

Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*



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New Science Synthesis to Inform Pinyon and Juniper Woodlands Management in the Western United States

Pinyon and Juniper Woodlands Are Undergoing Changes

Pinyon and juniper woodlands occupy over 70,000 square miles of the Great Basin and Colorado Plateau. In some areas, pinyon and juniper woodlands are expanding into other vegetation types, like sagebrush steppe. In other areas, these woodlands are contracting due to human development, more severe droughts, and larger wildfires. These ongoing changes are of concern to land managers and the communities that depend on them. A new publication by Rocky Mountain Research Station scientists and their collaborators called *The Ecology, History, Ecohydrology, and Management of Pinyon and Juniper Woodlands in the Great Basin and Northern Colorado Plateau of the Western United States (RMRS-GTR-403)* synthesizes over 1,000 publications and provides the best information on the woodlands that is currently available. The lead author,

Richard F. Miller of the Eastern Oregon Agricultural Research Center in Corvallis, Oregon, explains: “With so much literature coming out, our goal was to try and capture the story of pinyon and juniper woodlands across a large geographic region in a way that would benefit private, federal, and state land managers. This synthesis helps us to better understand these diverse ecosystems and develop effective management strategies across a very dynamic landscape.”

The New Synthesis Will Help Determine the Best Management Strategies

“This synthesis is a comprehensive review of the current knowledge of both persistent and newly expanded pinyon and juniper woodlands that will be of interest to managers, researchers, and the public,” says Jeanne Chambers, a Research Ecologist with the Rocky Mountain Research Station and synthesis co-author. The synthesis begins with an overview of where the woodlands occur and of the six pinyon and juniper species that comprise the woodlands. The history of the woodlands and their dynamic nature is then described. Over the past 20,000 years, the woodlands have shifted up and down in elevation by as much as 3,000 feet and migrated hundreds of miles to the north. A section on the ecology of the woodlands provides information useful for understanding the factors that determine recruitment and influence expansion of the woodlands as well as those that influence mortality and contraction. Another section describes the ecohydrology of the woodlands and the influence of tree expansion on infiltration and runoff of water and erosion of soil in these dryland ecosystems.



The synthesis reviews the history of pinyon and juniper woodlands from the last ice age to the present, to provide the basis for understanding their ecology. (photo: R. Miller, Oregon State University).



The final section reviews past and present pinyon and juniper woodland management, the types of vegetation treatments used, and the relative effectiveness of the different treatments. Managers



Fire can be a useful tool for managing pinyon and juniper woodlands. However, the threat of invasive plants following burning is a major concern. Increases in invasive annuals following a fire is often greater than following cutting and shredding treatments. Site characteristics—including soil temperature and moisture and vegetation present on the site prior to treatment—are key components that influence resistance to invasive plants. Underdown Canyon, Nevada (photo: J. Chambers, USDA Forest Service).

KEY MANAGEMENT CONSIDERATIONS

- **RMRS-GTR-403** is a comprehensive science synthesis of findings from over 1,000 publications. It provides the best available information on the distribution, history, ecology, hydrology, and management of pinyon and juniper woodlands in the Great Basin and on the Colorado Plateau.
- The changes occurring in these ecosystems—both expansion and contraction—are of concern to land managers and communities and the nature of these changes and their consequences for invasive species and fire regimes are discussed in the synthesis.
- Information is provided on the history of pinyon and juniper woodland management, the approaches available, and the key components to consider for restoring and maintaining ecosystem function and ecological resilience.
- The synthesis can be used in a shared stewardship context to prioritize areas for management of pinyon and juniper woodlands in locations that will provide the greatest ecological benefits and to identify effective management strategies for prioritized areas that will meet local needs.

will find this information particularly helpful when planning fuels management and habitat restoration projects.

The synthesis can be used in a shared stewardship context where managers work together with stakeholders to prioritize management actions in those areas where they have the greatest ecological benefits. It provides information on the different types of treatments that can be used to best meet local needs. The synthesis is supplemented by four companion fact sheets, which focus on key points regarding [ecology](#), [history](#), [ecohydrology](#), and [management and restoration](#) of pinyon and juniper ecosystems.

PROJECT LEADS

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FURTHER READING

Board, D.I.; Chambers, J.C.; Miller, R.F.; Weisberg, Peter J. 2018. [Fire patterns in piñon and juniper land cover types in the Semiarid Western United States from 1984 through 2013](#). RMRS-GTR-372. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 57 p.

Chambers, J.C.; Brooks, M.L.; Germino, M.J.; Maestas, J.D.; Board, D.I.; Jones, M.O.; Allred, B.W. 2019. [Operationalizing resilience and resistance concepts to address invasive grass-fire cycles](#). *Frontiers in Ecology and Evolution*. 7: 185.

Miller, R.F.; Chambers, J.C.; Evers, L.; Williams, C.J.; Snyder, K.A.; Roundy, B.A.; Pierson, F.B. 2019. [The ecology, history, ecohydrology, and management of pinyon and juniper woodlands in the Great Basin and Northern Colorado Plateau of the Western United States](#). Gen. Tech. Rep. RMRS-GTR-403. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 284 p.

Miller R.F.; Chambers, J.C.; Pellant, M. 2014. [A field guide to selecting the most appropriate treatments in sagebrush and pinyon-juniper ecosystems in the Great Basin: Evaluating resilience to disturbance and resistance to invasive annual grasses and predicting vegetation response](#). Gen. Tech. Rep. RMRS-GTR-322. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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