conifer**

  Units 4, 6, 10, 12, 14, 16, 18, 20, 24, 88, 108, 112, 120, 126, 128, 130, 131, 132, 134, 135, 136, 164, 166, 168, 170, 194, 196, 200, 206, 208, 210, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 242, 244, 248, 250, 254, 256, 258, 260, 262, 264, 270, 318, 338, 342, 344, 348, 350, 356, 362, 368, 420, 422, 442, 444, 448, 452, 454, and 464

### Marking Direction

Leave all trees that exhibit old tree characteristics as defined by the Van Pelt (2008) guidelines and by Johnston et al. (2018). Remove all trees less than 21.0 inches diameter at breast height within double the dripline of old ponderosa pine, western larch, and western white pine. When the old tree is not healthy leave a healthy replacement tree where available.

Leave all trees within 30 feet of grand fir and Douglas-fir that exhibit old tree characteristics. Where multiple grand fir and/or Douglas-fir are in close vicinity to each other, leave all trees within 30 feet of each individual tree to create a larger leave patch.

Leave all trees 21.0 inches diameter at breast height and greater except for young grand fir and Douglas-fir. Diameter limits for grand fir and Douglas-fir are specified in the unit table and are based off elevation and tree characteristics.

Leave all healthy ponderosa pine, western larch, western white pine, and Engelmann spruce except where these species exceed 80 square feet per acre basal area. Where these species exceed this thin from below following the leave tree criteria discussed above to 80 square feet per acre.

Leave wildlife trees. Wildlife trees will be defined as trees with visible nests; cavities; wolfy trees with poor form; western larch with a Dwarf Mistletoe Rating (DMR) of 6; and large mistletoe-infected Douglas-fir trees along ridgetops and large scab openings.

Leave all Douglas-fir within 30 feet of ephemeral draws.

Remove all other trees.

## Dry Meadow and Scabland Flat Bunchgrass Restoration

This prescription is recommended for dry meadows and scabland flats that have been encroached upon by juniper and other conifers. These areas historically supported few large trees, mountain mahogany, sagebrush, bunchgrasses, and other shrub species in higher elevations.

The goals of this prescription are to:

1. Fell and remove trees to restore historically open areas within the planning area.
2. Protect and enhance bunchgrass and browse species within these dry meadows and scabland flats.
3. Reduce erosion by utilizing tree material for slope stability.

Treatments include:

- **Non-commercial thinning in dry meadows and scabland flats**

  Units 56, 86, 100, 122, 124, 146, 152, 174, 176, 183, 280, 284, 288, 290, 294, 298, 302, 312, 316, 320, 324, 328, 330, 334, 346, 360, 390, 392, 394, 398, 399, 402, 406, 410, 414, 416, 418, 424, 428, 432, 436 and 450

Non-commercial thinning will occur in all units. Fell all trees less than 9 inches diameter at breast height within riparian habitat conservation area portions units. Fell all trees less than 11 inches diameter at breast height in all other units or portions of units. Trees cut will either be felled directionally and left on site or lopped and scattered throughout the unit for erosion control purposes.

Some of these units contain portions of riparian habitat conservation areas, where some of the material may be felled for use within the riparian habitat conservation areas for aquatic rehabilitation purposes.

- **Commercial and non-commercial thinning in dry meadows and scabland flats**

  Units 78 and 180

Commercial thinning units were designated where road access and soil conditions allow and the trees are large enough for commercial removal.

### Marking Direction

For units with commercial harvest:

Leave all trees that exhibit old tree characteristics as defined by the Van Pelt (2008) guidelines and by Johnston et al. (2018).

Leave all trees greater than or equal to 21.0 inches diameter at breast height.

Remove all other trees.

## Whitebark Pine and Western White Pine Restoration

This prescription is recommended for units within the Dixie Butte and Greenhorn Mountain inventoried roadless areas where whitebark pine and western white pine are in decline due to high stand densities and insect and disease activity.

The goals of this prescription are to:

1. Protect and enhance whitebark pine and western white pine.
2. Increase the health and vigor of individual trees to increase their resistance to insect and disease activity.
3. Reduce competition directly around individual whitebark pine and western white pine trees to release them and increase growth.

Treatments include:

- **Non-commercial thinning for whitebark pine and western white pine restoration**

  Units 2, 352, and 488

Fell all trees up to 9 inches DBH around individual western white pine and whitebark pine trees within a 30 foot radius around the bole. Some of these units may contain portions of riparian habitat conservation area, where some of the material may be felled for use within the riparian habitat conservation area for aquatic rehabilitation purposes.

## Aspen Restoration

Treatments include:

- **Non-commercial felling of conifers**

  Units A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, and A18

Conifers in these units will be felled and either left on site, moved into streams, or bucked up and piled for burning. In general, fell conifers that do not exhibit old tree characteristics to a distance of 150 feet from the last live sucker. Leave one to two young conifers for large tree recruitment. Do not cross roads, streams, or meadows if the aspen stand does not cross these barriers. Slash will need to be treated by hand piling and burning.

Designated aspen stands may be fenced with wildlife fences, barbed wire fences, or buck and pole fences. Fencing will be accomplished on prioritized stands as materials and funding allows. Direct ignition during prescribed burning may take place in designated stands to stimulate aspen suckering. Aspen guidelines are defined in Table 7 at the end of this prescription.

## Non-commercial Thinning in Dry Pine and Mixed Conifer Restoration

Non-commercial thinning prescriptions are recommended when the trees to be cut are not sawlog-sized material. This treatment can be done in conjunction with another commercial thinning as displayed in sections above, or alone as displayed in the unit lists below. In units designated as acceptable for biomass removal, the cut material may be used for non-lumber products, such as personal use post and pole permits, commercial fuel pellets, or chips for hog fuel. Material that is not utilized is to be treated by mastication or piling and burning. Thinning may be completed through hand methods (chainsaws) or mastication with heavy equipment if ground-based disturbance is authorized.

The objectives of this prescription are to:

- Alter stand conditions through removing ladder fuels and reducing fuel loadings to change fire behavior.
- Remove smaller, less vigorous trees that are competing for resources, to improve conditions for the survivability of remaining trees.
- Shift species compositions to a higher proportion of early seral species.

Treatments include:

- **Non-commercial Thinning in Dry Pine Restoration**

  Units 28, 39, 94, 98, 102, 106, 140, 142, 148, 278, 282, 300, 308, 314, 322, 364, 426, and 438

- **Non-commercial Thinning in Mixed Conifer Restoration**

  Units 8, 22, 26, 95, 201, 240, 246, 252, 268, 272, 317, 354, 366, 376, 409, 430, and 446

### Selection of Leave Trees

Non-commercial thinning shall be done using the standard specifications in current contracts. In harvest units where non-commercial thinning will be applied after commercial removal, fell all trees less than 11” diameter at breast height where stocking of larger trees meets or exceeds the basal area target. In areas that do not exceed the basal area target, leave tree spacing is to average 20’ x 20’ (110 trees per acre) where available. In units that will not be commercially harvested, leave tree spacing is to average 20’ x 20’ (110 trees per acre). Where non-commercial thinning occurs in riparian habitat conservation areas, the maximum cut diameter will be limited to 9 inches diameter at breast height.

Leave tree spacing may vary up to 50 percent to select the healthiest trees. Select leave trees that are the tallest in height, have the largest crowns, and have the straightest stems that are free of damage due to insects, disease, and physical injury. The order of preference for species is western white pine, western larch, ponderosa pine, Douglas-fir, Englemann spruce, lodgepole pine, and grand fir. Leave 5 to 15 percent of each unit larger than 25 acres in scattered, unthinned clumps that are 1 to 5 acres in size for wildlife hiding cover. These leave patches should be the same as what was left during commercial activities in commercial thinning units. Leave all shrubs and hardwood tree species, as well as all snags. Leave all trees within 100 feet of trees exhibiting wildlife nests and surface water including streams, bogs, seeps, springs, and elk wallows.

# Prescribed Fire

Prescribed fire is recommended for reduction of surface fuels in the stands when fuel loads and tree stocking are appropriate to burn in without losing control of the fire. Many stands need mechanical treatment before fire can be reintroduced, due to unnatural increases in fuel loads or tree density and/or species composition. Objectives for prescribed fire include:

1. Reduce fire hazard
2. Decrease stand density and shift species composition from predominantly late seral species to predominantly early seral species by killing the smaller, thin-barked trees in the stand
3. Raise the canopy base height by scorching the lower limbs
4. Remove mistletoe-infected trees through selective torching due to brooming caused by the disease
5. Create a seedbed for natural regeneration of early seral conifer seedlings
6. Stimulate suckering and natural regeneration of aspen, hardwoods, and shrubs for wildlife habitat and riparian restoration
7. Create conditions suitable for allowing natural fires to burn in the future

Caution must be used when burning stands with large, old ponderosa pine and western larch with deep accumulations of litter around their bases. These accumulations can burn for a long time, concentrating the heat at the base of the tree and girdling it. Care must be taken to: (1) burn when these accumulations are enough only to burn a portion at a time, or (2) rake the litter away from the base of the tree before burning.

