



White Pines in Decline: What Can Managers Do?



Whitebark pine in Yosemite National Park. Photo: ©Michael Durham.

Overview

The Sierra Nevada is home to five species of white pine: sugar pine (*Pinus lambertiana*), western white pine (*P. monticola*), foxtail pine (*P. balfouriana*), whitebark pine (*P. albicaulis*), and limber pine (*P. flexilis*). From mid-elevation, mixed-conifer forests where sugar pine grow to upper montane forests graced by hardy western white pines to the subalpine where whitebark, foxtail, and limber pines persist, these trees represent foundational components of these ecosystems. But white pines are threatened by the non-native pathogen white pine blister rust, a warming climate, altered fire regimes, and changing dynamics of mountain pine beetles. These stressors have interacted to significantly reduce populations of some white pines, particularly whitebark pine, a candidate species for listing under the Endangered Species Act. Regional scientists and managers are working together to address conservation and management of sugar pine and whitebark pine, the two species currently most at-risk.

Background: What Are We Learning?

- Blister rust, increased fire severity, and drought-induced mountain pine beetle outbreaks have particularly affected sugar pine, resulting in an estimated loss of more than 50% of sugar pine trees per hectare over the last 20 years in Sequoia & Kings Canyon National Parks (SEKI) (Dudney et al. 2020).
- White pine blister rust has continued to spread into higher elevation areas, and infection rates have increased from 3% to 9% in western white pine —



Assessing a foxtail pine. Photo: ©Michael Durham.

which occurs at the upper edge of the montane forest — within SEKI over the past 20 years (Dudney et al. 2020).

- Whitebark pine has experienced the most dramatic declines across the northern portion of its range, due to a combination of all the stressors noted above.
- In the southern Sierra Nevada, whitebark pine populations are still relatively healthy, having only low levels of rust infection and scattered pockets of beetle-related mortality. However, we are documenting new infections and mountain pine beetle attacks in previously healthy stands, demonstrating the disease is spreading and beetle incidence increasing in Sequoia, Kings Canyon, and Yosemite.
- To date, the southern population of foxtail pine in SEKI has been largely unaffected by any of the factors driving declines in the other white pine species.

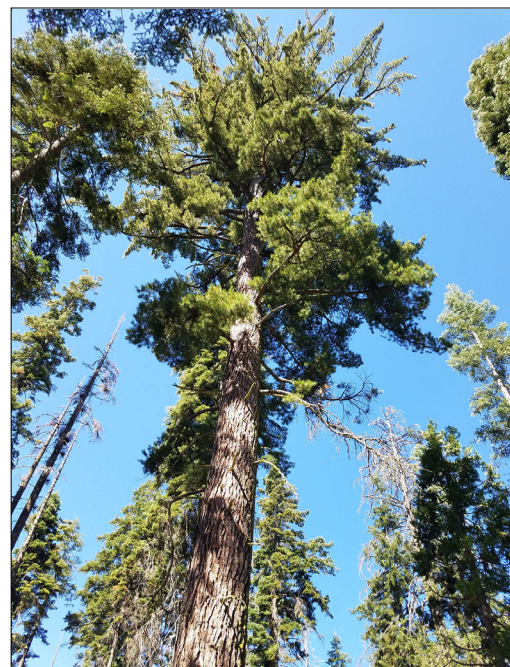
Strategies and Approaches: What Can Managers Do?

Regional and national efforts to help conserve and restore white pines in decline are focused on several key strategies:

- Protect and maintain genetic diversity.
- Increase resistance to white pine blister rust by identifying, protecting, and propagating seedlings from parent trees that display genetic resistance to the rust.
- Document current conditions and trends through time.
- Use forest management practices to improve forest health and resilience.

Sugar pine: Multiple tools are already available to effectively manage this species in the Sierra Nevada, and a recently initiated project with UC Berkeley will help identify which strategy or combination of strategies could be most effective to estimate population trends, establish benchmarks to maintain viable populations, and manage these populations.

Whitebark pine: A National Whitebark Pine Restoration Plan is being developed by the Whitebark Pine Ecosystem Foundation in conjunction with American Forests and the US Forest Service, with input from the National Park Service in designating “core areas” in parks for conservation of whitebark pine. The plan is expected to be completed in 2021. Recognizing the need for a California-focused conservation strategy, the US Fish and Wildlife Service is working with the US Forest Service and National Park Service to help coordinate efforts within California. This strategy is expected to be completed by the end of 2020.



Sugar pine, Sequoia National Park. Photo: L. Mutch

Restoration Requires Collaboration

Engage in interagency collaboration in order to:

- Prioritize when and where restoration approaches should be used.
- Expand the footprint of prescribed burning and implement the planting of rust-resistant seedlings.
- Support existing monitoring of white pine status and trends and expand to other national forests where feasible.
- Broadly communicate local implications of the National Whitebark Pine Restoration Plan to natural resource managers once it is available.



Whitebark pine cones. Photo: J. Nesmith.

Summary

Sugar pine, western white pine, whitebark pine, foxtail pine, and limber pine populations are threatened by:

- Blister rust
- Increased fire severity
- Drought-induced mountain pine beetle outbreaks
- Rapid climate change

Managers can:

- Protect genetic diversity.
- Propagate seedlings likely to have resistance to blister rust.
- Use prescribed fire to support forest health and resilience.
- Stay tuned for California and national restoration plans in 2020 and 2021.
- Anticipate a decision regarding federal listing in 2020.

Reference Cited

Dudney, J.C., J.C.B. Nesmith, M.C. Cahill, J.E. Cribbs, A. Das, D.M. Duriscoe, N.L. Stephenson, and J.J. Battles. 2020. Interacting effects of white pine blister rust, mountain pine beetle, and fire threaten four white pine species. *Ecosphere* 11(10) e03263.

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[Sierra Nevada Network Inventory & Monitoring Program website](#)