

Managing for Old-growth Forests: A Moving Target

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Presentation Abstract

Old-growth Douglas-fir (*Pseudotsuga menziesii*) forests are a goal for conservation and restoration across millions of acres of federal forest lands in western Oregon and Washington. Where old growth currently exists, management is typically focused on protecting stands and watersheds from logging and high-severity wildfire. Where old growth was converted to Douglas-fir plantations during the 20th century, the goal is often to actively manage those areas to create ecological diversity and accelerate development of old-growth conditions. What does it mean to use old growth as a target for management? Most old-growth Douglas-fir forests are over 200 years old, and many contain trees over 500 years old. Yet existing empirical studies and our scientific knowledge of forestry are less than a century old and have limited value in projecting how silvicultural manipulations will influence ecosystem function objectives centuries into the future. Old growth as a target can mean using the structure and function of current old-growth stands as a goal for manipulating plantations. This is a challenge because current old-growth stand structure represents centuries of succession, disturbance, and climate change—pathways of development that probably will not be repeated in nature or through silvicultural manipulations. Or, more realistically, it can mean altering conditions in plantations to more closely match what we know about the structure and dynamics of old-growth stands when they were young. In this second approach, managers would manipulate structure and composition to create conditions in young stands that would be more likely to develop the general features of old-growth forests over time than if they were left alone. This approach is based on several areas of knowledge with different degrees of development: (1) a relatively well-developed knowledge of how stand density affects stand development; (2) a moderately good understanding of current old-growth forest structure; (3) a fair understanding of how current old stands developed; and (4) a poor understanding of how any given stand might develop over the next several centuries. We review what is known about current old-growth forest structure and how old-growth forests develop over time and space. We show how regional and local ecological variation can affect old-growth structure and development. We use simulation models to explore how silvicultural manipulations might affect development of old-growth characteristics in the short run. We provide some scenarios of how plantations might develop over centuries. Finally, we propose some rules of thumb to guide management of dense conifer plantations to restore ecological diversity and reset pathways toward desired old-growth structure and composition:

1. Reduce stem densities in plantations to increase rates of diameter growth to produce large-diameter trees and encourage development of large and deep crowns.

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2. Use variable-density approaches to create spatial heterogeneity to promote understory development and diversity.
3. Favor hardwoods and other conifer species that would have been eliminated under intensive management for Douglas-fir timber production.
4. Plant shade-tolerant tree species where seed sources of desired species are lacking in the stand or landscape.
5. Don't use the same prescription everywhere—vary densities and frequency of entries.

Keywords: restoration, thinning, plantations, regeneration, structural diversity, species diversity, Douglas-fir, old growth.

Editors' suggestion:

Franklin, J.F.; Spies, T.A.; Van Pelt, R.; Carey, A.B.; Thornburgh, D.A.; Berge, D.R.; Lindenmayer, D.B.; Harmon, M.E.; Keeton, W.S.; Shaw, D.C.; Bible, K.; Chen, J. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. *Forest Ecology and Management*. 155: 399–423.