## Description

Prescribed burning is to be done on a landscape-scale basis. Burning can be done during any time of the year when weather and fuel moistures are in prescription, and when other resource project design criteria are met. Prescribed burning may take many years due to the large size of the area, lack of a suitable burn window, smoke management restrictions, or prioritizing other burn areas on the Forest.

Underburning is proposed within approximately 9,200 acres that would be mechanically treated first and within approximately 24,800 acres outside of mechanical treatment units. Ignition would be by hand, helicopter, or by UTVs. Prescribed burning will occur in a mosaic fashion where not all acres are burned at one time.

It is not expected that underburning will change stand structure in stands that have been mechanically treated. However, although it is not an objective of underburning, in stands that have not been mechanically treated there is a potential that enough trees of a specific size class could be killed that stand structure would be changed. Tree mortality is expected and acceptable, especially in the smaller size classes where burning mortality would be instrumental in keeping future stocking under control.

An estimated 9,200 acres of pile burning is proposed in areas where fuel loads are in excess of levels safe for underburning and where utilizing the material may not be an option. Piles would be burned under moist conditions when fire is limited primarily to the pile location. The piles would be located so that damage to any residual trees would be minimal during burning. While pile burning does create intense heat to the soil surface and may sterilize the soil, hand piles would be limited to less than 3 percent of the total surface area of a treatment unit.

Acceptable mortality ranges for prescribed burning for mechanical treatment units, connectivity corridors, and wildlife patches are as follows:

**Table 3. Mortality ranges within mechanical treatment areas, connectivity corridors, and wildlife patches**

| Size class (inches) | Desired mortality (percent) | Acceptable mortality (percent) | Outside prescription (percent) |
|---|---|---|---|
| 0 to1 DBH | 30 to 70 | 30 to 70 | 71 to 100 |
| 1 to 5 DBH | 5 to 15 | 5 to 15 | 16 to 100 |
| 5 to10 DBH | 1 to 5 | 5 to 10 | 11 to 100 |
| 10 to 20 DBH | 1 to 2 | 1 to 5 | 6 to 100 |
| >20 DBH | <1/acre | 1/acre | >1/acre |

DBH = diameter at breast height.

Acceptable mortality ranges for all other areas are as follows:

**Table 4. Mortality ranges outside mechanical treatment areas, connectivity corridors, and wildlife patches**

| Size class (inches) | Desired mortality (percent) | Acceptable mortality (percent) | Outside prescription (percent) |
|---|---|---|---|
| 0 to 1 DBH | 30 to 70 | 30 to 70 | 71 to 100 |
| 1 to 5 DBH | 10 to 20 | 20 to 40 | 41 to 100 |
| 5 to 10 DBH | 5 to 10 | 10 to 30 | 11 to 100 |
| 10 to 20 DBH | 1 to 5 | 5 to 10 | 6 to 100 |
| >20” DBH | <1/acre | 1/acre | >1/acre |

DBH = diameter at breast height.

These mortality levels are based on averages over the whole burning area and recognize the fact that fire is a relatively inexact tool and that there would be some localized areas where mortality reaches 100 percent. These patches should be kept to less than 5 acres within treated stands and may range up to 10 to 15 acres in areas not mechanically treated. These mortality patches are desirable as they will provide forage and structural diversity. Where burn blocks have a mixture of treated and non-treated areas, an average between these two sets of mortality levels may be used for determining acceptable mortality ranges.

Future prescribed burning would be necessary to maintain fuels at desirable levels and limit ingrowth. By implementing a maintenance burning program, the crown fire potential would be kept similar to that of the proposed action as regeneration would be kept at low levels, minimizing the creation of ladder and surface fuels.

# Appendix

## Appendix A: Mechanical Treatment Unit List

Table 6 below displays alternative 2 treatment information by unit number.

**Table 5. Alternative 2 treatment information by unit number**

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 2 | 358 | WPR | | | HP/L&S | | | |
| 4 | 6 | MCR HTHNCT | T/S | | WTY/CTL/HP | Yes | | Yes |
| 6 | 23 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | Yes | | Yes |
| 8 | 125 | MCR NCT | | | HP/L&S | Yes | Yes | |
| 10 | 7 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 12 | 12 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 14 | 6 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 16 | 70 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 18 | 14 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 20 | 14 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 22 | 19 | MCR NCT | | | HP/L&S | | | |
| 24 | 38 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | Yes | | Yes |
| 26 | 30 | MCR NCT | | | HP/L&S | Yes | Yes | |
| 28 | 16 | DPR NCT | | | HP | Yes | | |
| 30 | 21 | DPR HTH | T | 60 | WTY/CTL | | | |
| 32 | 37 | DPR HTH | T/S | 60 | WTY/CTL/HP | | | |
| 34 | 47 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | Yes | |
| 35 | 59 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | Yes | |
| 36 | 31 | DPR HTHNCT | T/S | 60 | WTY/CTL/GP/HP | | Yes | |
| 38 | 10 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | | |
| 39 | 17 | DPR NCT | | | HP/L&S | | | |
| 40 | 17 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | | |
| 42 | 23 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | | |
| 44 | 20 | DPR HTH | T | 50 | WTY/CTL | | | |
| 46 | 3 | DPR HTH | T/S | 50 | WTY/CTL/GP/HP | | | |
| 48 | 10 | DPR HTH | T | 50 | WTY/CTL | | | |
| 50 | 28 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | Yes | Yes | |
| 52 | 69 | DPR HTH | T | 50 | WTY/CTL | | | |
| 54 | 48 | DPR HTH | T | 50 | WTY/CTL | | | |

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 56 | 77 | DMSFBR NCT | | | HP/L&S | | | |
| 58 | 32 | DPR HTH | T | 50 | WTY/CTL | | | |
| 60 | 10 | DPR HTH | T | 50 | WTY/CTL | | | |
| 64 | 37 | DPR HTH | T | 40 | WTY/CTL | | | |
| 66 | 175 | DPR HTH | T | 40 | WTY/CTL | | | |
| 68 | 149 | DPR HTH | T | 40 | WTY/CTL | | | |
| 70 | 108 | DPR HTH | T | 40 | WTY/CTL | | | |
| 72 | 216 | DPR HTH | T | 40 | WTY/CTL | | | |
| 74 | 23 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 76 | 12 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 78 | 13 | DMSFBR HTHNCT | T | | WTY/CTL/GP/HP | | | |
| 80 | 19 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 82 | 32 | DPR HTHNCT | T/S | 50 | WTY/CTL/GP/HP | | Yes | |
| 84 | 43 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 86 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 88 | 50 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 90 | 64 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | Yes | |
| 92 | 143 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | Yes | |
| 94 | 47 | DPR NCT | | | GP/HP | Yes | Yes | |
| 95 | 15 | MCR NCT | | | HP | | | |
| 98 | 30 | DPR NCT | | | HP | | Yes | |
| 100 | 2 | DMSFBR NCT | | | HP/L&S | | | |
| 102 | 60 | DPR NCT | | | GP/HP | Yes | Yes | |
| 104 | 67 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | Yes | |
| 106 | 20 | DPR NCT | | | GP/HP | Yes | | |
| 108 | 78 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 110 | 28 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | Yes | |
| 112 | 34 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 118 | 80 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 120 | 105 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 122 | 2 | DMSFBR NCT | | | HP/L&S | | | |
| 124 | 3 | DMSFBR NCT | | | HP/L&S | | | |
| 126 | 25 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 128 | 64 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 130 | 59 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 131 | 13 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 132 | 28 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 134 | 68 | MCR HTHNCT | S | | WTY/CTL/HP | | | Yes |
| 135 | 79 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 136 | 7 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 138 | 48 | DPR HTHNCT | S | 60 | WTY/CTL/HP | | Yes | |
| 140 | 15 | DPR NCT | | | HP | Yes | | |
| 142 | 49 | DPR NCT | | | HP | | Yes | |
| 144 | 36 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 146 | 13 | DMSFBR NCT | | | HP/L&S | | | |
| 148 | 42 | DPR NCT | | | GP/HP | Yes | Yes | |
| 150 | 3 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 152 | 4 | DMSFBR NCT | | | HP/L&S | | | |
| 154 | 87 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | Yes | |
| 156 | 59 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 158 | 39 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | Yes | |
| 160 | 50 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | Yes | |
| 162 | 76 | DPR HTHNCT | T/S | 60 | WTY/CTL/GP/HP | | Yes | |
| 164 | 34 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 166 | 50 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | | | Yes |
| 168 | 9 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 170 | 10 | MCR HTHNCT | S | | WTY/CTL/HP | | | Yes |
| 172 | 89 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 174 | 8 | DMSFBR NCT | | | HP/L&S | | | |
| 176 | 11 | DMSFBR NCT | | | HP/L&S | | | |
| 178 | 89 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 180 | 70 | DMSFBR HTHNCT | T | | WTY/CTL/GP/HP | | | |
| 182 | 32 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 183 | 10 | DMSFBR NCT | | | HP/L&S | | | |
| 184 | 27 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 186 | 72 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 188 | 6 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 190 | 39 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 194 | 49 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 196 | 91 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 200 | 16 | MCR HTHNCT | H | | WTY/CTL/HP | Yes | | Yes |
| 201 | 20 | MCR NCT | | | HP/L&S | Yes | | |
| 202 | 22 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 204 | 8 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 206 | 8 | MCR HTHNCT | T | | WTY/CTL/GP/HP | Yes | | Yes |
| 208 | 43 | MCR HTHNCT | T | | WTY/CTL/GP/HP | Yes | | Yes |
| 210 | 17 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 212 | 27 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | Yes | |
| 214 | 9 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 216 | 56 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | Yes | | Yes |
| 218 | 38 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 220 | 7 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 222 | 10 | MCR HTHNCT | S | | WTY/CTL/HP | | | Yes |
| 224 | 87 | MCR HTHNCT | H | | WTY/CTL/HP | | | Yes |
| 226 | 8 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | | | Yes |
| 228 | 22 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 230 | 73 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 232 | 47 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 234 | 53 | MCR HTHNCT | S | | WTY/CTL/HP | | | Yes |
| 236 | 14 | MCR HTHNCT | S | | WTY/CTL/HP | | | Yes |
| 238 | 14 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 240 | 49 | MCR NCT | | | GP/HP | Yes/P&P[4] | Yes | |
| 242 | 24 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 244 | 56 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 246 | 40 | MCR NCT | | | HP | | Yes | |
| 248 | 4 | MCR HTHNCT | T | | WTY/CTL/GP/HP | Yes | | Yes |
| 250 | 18 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 252 | 20 | MCR NCT | | | HP | | | |
| 254 | 28 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 256 | 75 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 258 | 40 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 260 | 19 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 262 | 13 | MCR HTHNCT | S | | WTY/CTL/HP | | | Yes |
| 264 | 14 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 268 | 95 | MCR NCT | | | HP/L&S | | Yes | |
| 270 | 90 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | | | Yes |
| 272 | 47 | MCR NCT | | | HP | | Yes | |
| 274 | 28 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 276 | 44 | DPR HTH | T | 50 | WTY/CTL | | | |
| 278 | 20 | DPR NCT | | | GP/HP | | | |
| 280 | 6 | DMSFBR NCT | | | HP/L&S | | | |
| 282 | 46 | DPR NCT | | | GP/HP/L&S | Yes | Yes | |

