

GENETIC RESISTANCE AND RESTORING A THREATENED SPECIES: WHITEBARK PINE AT CRATER LAKE NATIONAL PARK

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Whitebark pine (WBP), *Pinus albicaulis* is a wide-ranging conifer species found at high elevations in western North American forests. It is a keystone species, but is facing serious challenges, including high mortality in many parts of its range due to the presence of white pine blister rust (WPBR), caused by the non-native pathogen *Cronartium ribicola*, as well as the impacts of mountain pine beetle infestation, climate change, and altered fire regimes. Due to impacts of these daunting challenges WBP has been listed as endangered in Canada, while in the United States it is being considered for listing under the Endangered Species Act. The consensus among scientists working with WBP is that for restoration efforts to be successful in most areas, they will have to include seedlings with genetic resistance to WPBR. Dorena Genetic Resource Center has been evaluating resistance of WBP from Crater Lake National Park (CRLA) since 2004. These trials show that at least some populations, including CRLA populations, have genetic resistance that will allow restoration to proceed successfully. From 2009 to 2016, six restoration plantings have been established using seedlings from resistant CRLA parent trees. Through fall 2013, survival in the four oldest restoration plantings ranged from 77.6–90.6 percent. Rust infection has been very low to this point. Each planting has documented family identification of each seedling, which allows for WBP restoration and conservation, along with facilitating further research on how survival, rust resistance, growth, and specific traits vary among and within family groups. These restoration plantings also serve as long-term source populations of resistance alleles to help the natural regeneration of resistant WBP throughout neighboring areas. In addition, the current living rust-resistant parent trees in CRLA are being protected from mountain pine beetle infestation using verbenone pouches, to further help spread genetic resistance. The CRLA plantings provide a successful example of the use of genetic resistance to begin the restoration of a non-commercial forest tree species. They also provide a conservation education tool to raise public awareness of the potential for restoration using genetic resistance.

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