

Transitioning From Even-Aged to Multi-Aged Forest Structure in Second-Growth Ponderosa Pine

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Overview:

- Uneven-aged management in ponderosa pine is of increasing interest; however, there is little experience in the Northern Rockies with how to transition from even-aged stands to multi-aged stands, especially where it requires multiple entries and years of forward thinking. Barriers to implementation include the scarcity of examples, inertia against doing something new, perceived administrative red tape (e.g., FACTS terminology), and leanness of continuous cover forestry in wildfire-prone forests.
- We share an example of multi-aged management of ponderosa pine in the Bitterroot National Forest in its adolescence, and pair that with plans to deliberately transition nearby young plantations to multi-aged stands.
- This research-management partnership at the Lick Creek Demonstration/Research Forest builds on a legacy of collaboration for ecosystem restoration and fuels management dating back to 1991. We are developing a planning guide to aid in implementing stand tending treatments designed to shift even-aged ponderosa pine-dominated forests to multi-aged for multiple benefits.

Summary:

Management problem: Throughout the range of ponderosa pine (*Pinus ponderosa*), clearcut harvesting and planting through the late 20th century resulted in widespread even-aged forests, which excelled at regenerating shade-intolerant species and producing wood in an operationally simple way. Two decades into the 21st century, timber production objectives are now also balanced with a variety of nontimber objectives such as increasing resistance and resilience to disturbances and managing wildlife habitat.

Management need: One way to attain these objectives is to improve structural diversity by restoring multi-aged forests, similar to the structure created historically by frequent, low-severity wildfires. Multi-aged management in ponderosa pine in the Northern Region is growing, but the concept remains novel and unexplored because of various constraints. For example, there is little experience in the region with how to transition from even-aged stands to multi-aged stands, especially where it requires multiple entries, and few local examples

exist to build from and spur creative management solutions. Furthermore, nontraditional management techniques are difficult to document in agency reporting databases (e.g., FACTS). Additionally, it is unclear how managers might balance fire hazard reduction with the development of forests with multiple canopy layers. Taken together, there is a need to gain momentum to make multi-aged management a more common practice.

Purpose: We are developing a planning guide to aid in implementing stand tending treatments designed to shift even-aged ponderosa pine-dominated forests to multi-aged. We will include case studies from both naturally regenerated forests and plantations on the Bitterroot National Forest of southwestern Montana.

Silvicultural Concepts:

- In multi-aged forestry at least two age cohorts are cultivated and managed within a stand. This type of silviculture is advantageous because it retains cover through harvest, improves opportunity for genetic adaptation to local climate by producing new regeneration, and generates a diversity of timber size classes. Yet, high stocking often associated with multi-aged forests may be a disadvantage to stands facing insect, drought, or wildfire stressors. Therefore, stocking must be carefully managed to optimize resilience to multiple disturbances, as was the case in some historical stands with intact fire regimes.
- We are using studies from both naturally regenerated forests and plantations on the Bitterroot National Forest of southwestern Montana to demonstrate how naturally regenerated and planted stands can be moved towards uneven-age structures with harvesting and prescribed burning.
- The natural regeneration study at the Lick Creek Demonstration/Research Forest consists of a uniform shelterwood with reserves regeneration harvest with and without prescribed burning, which induced a second cohort underneath an 80- 85-year-old, second-growth ponderosa pine overstory in 1991. Regeneration is patchy and dependent on past burning. Re-entry cutting and burning treatments are planned for 2022 to foster another cohort, remove shade-tolerant Douglas-fir advance regeneration, and reduce surface fuels.
- Also in the Lick Creek watershed, numerous even-aged ponderosa pine plantations were established after harvesting and planting between 1979 and 1986. Plantations were thinned one to two times as recently as 2004, and will now receive different cutting and burning treatments to tend the overstory and develop a second cohort of ponderosa pine.



Management Applications:

- This project is useful for demonstrating possible transition treatments and reentries to increase complexity and resilience to future disturbances in frequent-fire ponderosa pine ecosystems.
- There are very few places in the Northern Region that use prescribed burning in plantations towards creating multi-aged structures. This project will provide examples of the effects of different burning and harvesting treatments to meet multi-aged management goals in ponderosa pine.
- The long-term studies at the Lick Creek Demonstration/Research Forest have provided a demonstration viewing area for several public tours to show what treatments look like. Additionally, the Bitterroot National Forest has used the study data and results in NEPA documents to support local ponderosa pine management.



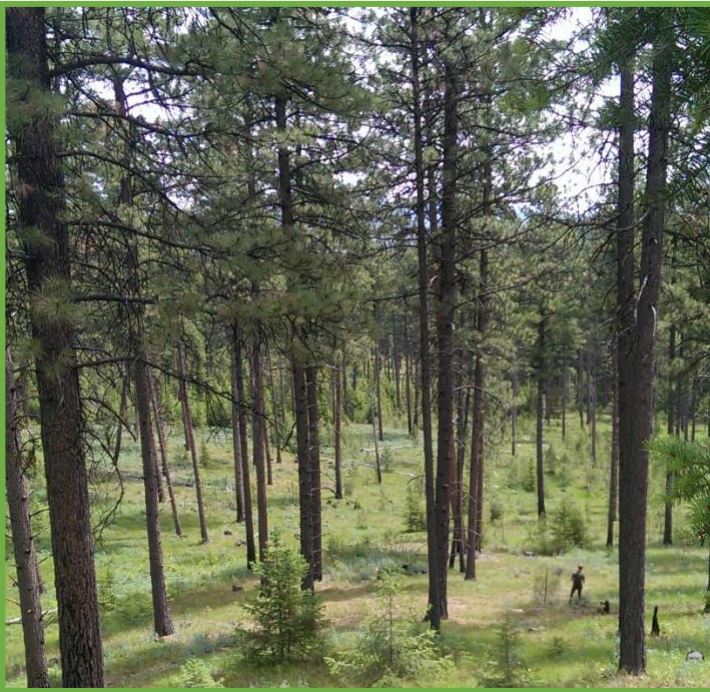


Figure 1—Light Douglas-fir regeneration beneath ponderosa pine 23 years after 1991 uniform shelterwood with reserves overstory at Lick Creek Demonstration/Research Forest.



Figure 2—Ponderosa plantation aged at 35 to 40 years old in the Lick Creek drainage of the Bitterroot National Forest. Note the dense, regular spacing and abundant Douglas-fir in the understory.