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 284 | 20 | DMSFBR NCT | | | HP/L&S | | | |
| 286 | 12 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 288 | 17 | DMSFBR NCT | | | HP/L&S | | | |
| 290 | 15 | DMSFBR NCT | | | HP/L&S | Yes | | |
| 292 | 115 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 294 | 10 | DMSFBR NCT | | | HP/L&S | | | |
| 296 | 46 | DPR HTH | T | 50 | WTY/CTL | | | |
| 298 | 12 | DMSFBR NCT | | | HP/L&S | | | |
| 300 | 49 | DPR NCT | | | GP/HP/L&S | | Yes | |
| 302 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 304 | 10 | DPR HTHNCT | T/S | 50 | WTY/CTL/GP/HP | Yes | | |
| 306 | 35 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | Yes | Yes | |
| 308 | 39 | DPR NCT | | | GP/HP | Yes | Yes | |
| 310 | 9 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | | |
| 312 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 314 | 17 | DPR NCT | | | GP/HP | Yes | | |
| 316 | 16 | DMSFBR NCT | | | HP/L&S | | | |
| 317 | 19 | MCR NCT | | | HP/L&S | | | |
| 318 | 89 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 320 | 16 | DMSFBR NCT | | | HP/L&S | | | |
| 322 | 39 | DPR NCT | | | HP/L&S | | Yes | |
| 324 | 11 | DMSFBR NCT | | | HP/L&S | | | |
| 326 | 40 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 328 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 330 | 149 | DMSFBR NCT | | | HP/L&S | | | |
| 332 | 26 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | Yes | Yes | |
| 334 | 10 | DMSFBR NCT | | | HP/L&S | | | |
| 336 | 7 | DPR HTH | T | 60 | WTY/CTL | | | |
| 338 | 121 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 340 | 71 | DPR HTHNCT | H | 60 | WTY/CTL/HP | | Yes | |
| 342 | 62 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 344 | 92 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 346 | 1 | DMSFBR NCT | | | HP/L&S | | | |
| 348 | 140 | MCR HTHNCT | H | | WTY/CTL/HP | | | Yes |
| 350 | 10 | MCR HTHNCT | T | | WTY/CTL/GP/HP | Yes | No | Yes |
| 352 | 455 | WWPR | | | HP/L&S | | | |
| 354 | 28 | MCR NCT | | | HP | | Yes | |
| 356 | 21 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 360 | 7 | DMSFBR NCT | | | HP/L&S | | | |
| 362 | 37 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 364 | 59 | DPR NCT | | | HP/L&S | Yes | Yes | |
| 366 | 5 | MCR NCT | | | HP | Yes | | |
| 368 | 38 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 370 | 27 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | Yes | Yes | |
| 372 | 41 | DPR HTHNCT | S | 60 | WTY/CTL/HP | Yes | Yes | |
| 374 | 15 | DPR HTHNCT | S | 60 | WTY/CTL/HP | Yes | | |
| 376 | 60 | MCR NCT | | | HP | | Yes | |
| 388 | 33 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 390 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 392 | 13 | DMSFBR NCT | | | HP/L&S | Yes | | |
| 394 | 10 | DMSFBR NCT | | | HP/L&S | | | |
| 396 | 8 | DPR HTH | T | 50 | WTY/CTL | | | |
| 398 | 4 | DMSFBR NCT | | | HP/L&S | | | |
| 399 | 7 | DMSFBR NCT | | | HP/L&S | | | |
| 400 | 43 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | | Yes | |
| 402 | 8 | DMSFBR NCT | | | HP/L&S | | | |
| 404 | 11 | DPR HTHNCT | H | 50 | WTY/CTL/HP | Yes | | |
| 406 | 8 | DMSFBR NCT | | | HP/L&S | | | |
| 408 | 30 | DPR HTHNCT | H/T | 50 | WTY/CTL/GP/HP | Yes | Yes | |
| 409 | 40 | MCR NCT | | | HP/L&S | Yes | Yes | |
| 410 | 25 | DMSFBR NCT | | | HP/L&S | | | |
| 412 | 17 | DPR HTHNCT | T | 50 | WTY/CTL/GP/HP | Yes | | |
| 414 | 2 | DMSFBR NCT | | | HP/L&S | | | |
| 416 | 8 | DMSFBR NCT | | | HP/L&S | | | |
| 418 | 20 | DMSFBR NCT | | | HP/L&S | | | |
| 420 | 25 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 422 | 19 | MCR HTHNCT | T/S | | WTY/CTL/GP/HP | | | Yes |
| 424 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 426 | 45 | DPR NCT | | | HP | | Yes | |
| 428 | 16 | DMSFBR NCT | | | HP/L&S | | | |
| 430 | 17 | MCR NCT | | | HP | | | |
| 432 | 5 | DMSFBR NCT | | | HP/L&S | | | |
| 434 | 9 | DPR HTHNCT | T/S | 50 | WTY/CTL/GP/HP | Yes | | |
| 436 | 4 | DMSFBR NCT | | | HP/L&S | | | |
| 438 | 34 | DPR NCT | | | GP/HP | Yes | Yes | |
| 442 | 44 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |

| Unit | Acres | Silvicultural prescription[1] | Harvest System[2] | Target basal area | Activity Fuels Treatment[3] | Biomass | Wildlife Patch | Borax |
|---|---|---|---|---|---|---|---|---|
| 444 | 29 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 446 | 12 | MCR NCT | | | HP | | | |
| 448 | 23 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 450 | 2 | DMSFBR NCT | | | HP/L&S | | | |
| 452 | 65 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 454 | 13 | MCR HTHNCT | T | | WTY/CTL/GP/HP | | | Yes |
| 456 | 12 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | | |
| 458 | 6 | DPR HTHNCT | T | 60 | WTY/CTL/GP/HP | | | |
| 460 | 12 | DPR HTHNCT | T/S | 60 | WTY/CTL/GP/HP | | | |
| 462 | 14 | DPR HTHNCT | T/S | 60 | WTY/CTL/HP | | | |
| 464 | 23 | MCR HTHNCT | T/S | | WTY/CTL/HP | | | Yes |
| 468 | 26 | DPR HTHNCT | S | 60 | WTY/CTL/HP | | Yes | |
| 488 | 49 | WPR | | | HP/L&S | | | |

1. Silviculture prescriptions: NCT = Non-commercial thinning, HTH = commercial thinning, WWPR = western white pine restoration WPR = whitebark pine restoration, MCR = mixed conifer restoration, DPR = dry pine restoration, DMSFBR = dry meadow/scabland flat restoration.

2. Harvest system: T = tractor, S = skyline, H = helicopter.

3. Activity fuels treatment: HP = hand pile, L&S = lop and scatter, WTY = whole tree yard, CTL = cut to length, GP = grapple pile.

