



Vital Sign Update: 2020 Results for Whitebark Pine Monitoring at Crater Lake National Park

Importance

The iconic whitebark pine (*Pinus albicaulis*) grows at high elevation along the rim of Crater Lake. Its high-energy seeds feed Clark's nutcrackers (*Nucifraga columbiana*) and squirrels. Its roots stabilize the thin rocky soil. Its shady branches prolong the snowmelt that sustains Crater Lake's streams. But stressors such as climate change, pests and pathogens, competition with other species, and fire exclusion are taking a toll. To detect concerning changes and keep park managers informed, we've been monitoring whitebark pine at Crater Lake since 2012. This brief describes how we monitor whitebark pine at Crater Lake and presents a slice of results about pathogen conditions between 2012 and 2020.

Documenting whitebark pine tree conditions

Several different measurements help us understand the condition of whitebark pine forests and how they may be changing. We document the variety and abundance (composition) of all tree species in our plots to understand competition. We measure tree heights and diameters within a stand to assess the stand's structure. We examine seedlings in "regeneration" plots nested inside the larger plots. We also document seed cones in mature trees. Information about structure, regeneration, and

cones tells us about birth, death, and growth rates of whitebark pines in the study area.

Documenting stressors

To better understand the threats to whitebark pine, we document a variety of stressors, including white pine blister rust, mountain pine beetle, and dwarf mistletoe.

White pine blister rust is a major stressor and a key component of monitoring. Caused by an exotic fungal pathogen, *Cronartium ribicola*, accidentally introduced into North America in 1910, blister rust affects all five-needle white pines. Blister rust infections (cankers) are usually lethal. A canker may girdle the stem, disrupting the flow of water and nutrients and killing any portion of the twig, branch, or stem beyond the canker. Cankers that form on the main stem (trunk) will often kill the tree top and can cause a tree to die quickly.

Results and Ongoing Monitoring

Every year since 2012 we have monitored 10 sites at Crater Lake between August and September. Our sampling design consists of 3 panels of sites, established in 2012, 2013, and 2014, for a total of 30 sites. We revisit sites every 3 years. In 2020, we completed the third revisit to all panels; all 30 sites have now been sampled 3 times.

View the map on back for average blister rust infection across the 3 visits for each site. Yearly values ranged from 0 to 100%, while average values across the 3 years ranged from 0 to 83%. New infections are detected each year. We sample sites at Crater Lake every year.

More Information

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Project overview, reports, and protocol:
<https://www.nps.gov/im/klmn/whitebark.htm>

Datasets and all related publications:
<https://irma.nps.gov/DataStore/Reference/Profile/2218776>



NPS/Hooke

Measuring whitebark pine seedlings in 3 x 3 m regeneration plots nestled inside a larger 50 x 50 m monitoring plot. In the larger plot, whitebark pine trees are tagged and tracked over time for changes in height, diameter, the presence of blister rust infection or mountain pine beetle activity, cones, and other key characteristics.

