

TITLE: An Assessment of White Pine Blister Rust on High Elevation White Pines in California

LOCATION: California

DURATION: Year 1 of 2-year project **FUNDING SOURCE:** Base Plan

PROJECT LEADER: John Kliejunas, Forest Pathologist, USDA Forest Service, Pacific Southwest Region, 707-562-8914, jkliejunas@fs.fed.us

COOPERATORS: Joan Dunlap, Program Manager, Sugar Pine Blister Rust Program, USDA Forest Service, Pacific Southwest Region; John Pronos, Bill Woodruff, and Pete Angwin, Forest Pathologists, Pacific Southwest Region

PROJECT OBJECTIVES:

- 1) To determine current levels of white pine blister rust associated with western white, whitebark, foxtail, limber and bristlecone pines in California.
- 2) To establish a system of permanent plots for long-term monitoring of rust incidence and severity, and its effects on the dynamics of the high elevation pine stands over time.

JUSTIFICATION:

a. Linkage: The distribution and severity of the introduced invasive pathogen *Cronartium ribicola* on sugar pine populations are well documented in California, and permanent plots are in place to measure trends. However, the presence and impacts of the pathogen on other, higher elevation, 5-needled pines (western white, whitebark, limber, foxtail, and bristlecone) in California are not well documented. There are no current surveys or system of permanent plots that assess the incidence and severity of blister rust on these species in the State. Reports of the rust on high-elevation white pines are sporadic and mostly anecdotal, resulting in observations that are not adequately recorded. The existing network of FHM plots in California is inadequate to determine the incidence of blister rust. For example, in 1992 only 5 of 55 forest health monitoring plots contained sugar pine and none had blister rust recorded. We know from other more intensive surveys that sugar pine makes up a greater component of the mixed conifer forest and that the level of rust in sugar pine averages about 40%. Intensification of the grid to adequately sample 5-needled pines was examined, but deemed cost prohibitive. Results from the Region 5 2002 aerial mortality survey indicate that about 53,000 acres of high elevation (>8,000 ft.) pine type have mortality. The cause for about 50% of the mortality is recorded as insects or as fire; the cause for the remaining 25,000 acres or so is unknown.

b. Significance: The high elevation mountain ranges of California contain some of the most diverse ecosystems in North America. Five species of white pines are keystone species of these ecosystems, playing a major role in maintaining ecosystem health and resilience. Bristlecone, foxtail, limber, and whitebark pines are among the few conifers adapted to arid, high elevation environments with harsh climatic conditions, sometimes being the only tree species present. They stabilize soils, provide wildlife forage and habitat, and are valued culturally. Bristlecone, foxtail, and limber pines have relatively small geographic ranges with isolated populations. Bristlecone pine has been dated as the oldest living trees, attaining 4600

years. These white pines are hosts, or potential hosts, to the exotic, invasive pathogen, *C. ribicola*.

c. Biological impact/political importance: Levels of blister rust in whitebark and limber pines of the Rocky Mountain and Intermountain regions are 80 to 90%; in some instances, ecosystems are being threatened. The incidence and effects of the rust in high elevation ecosystems in California are largely unknown. In the lower elevation sugar pine, the pathogen has not yet stabilized, and is continuing to spread and intensify. Anecdotal reports suggest that the rust may just be entering the higher elevations. The spread and impact of the introduced disease in these high elevation ecosystems needs to be documented in order to effectively formulate recommendations and policies to mitigate adverse impacts, and in order to respond to public concerns regarding the health of these highly visible and highly valued ecosystems.

d. Feasibility or probability that the project will be successfully completed: The rust resistance program and FHP in Region 5 are committed to obtaining the information. The ten National Forests of the Sierra Nevada are in the process of obtaining insect and disease information for forest plan revisions. Several private contractors with experience in high elevation blister rust surveys are interested and available to contribute to the project.

DESCRIPTION:

a. Background: The project will determine the current extent of *C. ribicola* on five species of white pines in high elevation ecosystems in California, and establish a system of permanent plots to allow for long term monitoring of health of these ecosystems. Reconnaissance surveys, using a contractor with rust experience, Wilderness Rangers, and Forest and FHP personnel, will be made to record the current presence and extent of the rust and tree mortality. A procedure for GPS/GIS documentation used in Sequoia-Kings Canyon National Parks will be used to document locations. Permanent plots will be established and examined for rust in representative areas with the 5-needled pine species. We anticipate working first with those species of limited distribution (Foxtail, bristlecone, limber) and having substantial data collection completed on those species in the first year. Similar work will be done for western white and whitebark pines with limited plot establishment and surveys in the first year, and more extensive work in the second year.

b. Methods:

Permanent Plots:

1. Compile, from existing vegetation type maps and other sources, a GIS database of the potential distribution of western white, whitebark, limber, foxtail and bristlecone pines, and reported incidences of rust, in California.
2. Divide the range of each of the hosts into units delineated by watershed boundaries.
3. Within each watershed unit, install at least one plot for each white pine species. The number of plot/unit will be governed by the areal extent of each species and the variability in rust expression observed). Potential plot locations will be determined by random points that "hit" the target population distribution. Random X,Y coordinates will be generated for each subpopulation of each species within a watershed unit.
4. Install plots at valid points (30 m wide and 50 m long; size adjustable according to stand density, topography, and other factors; extend transect until 50 white pines included).

5. Data collection in each plot will include location, slope, aspect, associated tree species, estimate of *Ribes* cover, white pine information (ht., dbh), and rust information (number of branch/stem cankers, age of cankers, presence of other mortality agents).

Reconnaissance Surveys:

1. Select a sample of natural stands where these host species have ecological or other significance and stands in which the hosts are not part of the permanent plot system.
2. Record rust presence or absence.

c. Products:

1. A GIS database containing locations of high elevation white pines and locations of blister rust in California.
2. A system of permanent plots allowing for periodic re-measurement of trends and impacts.
3. A report of conditions and health of 5-needled white pines in high elevation ecosystems of California.

d. Schedule of Activities:

Year 1: Compile existing information on host range and reports of rust incidence; determine number and location of areas to survey; begin surveying.

Year 2: Continue surveys; compile information into database.

Year 3: Produce reports on incidence/severity of rust in the five high elevation white pines of CA.

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR ONE				
Administration	Salary		\$18,000	R5
	Overhead @ 15%		\$2,700	R5
	Travel		\$4,300	R5
Procurements	1 GS 11 @ \$1,200/week for 12 wks.	\$14,400		
	2 person crew, GS 5-7 level, 10 wks.	\$18,000		
	Travel (\$500/week X 12 weeks)	\$6,000		
	Vehicle (\$300/week X 12 weeks)	\$3,600	\$2,500	R5
	Contracting: rangers/others	\$5,000		
	Equipment/Supplies	\$3,000	\$1,000	
TOTAL		\$50,000	\$28,500	
YEAR TWO				
Administration	Salary		\$18,000	R5
	Overhead @ 15%		\$2,700	R5
	Travel		\$4,300	R5
Procurements	1 GS 11 @ \$1,200/week for 12 wks.	\$14,400		
	2 person crew; GS 5-7 level, 10 wks.	\$18,000		
	Travel (\$500/week X 12 weeks)	\$6,000		
	Vehicle (\$300/week X 12 weeks)	\$3,600	\$2,500	R5
	Equipment/Supplies	\$3,000	\$1,000	
TOTAL		\$45,000	\$28,500	
YEAR THREE				
	1 GS 11 @ \$1,500/week for 4 weeks	\$6,000		
	Supplies		\$2,000	
TOTAL		\$6,000	\$2,000	