4. P&P = post and pole.

# Appendix B: Aspen Treatment Unit List

**Table 6. Alternative 2 aspen information by unit number**

| Aspen Id | Acres | Silvicultural prescription[1] | Prescribe burn | Fence | Wood placement |
|---|---|---|---|---|---|
| A1 | 0.6 | NCT | | | |
| A2 | 1.4 | NCT/TT | | | |
| A3 | 0.6 | NCT | | | |
| A4 | 0.1 | NCT/TT | | Yes | |
| A5 | 0.1 | NCT/TT | | Yes | |
| A6 | 0.4 | NCT/TT | | | |
| A7 | 0.1 | NCT/TT | | Yes | |
| A8 | 0.1 | NCT/TT | | | |
| A9 | 0.1 | NCT | | | |
| A10 | 0.4 | NCT | | | |
| A11 | 0.2 | NCT | | | |
| A12 | 2.5 | NCT/TT | | | |
| A13 | 1.0 | NCT/TT | | | |
| A14 | 0.4 | NCT/TT | | Yes | |
| A15 | 0.5 | NCT/TT | | | |
| A16 | 0.3 | NCT/TT | | | |
| A17 | 0.4 | | | Yes | |
| A18 | 0.4 | NCT/TT | | Yes | |

1. NCT = non-commercial thinning, TT = tree tipping

# Appendix C: Rating Systems for Determining the General Age of Ponderosa Pine, Western Larch, and Douglas-fir

## Ponderosa Pine Rating

(Choose one score from each category and sum scores to determine developmental stage)

| Lower trunk bark condition | Score |
|---|---|
| Dark bark with small fissures | 0 |
| Outermost bark ridge flakes reddish, fissures small | 1 |
| Colorful plates, width about equal to fissure widths | 2 |
| Maximum fissure to fissure plate width ≥ 15 cm (6 in) and <25cm (10 in) | 3 |
| Maximum fissure to fissure plate width ≥ 25 cm (10 in) | 5 |
| **Knot indicators on main trunk below crown** | |
| Dead branches below main crown, whorl indicators extending nearly to tree base | 0 |
| Old knot/whorl indicators visible below main crown | 1 |
| No knot/whorl indicators visible | 3 |
| **Crown form (refer to Figure 69)** | |
| Similar to a tree in top row | 0 |
| Similar to a tree in middle row | 3 |
| Similar to a tree in bottom row | 5 |

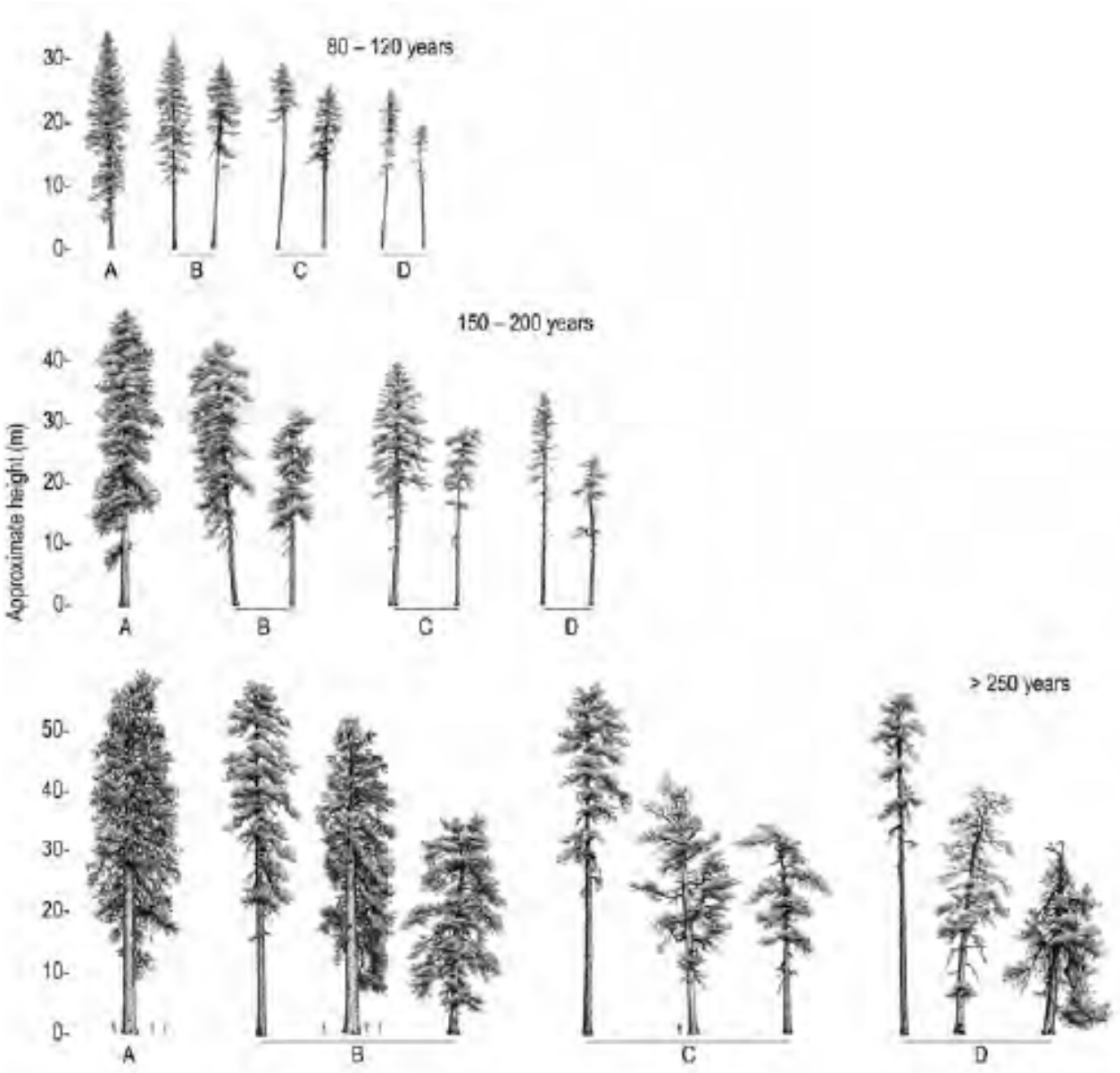
Scoring Key

| | |
|---|---|
| < 2 | Young tree |
| 2–5 | Mature tree < 150 years |
| 6–10 | Mature tree ≥ 150 years |
| > 10 | Old tree ≥ 250 years |

[3] From Van Pelt (2008), page 90.

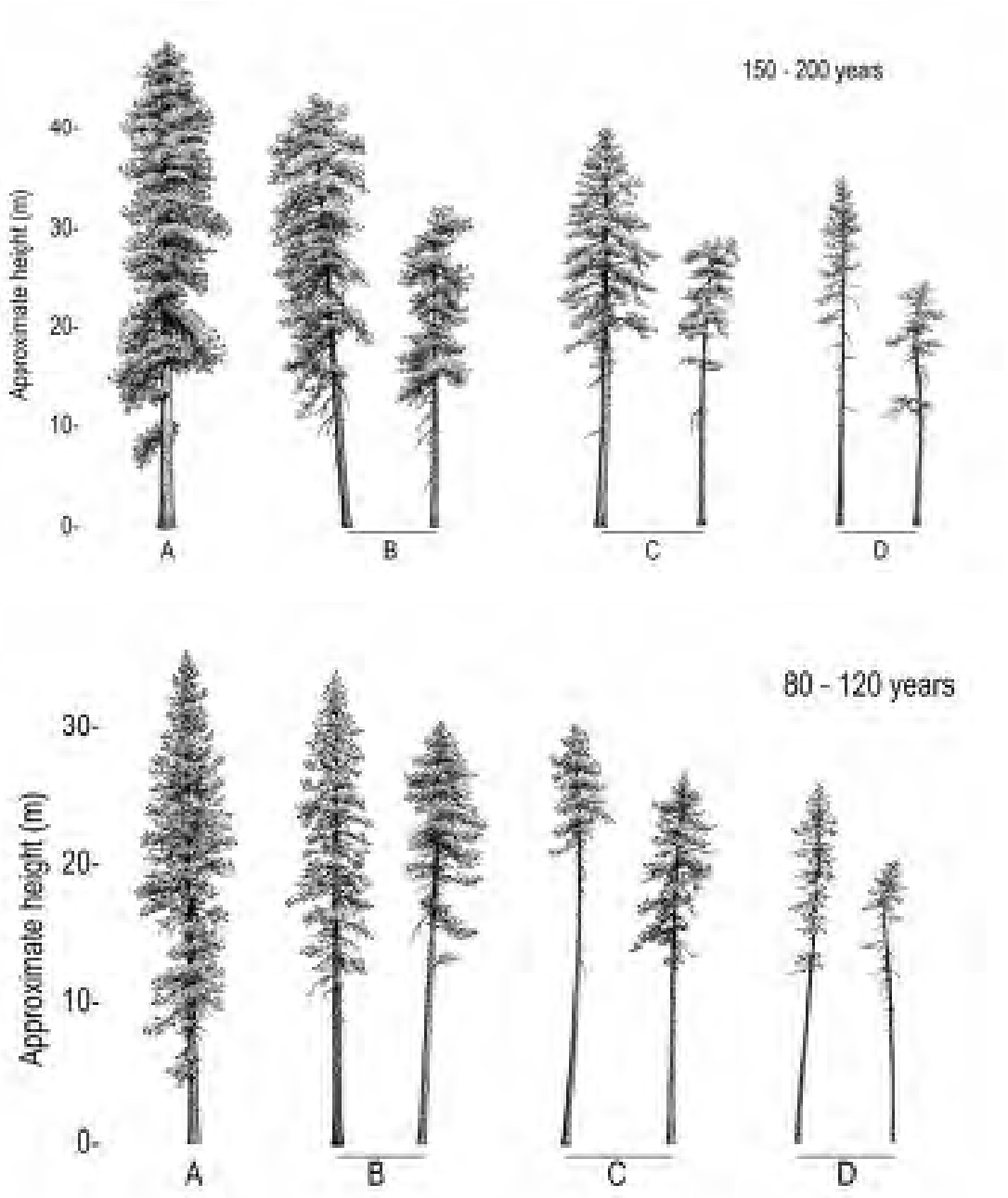
# Ponderosa Pine

**Figure 69. Ponderosa pine crown form and tree vigor in eastern Washington**. Idealized forms represent three age and four vigor classes (A-high vigor to D-low vigor). Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown for vigor classes BD to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class. The trees depicted are the same scale in the first image, and at differing scales on the following pages.



