



Ecological Restoration Institute



Fact Sheet: Implications of Diameter Caps on Multiple Forest Resource Responses in the Context of the Four Forest Restoration Initiative

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Implications of Diameter Caps on Multiple Forest Resource Responses in the Context of the Four Forest Restoration Initiative

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INTRODUCTION

Due to the ecological and social importance of large, old (presettlement) trees, it is often desirable to protect them when planning forest treatments, and a diameter cap is one way to try to accomplish this. A diameter cap is a limitation on cutting trees above a certain diameter during treatment implementation. Some environmental and conservation groups have advocated for them and caps have been implemented on a range of projects in the western U.S. Nevertheless, there is little knowledge of the potential effects of a diameter cap on forest resources. The large scale restoration treatments proposed by the Four Forest Restoration Initiative (4FRI) in northern Arizona provide an opportunity to use current stand data (Fig. 1A) and treatment prescriptions targeting desired future conditions (Fig. 1B) to provide insights into the use of diameter caps on a variety of forest resource responses.

This fact sheet's purpose is to give an overview of the effects of diameter cap implementation on a variety of forest resources in ponderosa pine (*Pinus ponderosa*) stands within the Coconino National Forest, Arizona.

METHODS

A subset of stands in the Coconino National Forest was selected and examined using the Central Rockies variant of the Forest Vegetation Simulator (CR-FVS). By using this simulator, the effects of the treatments proposed by 4FRI were examined under six different diameter cap scenarios: 12-inch, 16-inch, 20-inch, 24-inch, 30-inch, and no treatment.

The 30-inch treatment scenario was tested to approximate the effects of a no-cap treatment scenario and a no treatment alternative was also tested. Numerous forest attributes were examined, including tree density (trees/acre), average basal area (ft²/acre), quadratic mean tree diameter, torching index (wind speed in miles per hour (mph) necessary to initiate torching or passive crown fire), crowning index (wind speed in mph necessary to maintain an active crown fire), percent canopy cover, total volume (ft³/acre), relative density index (percent maximum stand density index), snags per acre, scenic beauty, water yield, and herbaceous production (pounds/acre).

RESEARCH FINDINGS

Findings suggest that tradeoffs exist when evaluating multiple resource benefits. For example, a 12-inch diameter cap (the minimum tested) appeared to be the best compromise between wood fiber production and short-term fuels reduction because it allows for some thinning of the stand while ultimately retaining high levels of basal area and tree volume. Alternatively, the results suggest that a 30-inch diameter cap (the simulated no-cap scenario) may be the best option for reducing the effects of wildfire due to the observed increase in simulated crowning index (wind speed at which active crown fire is possible). Conditions resulting from the diameter caps of less than 20-inch showed little variation by the end of the simulation period (year 2100) but may result in a more even-aged distribution.

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The Forest Vegetation Simulator (FVS) is a deterministic model that has limitations in its evaluation of future stand conditions. Specifically, FVS is not spatially explicit and does not have the ability to simulate the retention of old trees. In addition, diameter caps were the only treatment strategies evaluated by this study. As a result, the implications and recommendations of this study likely underestimate the true costs to natural resources imposed by implementing diameter caps. Given the differing results of diameter cap scenarios and the variety of other possible treatment strategies, the information contained in this fact sheet will help land managers and landowners evaluate the efficacy of a diameter cap based on their specific goals and objectives.

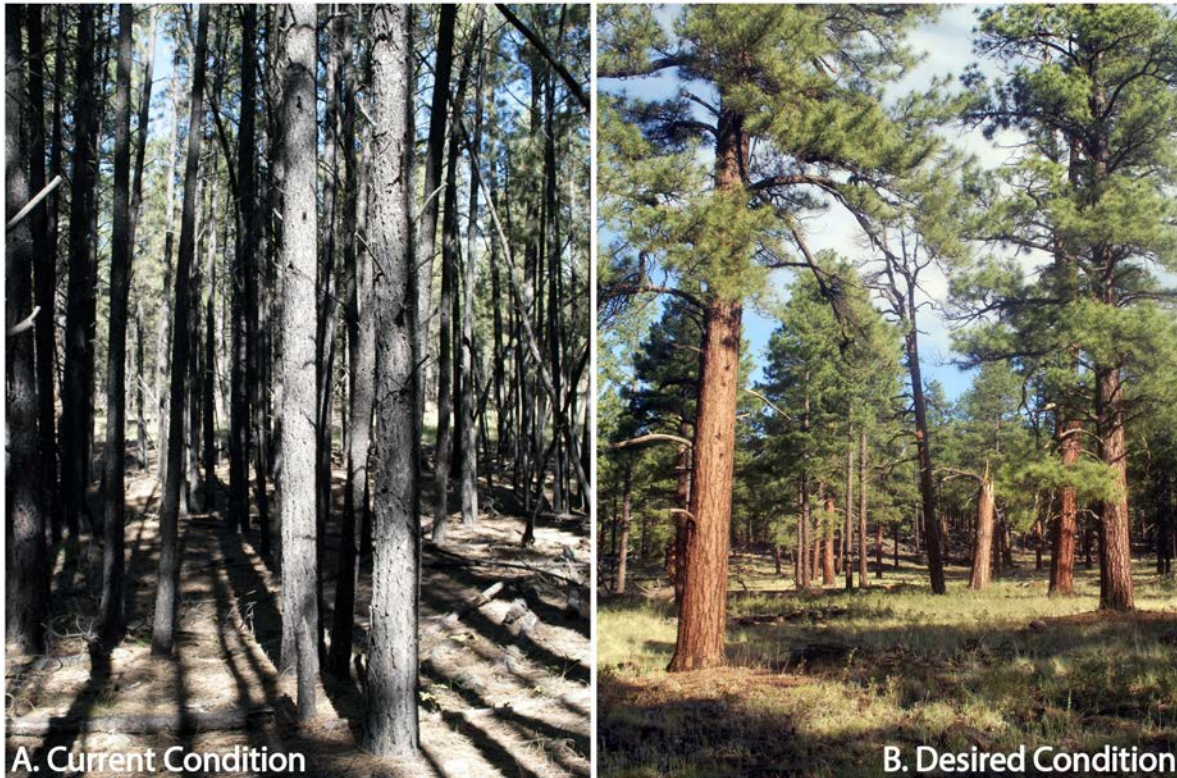


Figure 1. Photographs depicting current, untreated (A), and desired future conditions (B) for a ponderosa pine stand in the southwestern United States. This transition in forest structure is one of the primary goals of landscape scale collaborative restoration projects such as 4FRI.

MANAGEMENT IMPLICATIONS

- The 30-inch diameter cap was the most effective for maintaining stand basal area between 50–70 ft²/acre, retaining old growth, promoting spatial heterogeneity, and reducing the continuity of canopy fuels. It also moved the stand toward uneven-aged conditions and resulted in the highest herbaceous production, the lowest percent canopy cover, and the highest simulated water yield.
- The reduction in canopy cover and the increase in herbaceous production simulated in the 30-inch diameter cap scenario would have a positive effect on many wildlife species; however, corresponding reductions in snag density could be considered unfavorable.
- The effects of diameter caps became less pronounced over the 90-year simulation, which underscores the importance of maintenance treatments and the simulated reintroduction of fire for lasting effects.

This Fact Sheet summarizes information from the following source:

Sánchez Meador, A.J., K.M. Waring, and E.L. Kalies. 2015. [Implications of Diameter Caps on Multiple Forest Resource Responses in the Context of the Four Forests Restoration Initiative: Results from the Forest Vegetation Simulator.](#) *Journal of Forestry*: 113.

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