

Jules, E. S., P. J. van Mantgem, B. G. Iberle, J. C. B. Nesmith, and R. M. Rocheffort. 2020. Whitebark pine in the National Parks of the Pacific States: An Assessment of Population Vulnerability. Northwest Science Vol 94, in press.

## **Abstract**

Whitebark pine (*Pinus albicaulis*) is a long-lived tree found in high elevation forests of western North America that is declining due to the non-native white pine blister rust (*Cronartium ribicola*) and climate-driven outbreaks of mountain pine beetle (*Dendroctonus ponderosae*; MPB). The National Park Service established a monitoring program for whitebark pine in seven parks, including Sequoia & Kings Canyon, Yosemite, Lassen Volcanic, Crater Lake, Mount Rainier, Olympic, and North Cascades national parks. Using these data, we summarized stand structure, presence of blister rust, and MPB prevalence to provide a baseline for future monitoring. Next, we used a stochastic, size-structured population model to speculate on future trends in the seven national park populations under conditions of increased MPB activity and ongoing blister rust infection observed in Crater Lake. We found that blister rust infected 29 to 54% of whitebark pine in all the parks except the two southernmost, Sequoia & Kings Canyon and Yosemite, where infections rates were 0.3% and 0.2%, respectively. The proportion of dead trees in Sequoia & Kings Canyon and Yosemite was low (0 to 1%), while they ranged from 10 to 43% in the other parks. Model projections suggested an average population decline of 25% in the parks over the next century using Crater Lake conditions, declines which are possible if blister rust continues to spread and climate change results in a significant increase in the frequency or severity of MPB outbreaks. Overall, our study describes conditions at seven western parks and illustrates potential rates of whitebark pine decline if pest outbreaks and/or blister rust infections worsen.

**Keywords:** Inventory and Monitoring Program; matrix model; mountain pine beetle; *Pinus albicaulis*; whitepine blister rust

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