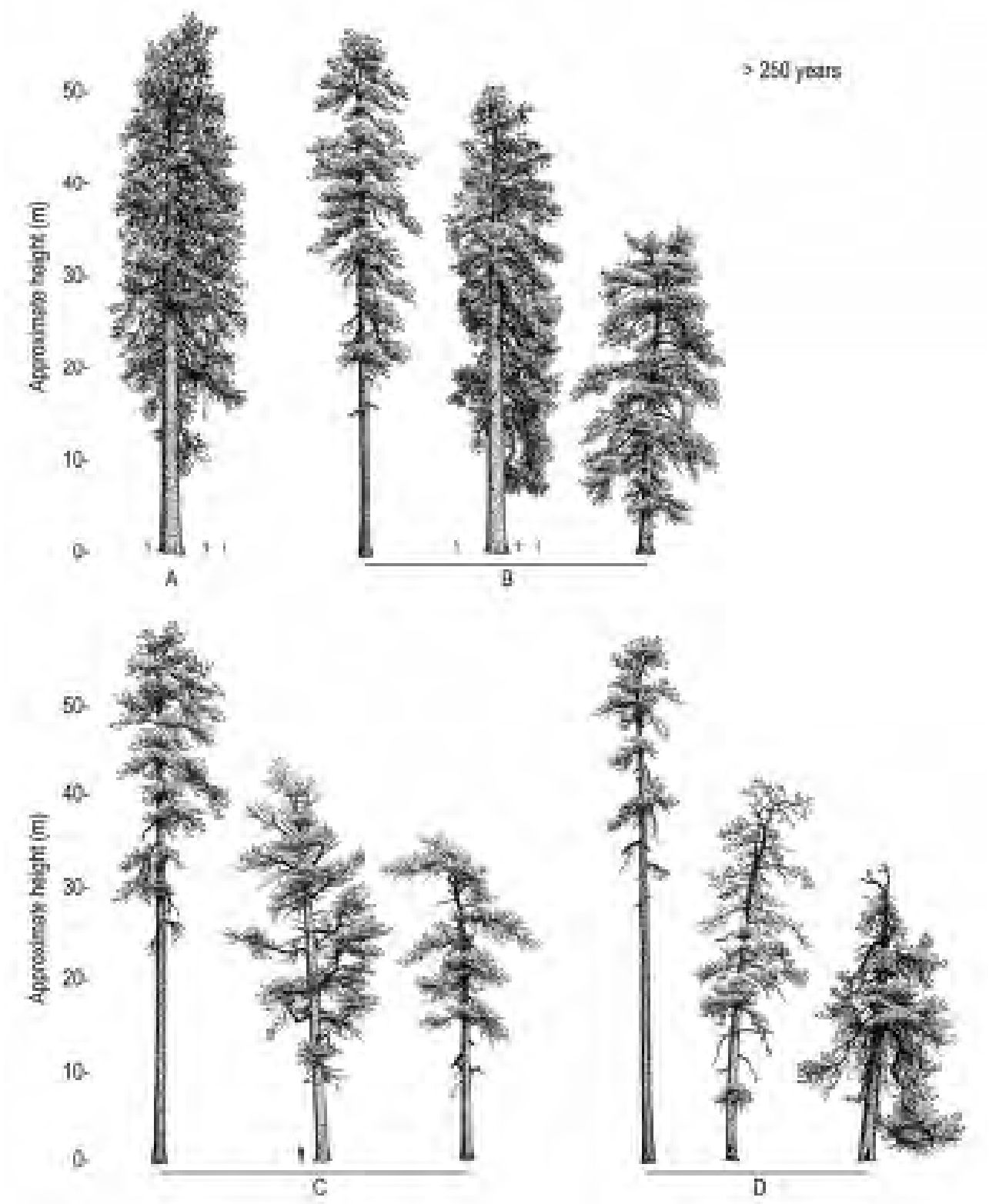
# Individual Species or Group Treatments

**Figure 69. Continued**



# Ponderosa Pine

**Figure 69. Continued**



## Douglas-fir Rating

(Choose one score from each category and sum scores to determine developmental stage)

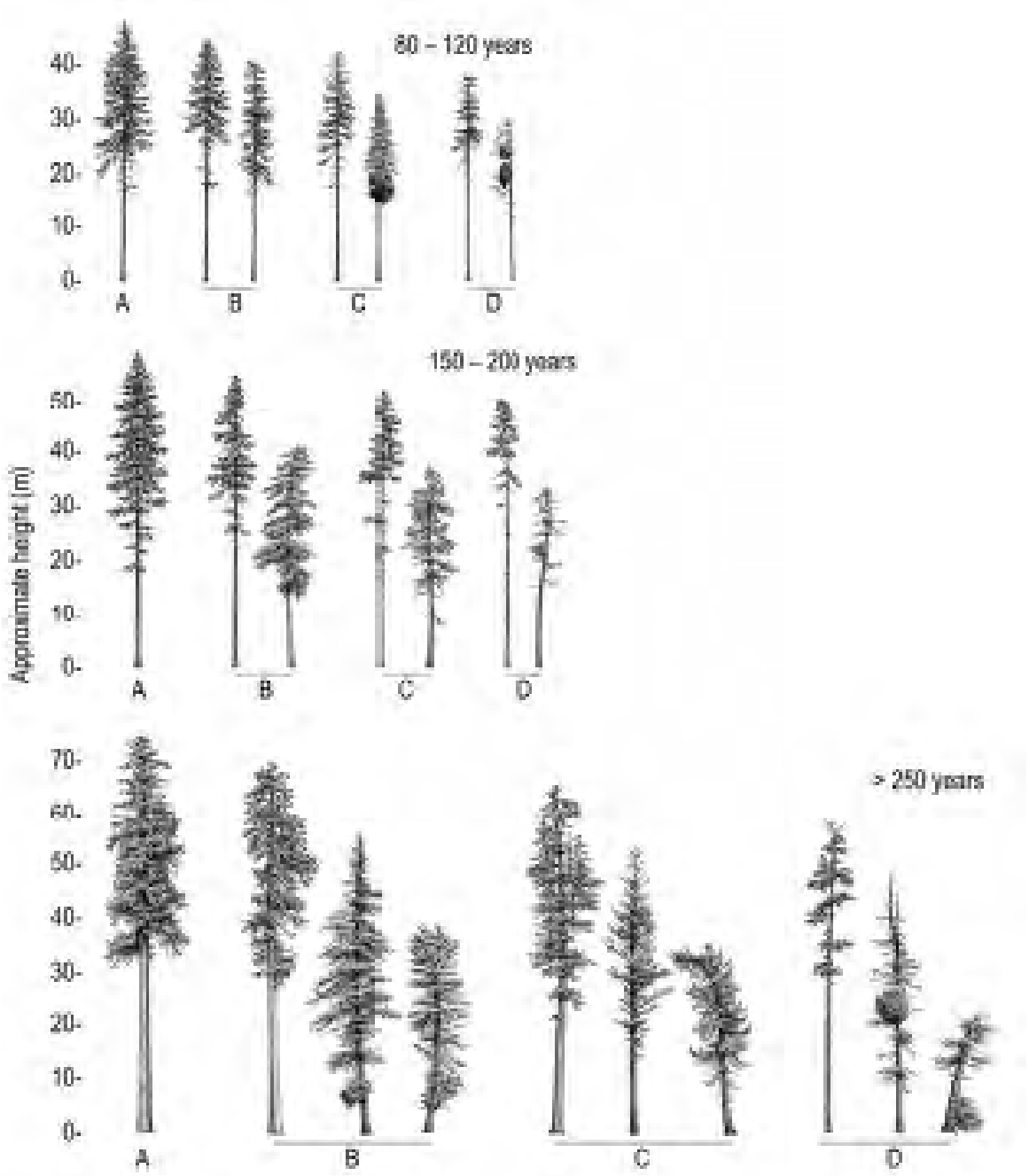
| Bark condition, lower one-third of tree | Score |
|---|---|
| Hard, bony bark with small fissures | 0 |
| Hard bark with moderately deep fissures (4-10 cm – 2-4 in) | 1 |
| Deep fissures present (> 10 cm – 4 in) | 3 |
| **Knot indicators, lower one-third of tree** | |
| Branch stubs present | 0 |
| Old knot/whorl indicators visible | 1 |
| No knot/whorl indicators visible | 3 |
| **Lower crown indicators** | |
| No epicormic branches | 0 |
| Small epicormic branches present | 1 |
| Large and/or gnarly epicormic branches present | 3 |
| **Crown form (refer to Figure 109)** | |
| Similar to a tree in top row | 0 |
| Similar to a tree in middle row | 3 |
| Similar to a tree in bottom row | 5 |

Scoring Key
< 3 Young tree
3–6 Mature tree < 150 years
7–10 Mature tree ≥ 150 years
> 11 Old tree ≥ 250 years

[4] From Van Pelt (2008), page 130.

