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Guidelines for Thinning Ponderosa Pine for Improved Forest Health and Fire Prevention

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Past land management practices have often resulted in ponderosa pine stands that are overly dense and prone to catastrophic wildfire or bark beetle outbreaks (Covington and Moore 1994a, 1994b; Kolb et al. 1994). Landowners and property managers in the Southwest now are faced with determining appropriate ways to prevent these potentially stand-replacing events. The best way to reduce wildfire threat, drought damage and attack by bark beetles is to lower stand density through mechanical thinning. This publication will help those landowners with little or no experience to determine existing stand density and choose an appropriate method to select trees for removal where needed.

An additional benefit from reducing stand density is that remaining trees will grow more rapidly than when in an over-stocked condition. A century of research has shown that tree diameters increase at a faster rate in stands with lower densities, and ponderosa pine is no exception (Ronco and Edminster 1985). Thinning can greatly increase under story plant density in ponderosa pine forests (Moore and Diter 1992, Covington et al. 1997). Herbaceous plant growth, both grasses and forbes, typically increases when additional light reaches the forest floor.

A potential drawback to thinning may be the perception that the properties scenic beauty will be spoiled. Brown and Daniel (1986) found, in their study of predicting scenic beauty in ponderosa pine stands, that less dense (more open) stands had greater scenic value. The major components of higher preference were the increase in herbaceous plant growth and the remaining mature trees. (Refer to Figures 1a-e for a visual representation of various basal areas in a ponderosa pine stand with even-aged management.)

AT A GLANCE

- Preventing a stand-replacing event is best accomplished through tree thinning.
- Lower stand densities result in greater individual tree growth and vigor.
- Lower stand densities promote greater plant diversity in the understory.
- Determining stand conditions is the first step.
- Formulating a plan to improve stand conditions.
- Thinning around individual trees can improve individual tree health, thus reducing the likelihood of damage from bark beetles, fire or drought.

How to determine stocking rate (trees per acre) and basal area (BA)

Using sub-sampling methods

Sub-sampling with 1/20th acre plots (radius of 26.3') will provide a good estimate of total number of trees and basal area per acre without measuring every tree on the property.

Laying out the first 1/20th acre sub-sample plot

Using a map of the property, select a representative point on the property sufficiently distant from edges. Using this point as the first plot center, measure a radius of 26.3 feet. Use powdered chalk or other marking method to delineate the boundaries of the plot.

Determining number of plots

For properties of one the five acres use Table 1 to determine the number of evenly spaced plots to measure. For larger properties of 6 to 100 acres add one additional plot per acre [i.e. 6 acres = 11 or 16 plots, 10 acres = 15 or 20 plots, 20 acres = 25 or 30 plots (uniform or non-uniform). Thirty plots will be sufficient for 25 to 100 acres.

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Figure 1a. Basal area of ~30 square feet per acre.

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Figure 1b. Basal area of ~60 square feet per acre.

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Figure 1c. Basal area of ~90 square feet per acre.

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Figure 1d. Basal area of ~120 square feet per acre.

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Figure 1e. Basal area of ~150 square feet per acre.

Figures 1a-e. Photos from top to bottom represent basal areas of approximately 30, 60, 90, 120, and 150 square feet per acre, from an even-aged stand in Flagstaff, Arizona.