

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



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Predicting the Future to Save Whitebark Pine

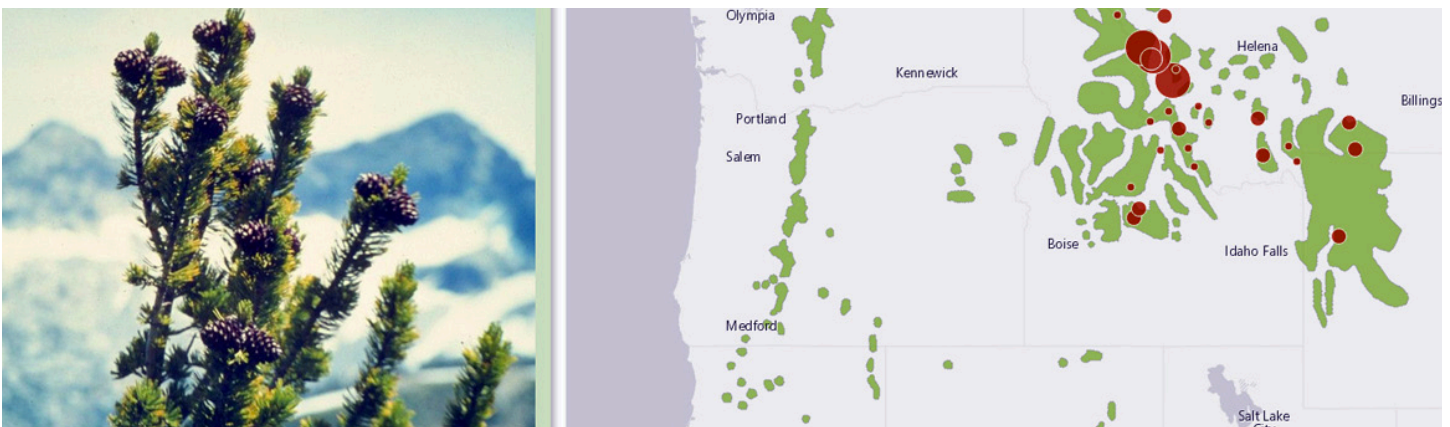
Whitebark pine (*Pinus albicaulis*) has been disappearing from high mountain landscapes due to mountain pine beetle outbreaks, white pine blister rust, human intrusions, and fire exclusion. It is currently a candidate species for listing under the endangered species act. In a recently published General Technical Report (RMRS-GTR-361), Rocky Mountain Research Station Research Ecologist [Robert Keane](#) and collaborators present guidelines for [restoring whitebark pine under future climates](#) based on an existing international rangewide restoration strategy and an extensive modeling experiment. This GTR will help forest managers develop the appropriate site-specific treatment plans for whitebark pine restoration projects.

The model used in Keane's project—FireBGCv2—uses historical and projected weather to predict changes in landscape composition and structure under two different climates, three restoration strategies, and two different fire management scenarios. They found that, without active restoration treatments, whitebark pine cannot survive. Management intervention actions such

KEY FINDINGS

- Whitebark pine will continue to decline over the next several decades, mostly from white pine blister rust, and mountain pine beetle mortality and indirectly by climate change impacts on regeneration and growth.
- This decline can be reversed or mitigated with proactive restoration actions; whereas if restoration does not take place, whitebark pine forests will continue to decline becoming a minor, if not missing, component on the high elevation landscapes in western North America.
- Whitebark pine can thrive under future climate scenarios in many landscapes, particularly where stands are managed with frequent fire.

as planting rust-resistant seedlings and employing proactive restoration treatments, can return whitebark pine to some high mountain settings in western North America to create resilient upper subalpine forests for the future. This most recent GTR is intended to be a companion to the [rangewide restoration strategy for whitebark pine](#) (RMRS-GTR-279) published in 2012. Additionally, a user-friendly [Story Map](#) has been developed as a companion to this work.



The Researching Whitebark Pine Story Map relates the current range of whitebark to ongoing research and key findings.





Whitebark pine forests are declining across most of their range in North America because of the combined effects of insect and disease mortality and fire exclusion. Guidelines for restoring whitebark pine under future climates are presented in a recently published GTR (RMRS-GTR-361) (photo by R. Keane).

Why is whitebark pine important to forests?

The loss of this iconic high-elevation tree species has serious consequences for high mountain ecosystems, both in terms of the impacts on biodiversity and in losses of valuable ecosystem processes and services.

WHITE PINE RESTORATION STRATEGY

Guiding Principles

1. Promote resistance to blister rust
2. Conserve genetic diversity
3. Save seed sources
4. Employ restoration treatments

Management Actions

1. Assess condition
2. Plan activities
3. Reduce disturbance impacts
4. Gather seed
5. Grow seedlings
6. Protect seed sources
7. Implement restoration treatments (any combination of prescribed fire, silvicultural treatments and regeneration plantings)
8. Plant burned areas
9. Monitor activities
10. Support research

FURTHER READING

Keane, Robert E.; Holsinger, Lisa M.; Mahalovich, Mary F.; Tomback, Diana F. 2017. [Restoring whitebark pine ecosystems in the face of climate change](#). Gen. Tech. Rep. RMRS-GTR-361. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 123 p.

Keane, Robert E.; Holsinger, Lisa M.; Mahalovich, Mary F.; Tomback, Diana F. 2017. [Evaluating future success of whitebark pine ecosystem restoration under climate change using simulation modeling](#). Restoration Ecology. 25(2): 220–233.

Keane, Robert E.; Tomback, D. F.; Aubry, C. A.; Bower, A. D.; Campbell, E. M.; Cripps, C. L.; Jenkins, M. B.; Mahalovich, M. F.; Manning, M.; McKinney, S. T.; Murray, M. P.; Perkins, D. L.; Reinhart, D. P.; Ryan, C.; Schoettle, A. W.; Smith, C. M. 2012. [A range-wide restoration strategy for whitebark pine \(*Pinus albicaulis*\)](#). Gen. Tech. Rep. RMRS-GTR-279. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 108 p.

Whitebark pine is considered a keystone species that promotes community diversity and stability. Mature pines help regulate snowmelt and reduce soil erosion in upper sub-alpine areas. The seedlings are hardy and act as nurse trees to other vegetation. The large seeds are also food for many animals such as the grizzly bear and birds like the Clark’s nutcracker, which disperses the whitebark pine seed by caching them in burn areas. Most importantly, whitebark pine is more resilient to the effects of increasing temperatures than the competing shade tolerant trees that, presently, make up most forests. To ensure the persistence of whitebark pine and associated communities into the future, restoration actions are needed now. According to Keane, “Without proactive restoration, white pine blister rust and mountain pine beetles will reduce whitebark pine populations to such low levels that we may lose the species from many landscapes.”

Rocky Mountain Research Station researchers work at the forefront of science to improve the health and use of our Nation’s forests and grasslands. More information about Forest Service research in the Rocky Mountain Region can be found here: <https://www.fs.fed.us/rmrs/>



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