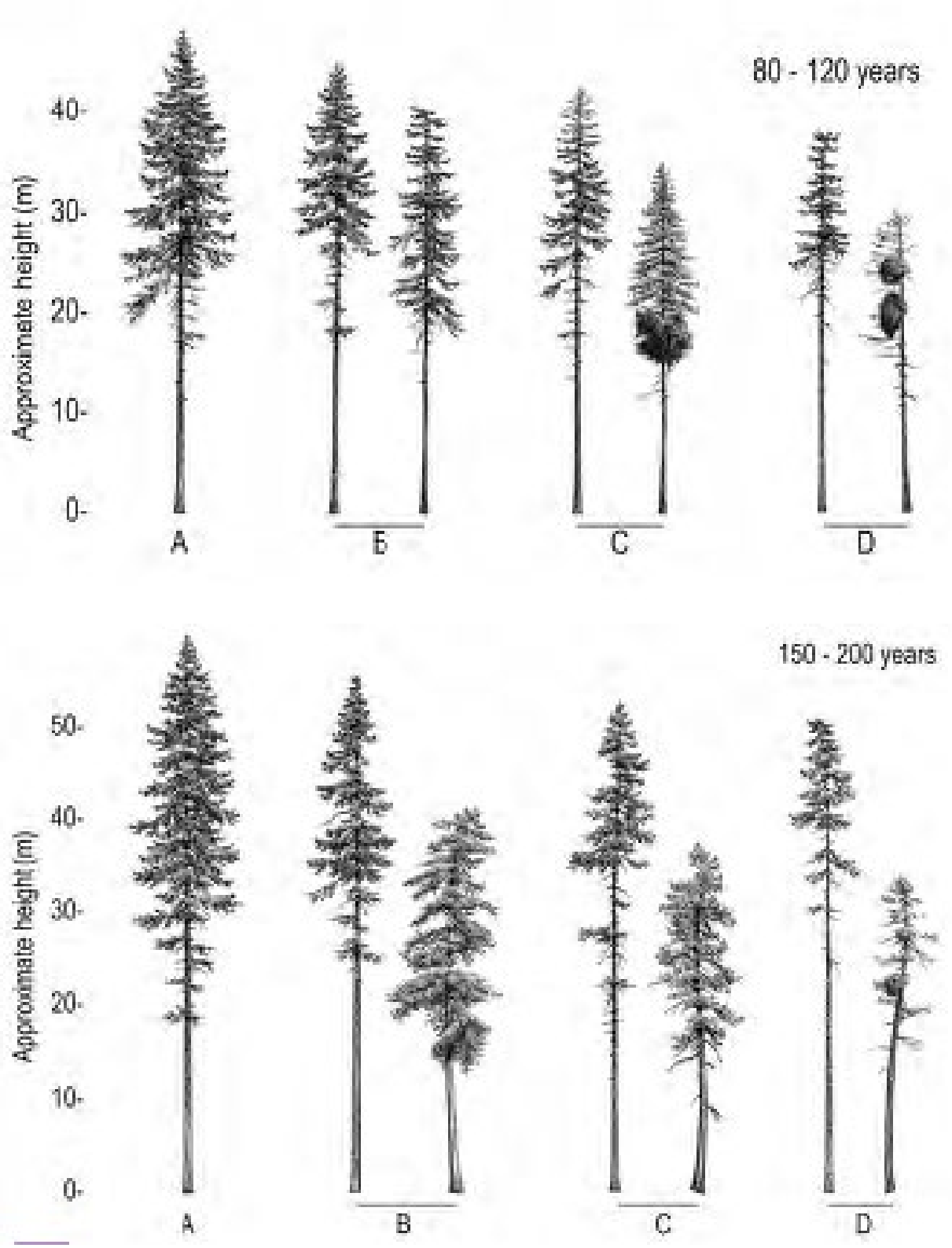
## Douglas-Fir

**Figure 109. Douglas fir crown form and tree vigor in eastern Washington.** Idealized forms represent three age and four vigor classes (A-high vigor to D-low vigor) in eastern Washington. Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown for vigor classes B-D to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class. The trees depicted are the same scale in the first image, and at differing scales on the following pages.



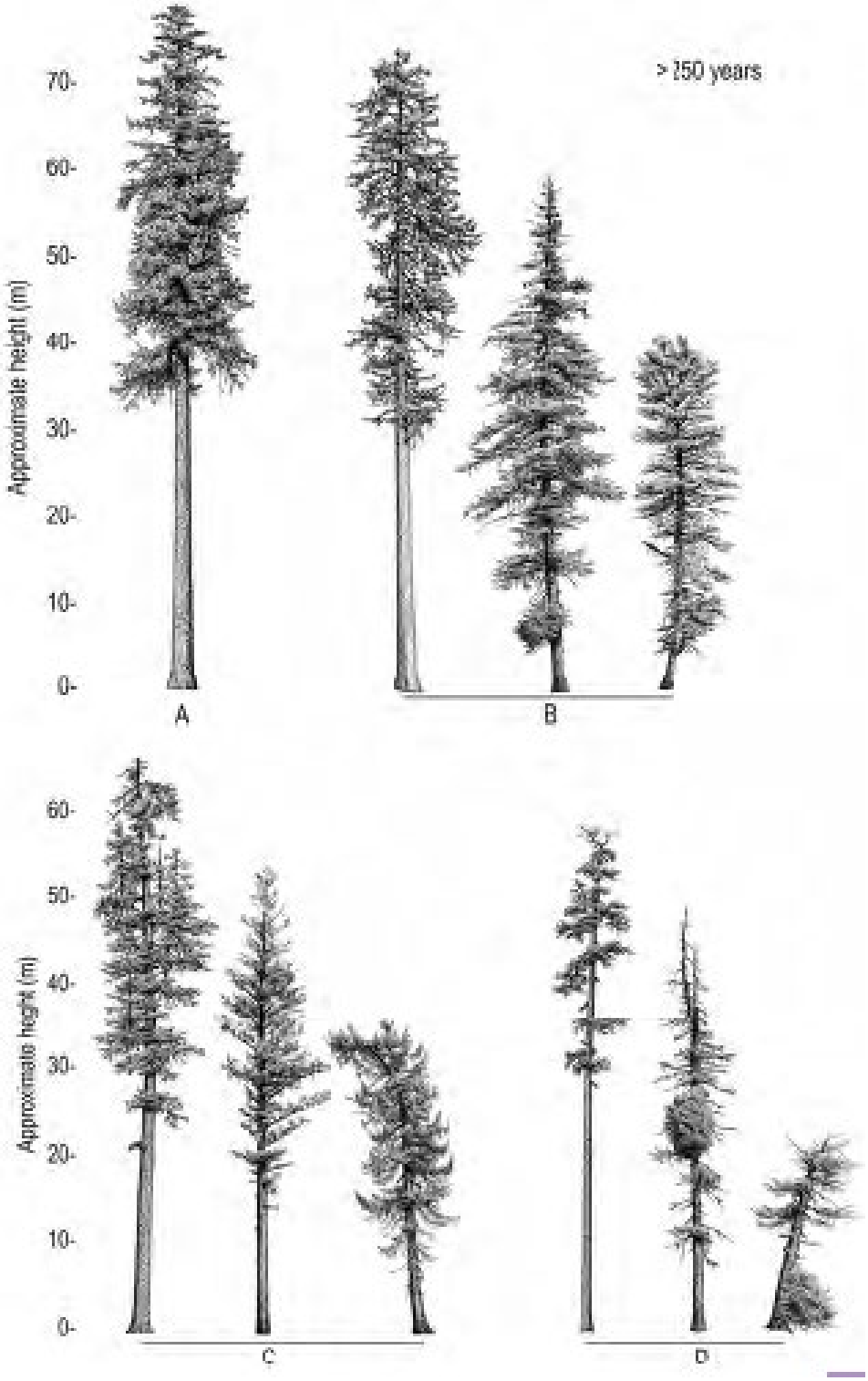
# Individual Species or Group Treatments

**Figure 109. Continued**



## Douglas-Fir

**Figure 109. Continued**



## Western Larch Rating

(Choose one score from each category and sum scores to determine developmental stage)

Bark condition, tree base.....Score
- Hard, bony bark with small fissures .....0
- Hard bark with moderately deep fissures (4-10 cm – 2-4 in) .....1
- Deep fissures present (> 10 cm – 4 in) .....3
- Maximum fissure to fissure plate width ≥ 15 cm (6 in).....3

Knot indicators, lower one-third of tree
- Branch stubs present .....0
- Old knot/whorl indicators visible.....1
- No knot/whorl indicators visible.....2

