

# Status of White Pine Blister Rust and Seed Collections in California's High-Elevation White Pine Species

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**Abstract**—White pine blister rust (caused by the non-native pathogen *Cronartium ribicola*) reached northern California about 80 years ago. Over the years its spread southward had been primarily recorded on sugar pine. However, observations on its occurrence had also been reported in several of the higher elevation five-needled white pine species in California. Since the late 1990s, field surveys have substantiated that rust is present in several of these higher elevation species. The combined results of three local surveys in the Sierra Nevada and Warner mountains documented the occurrence of rust in western white and whitebark pines, but not in southern Sierra foxtail or limber pine. A 2004–2006 State-wide survey, funded by the USDA Forest Service (USDA-FS) Forest Health Monitoring Program, showed that the incidence of rust varied considerably within and between regions. For western white pine, mean rust incidence (percentage of infected trees with aecial evidence in a plot), was highest in the North Coast region (42 percent), and averaged substantially less in other areas such as the Klamath, southern Cascades, and northern and southern Sierra Nevada of California (18, 14, 8, and 1 percent, respectively). For whitebark pine, rust incidence averaged 24 percent in the northern Sierra Nevada (plots were as far south as Yosemite), but means were much lower, up to 2 percent, in the other areas. It was recorded on both species, east of the Sierra crest in the Lake Tahoe area, and as high as 3443 m elevation in a southern Sierra whitebark plot. For the more geographically-limited foxtail pine, rust was confirmed in five of six plots of the northern subspecies (mean of six plots: 12 percent). Since the survey was completed, several plots have been added in foxtail stands to further examine

rust occurrence and the population structure of this species, an endemic to California. In this survey, no rust was found on southern foxtail, limber, or Great Basin bristlecone pine, all located in southern mountain ranges. General plot mortality averaged 0 to 7 percent, depending on the species and regions.

The collection and storage of seed is a simple strategy for ex situ genetic conservation. In California, seed from high-elevation white pines is banked as conservation collections by the USDA-FS Region 5 Genetics group and as research collections by the USDA-FS Pacific Southwest Research Station's Institute of Forest Genetics (IFG). The Region's genetic seed inventory contains limited collections from foxtail and whitebark trees collected as early as 1994. In the mid-2000s, funds became available for cone collections of limber pine from southern California. In 2009, when the cone crop was very good and funding was available through the USDA Forest Service Forest Health Protection (FHP), cones were collected from trees at six new sites of whitebark, northern and southern foxtail, limber, and Great Basin bristlecone pine. In the last two years, separate research collections have been made at 28 sites of sugar, western white, and whitebark pine in the Lake Tahoe Basin and three sites of Great Basin bristlecone pine in Nevada, using funds from several grants (Snieszko and others, these proceedings). Collaboration between Region 5, IFG, and FHP is facilitating additional cone collections and seed banking. A national effort, led by FHP, has resulted in financial support for more California collections which will fill in geographic gaps where cone collections have not yet been made from these species.

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