Lower crown indicators
- No epicormic branches.....0
- Small epicormic branches present.....1
- Large and/or gnarly epicormic branches present .....2

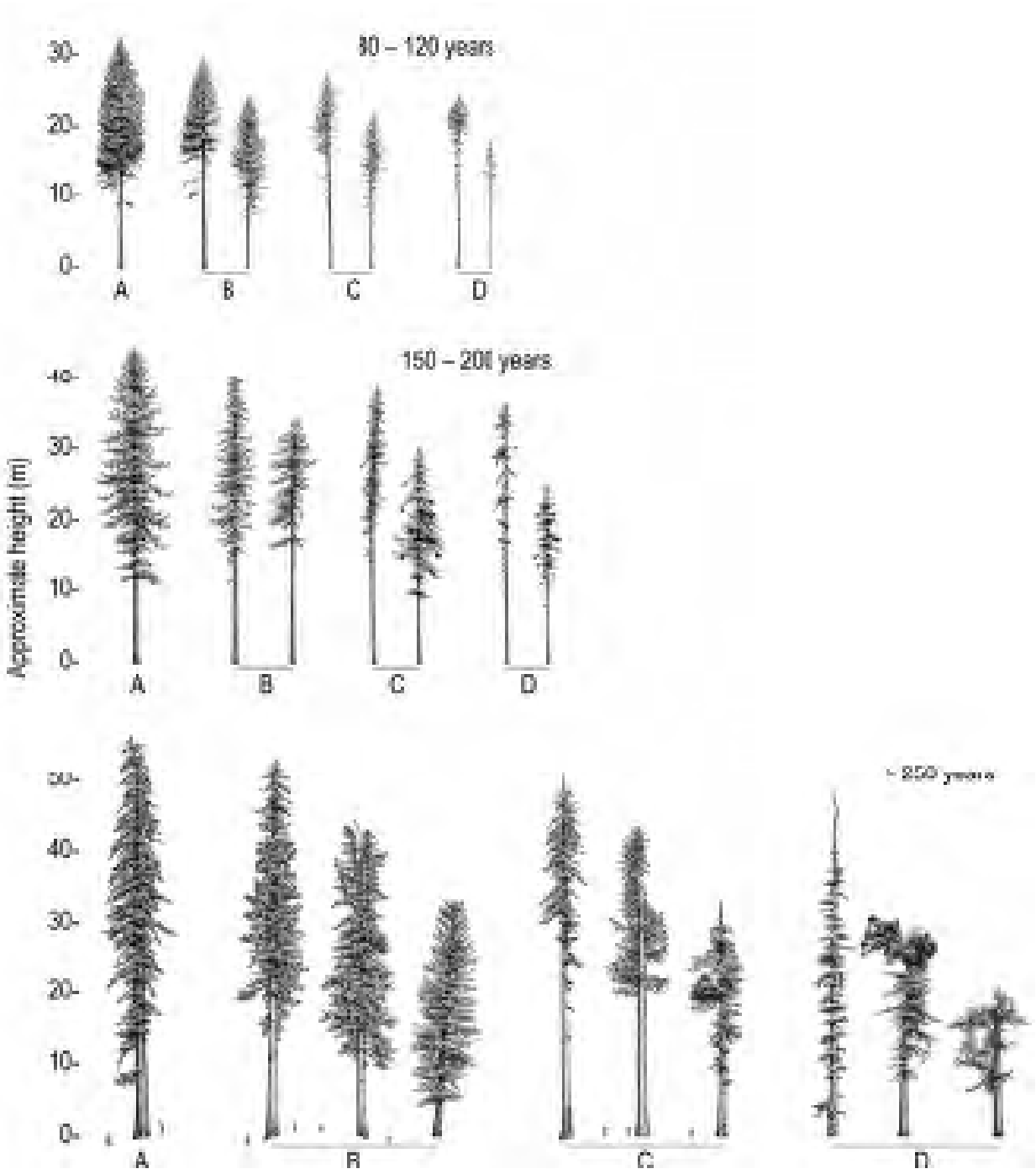
Crown form (refer to Figure 94)
- Similar to a tree in top row .....0
- Similar to a tree in middle row.....3
- Similar to a tree in bottom row.....5

Scoring Key

| | |
|---|---|
| < 3 | Young tree |
| 3–6 | Mature tree < 150 years |
| 7–10 | Mature tree ≥ 150 years |
| > 10 | Old tree ≥ 250 years |

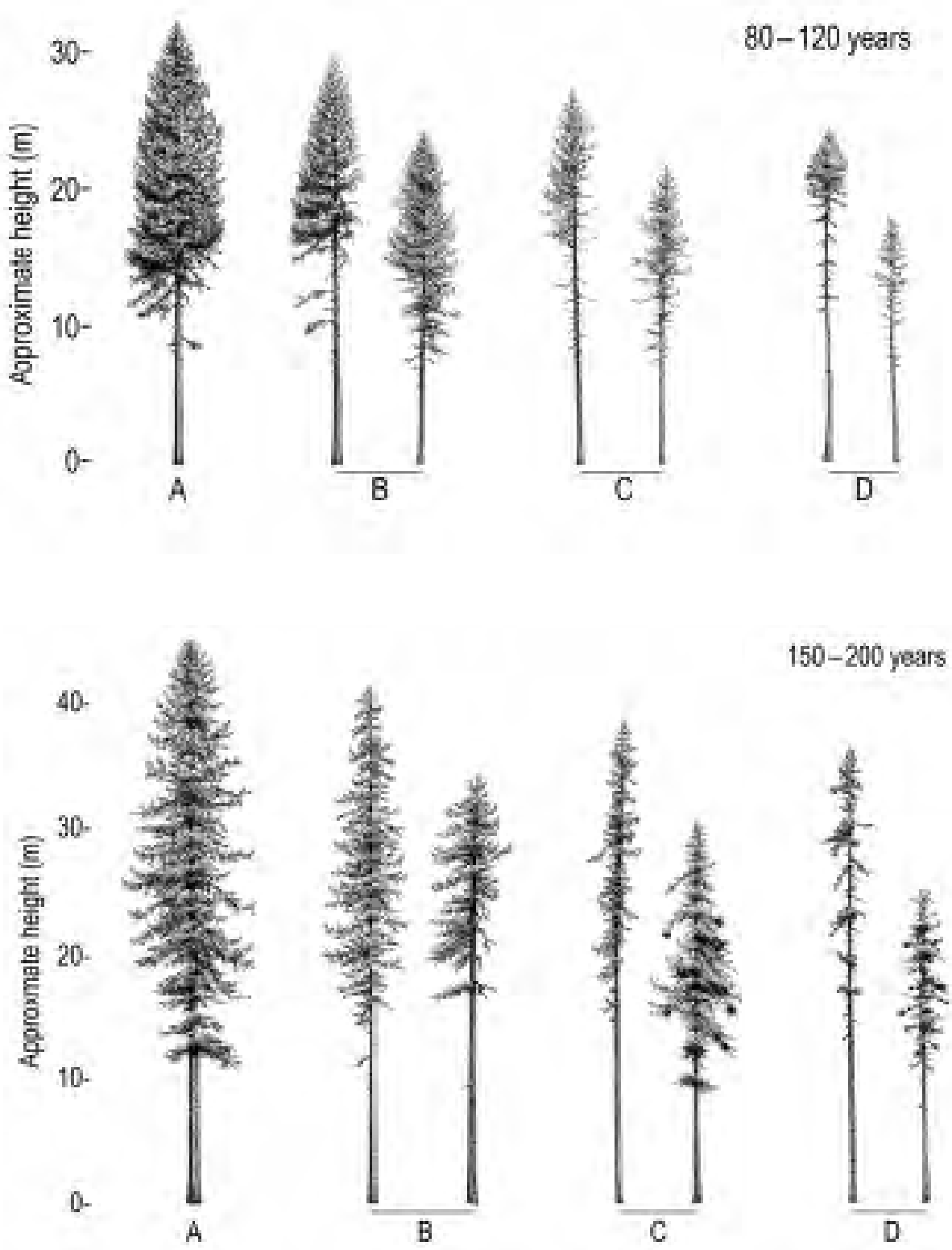
# Western Larch

**Figure 94. Western larch crown form and tree vigor in eastern Washington**. Idealized forms represent three age and four vigor classes (A-high vigor to D-low vigor). Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown for vigor classes B-D to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class. The trees depicted are the same scale in the first image, and at differing scales on the following pages.



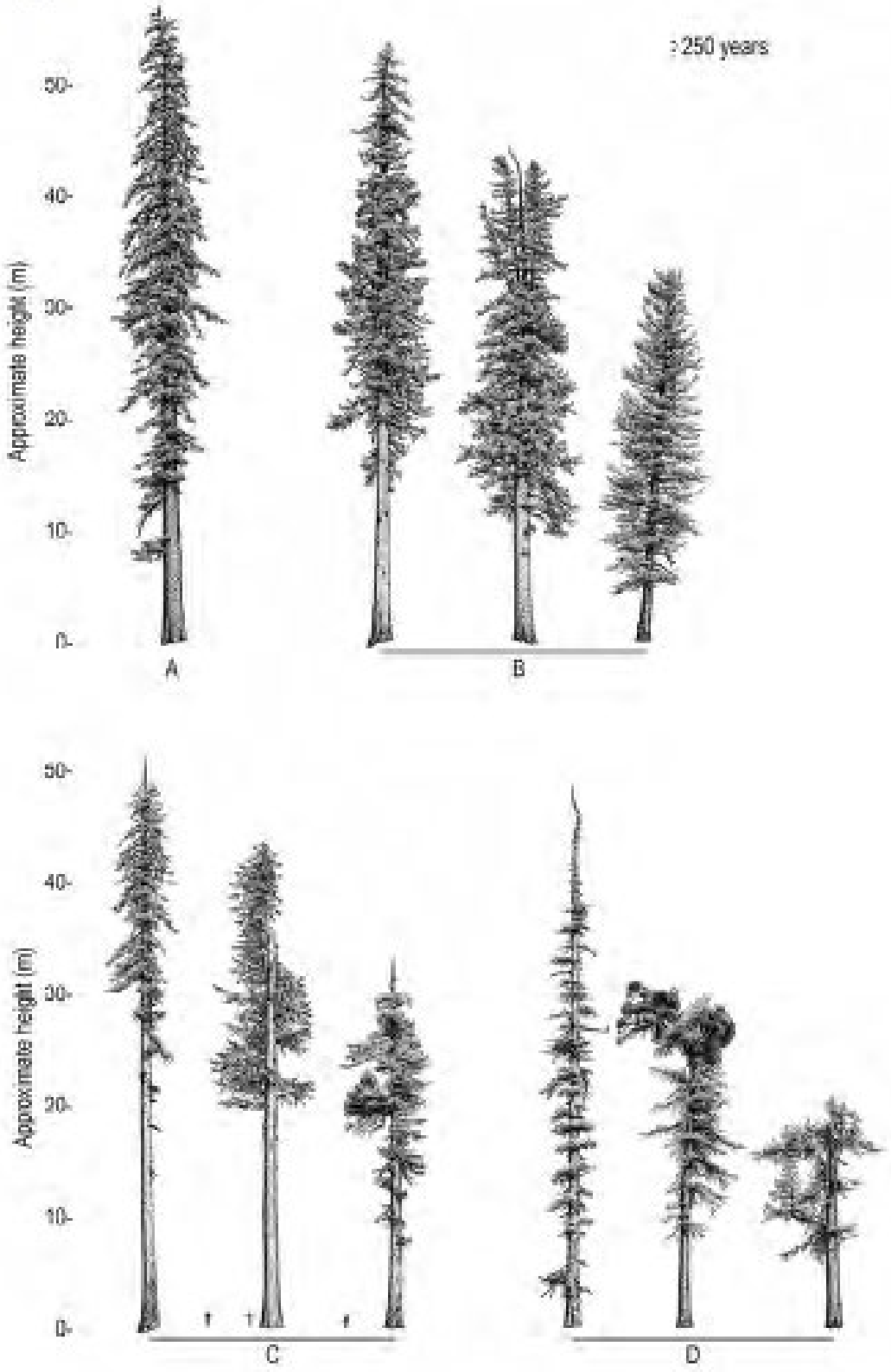
# Individual Species or Group Treatments

**Figure 94. Continued**

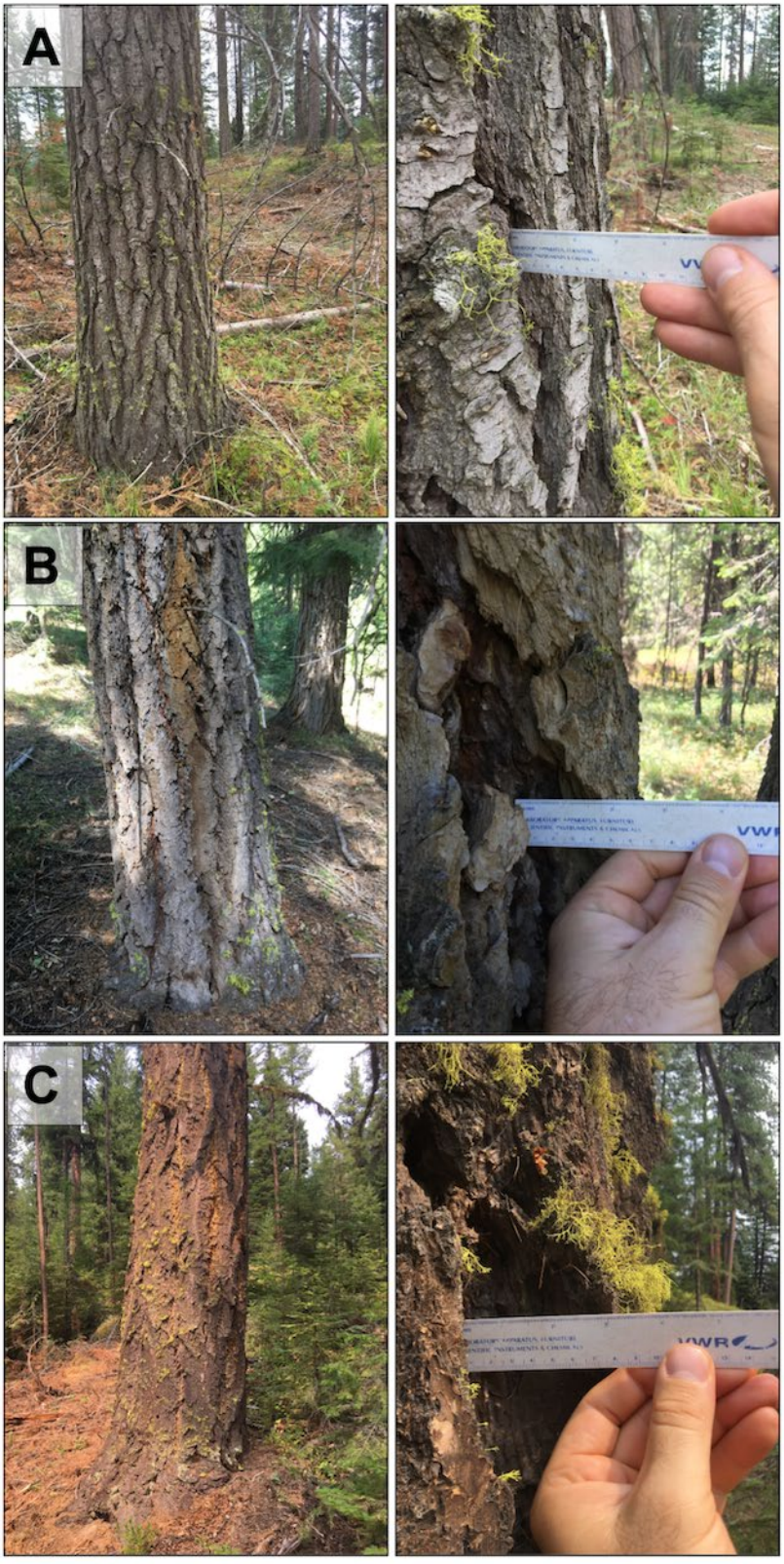


# Western Larch

**Figure 94. Continued**



# Appendix D: Key for Determining the General Age of Grand Fir



Example photographs for aging grand fir. Photo A: <150 year old grand fir (exact age = 107 years old). This tree has greyish-silvery bark, somewhat narrow bark platelets (a platelet is the flat piece of bark between the bark fissures), and relatively shallow bark fissures (1.4 inches deep). This tree has numerous dead branches low to the ground. Many of these dead branches are very fine (only a millimeter or two diameter at the tip). Live foliage is 10 feet from the ground. Photo B: <150 year old grand fir (exact age = 139 year old). This tree has distinctly greyish bark with little hint of silver, medium sized bark platelets, relatively wide bark fissures, and moderately deep bark fissures (1.75 inches deep). This tree has just a few dead branches within five feet of the ground, but no fine dead branches. Live foliage is 16 feet from the ground. Photo C: >150 year old grand fir (exact age = 197 years old). This tree has greyish-brown bark, with large bark platelets, relatively wide bark fissures, and deep bark fissures (almost 3 inches deep). This tree has a few dead branches, all more than 8 feet off the ground. Some dead branch stubs are relatively large diameter (>1.75 inches). Live foliage is 23 feet off the ground. In appearance, this tree is very similar to an old growth Douglas-fir. Note: It is difficult to estimate lichen cover, and the amount of lichen on a tree is not particularly predictive of age, although many old grand fir including this one have extensive lichen cover.

The picture key described above will be the first step in determine the age of grand fir. Trees where the age is easily identifiable by the above picture key need no further evaluation. Trees where the age is not easily identifiable will then be evaluated through the following point system, where the DBH, fissure depth, and height to live foliage will be measured or visually estimated.

| **Measurement** | **Points** |
|---|---|
| DBH <10 in | 0 |
| DBH 10-20 in | 1 |
| DBH 20-30 in | 2 |
| DBH 30-40 in | 3 |
| DBH >40 in | 4 |
| Fissure depth | |
| <1 in | 0 |
| 1-2 in | 2 |
| >2 in | 4 |
| Height to live foliage | |
| <10 ft | 0 |
| 10-20 ft | 1 |
| >20 ft | 2 |

| | |
|---|---|
| 0-3 points | Tree is <150 years old |
| 4+ points | Tree is >150 years old |

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