

Monitoring of Genetic Variation in White Pine Blister Rust Resistance and Survival at 10 Sugar Pine Evaluation Sites

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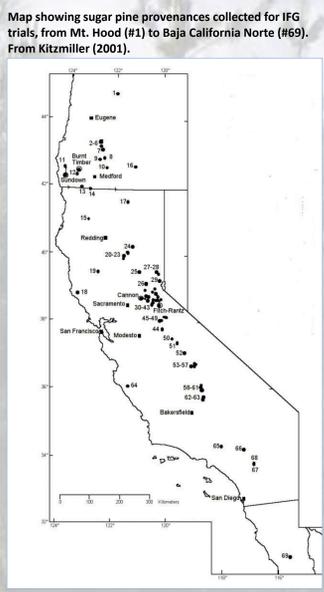
These plantings are a unique and valuable resource for this important forest species. They form probably the best older test series of all the white pine species in the U.S. It includes the most complete test of sugar pine provenances. They are essentially 'permanent plots', with known planting dates and genetic composition.

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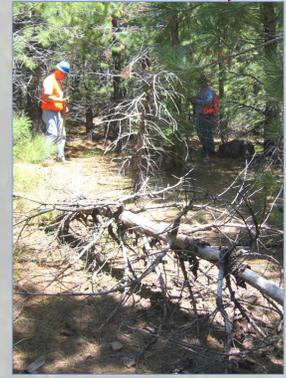


Two unique trial series are being monitored for growth/adaptation and infection from *Cronartium ribicola* (fungus causing white pine blister rust -- WPBR). One series includes seed sources of sugar pine (*Pinus lawsoniana*) from throughout most of the large range of the species. This trial series is planted at 2 sites in California and 2 in Oregon. The second includes a common set of sugar pine families from Oregon (some of the first families evaluated for WPBR resistance), planted at four sites in southern Oregon. Due to their composition and the array of sites on which they are planted, these two trial series provide the best continuous record of blister rust impacts on sugar pine over time. They should provide the opportunity to observe potential changes in adaption of the species to changing climate. We anticipate that they will also serve as an early warning indicator of the (potential) first presence in Oregon of a race of the rust virulent to one type of resistance.

IFG Sugar Pine Provenance Trials
 The Pacific Southwest Research Station along with the Siskiyou and El Dorado National Forests established a set of sugar pine test sites for the purpose of evaluating sugar pine seed-transfer guidelines. Seed was collected from 62 sources (provenances) of sugar pine from Baja California to as far north as the Mt. Hood NF in Oregon. In 1984 and 1988, different sets of these provenances were planted at sites with varying elevation in California and Oregon, with 42 common to all four sites. A fifth site (Harrell) was planted in 1992, with all provenances and families which were planted at the other sites. They were measured at regular intervals for growth and survival with several analyses of growth published. A recent, thorough analysis of growth & adaptation was done by Kitzmiller (RMRS-P-32: Breeding and genetic resources of five-needle pines: growth, adaptability, and pest resistance; 2001; http://www.fs.fed.us/rm/pubs/rmrs_p032.html). Trees have been growing between 20 and 25 years but prior to this, only a cursory survey has ever been made of these plantings to assess WPBR resistance of the provenances.



Photographs of recent and older sugar pine deaths due to WPBR at the Fitch-Rantz site.



Progress – 2009

- Two BLM sites were evaluated in 2005-6 and 2008.
- Four IFG sites were evaluated in 2009.
- New aluminum tree tags were purchased for all six BLM sites. The Boulder Creek site was retagged & brushed. Retagging and brushing is underway for Jamison Gulch and Anchor Ranch sites.
- The last four BLM sites have been scouted out and will be evaluated in 2010.
- The Harrell IFG site might also be evaluated in 2010.

Observations

- There was **extensive WPBR infection** (65-85%) at all sites assessed thus far (except for Cannon).
- There was **significant rust mortality** (around 50%) on all sites assessed, except Cannon.
- **Good growth** – trees up to 15" DBH and 12 m tall
- Many trees are **surviving and growing well in spite of rust** infection and significant cankering
- Some large trees showed **no evidence of infection** other than a small areas of **aecia** peeking through normal furrows in the bark (no swelling, no bark porosity).
- There were some large trees **surviving in spite of early infection** (large cankers at base).
- Infected *Ribes* plants were common at all sites.
- Evidence of **frequent infection years** up through 2007.
- Very few trees reproductively mature (a few cones at 2 sites).



Healthy, uncankered "13" DBH sugar pine at Sundown site.



Photos of recent and older branch cankers on sugar pine at Fitch-Rantz



Large ("11" DBH) sugar pine at Fitch-Rantz with only evidence of cankering being **aecia** in bark cracks.



Old basal **canker** on healthy 10" DBH sugar pine at Fitch-Rantz. **Aecia** also visible.



Rust infected *Ribes* at Fitch-Rantz

Bureau of Land Management Progeny Test
 Putative blister rust resistant sugar pine trees on BLM managed lands were selected during the 1970s. Fifty-three of the earliest selections from that rust resistance program were selected for evaluation of their field resistance to blister rust. The BLM and the US Forest Service planted six evaluation sites in 1982 and 1983. Thirty-one families were common to all 6 sites. They were evaluated about every 5 years with the most recent evaluation in 1997 (15 year).



Evaluations by

BLM Medford: Jim Brimble, Dave Russell, Paul LeBlanc, Sarah Queen, Ferris Fisher, Grant Cannon

R5 Genetics: Joan Dunlap

PSW: Det Vogler, Jessica Wright, Valerie Hipkin, Annie Mix, Paul Hodgskiss, Nicole Elen, Courtney Castle, Leo Landau

Siskiyou NF Silviculture: Paula Trudeau

Dorena GRC: Jerry Hill, Richard Snieszko, Bob Danchok, Sally Long, Angelia Kegley, Brock Mayo

(See Snieszko, et al, 2000. White pine blister rust infection and mortality in sugar pine: results through age 15. <http://www.fs.fed.us/r6/dorena/publications/detail/pub006>.)

NOTE
 Results and statements in this report are preliminary. This report covers the first year of a three-year project. Detailed analysis and final report will be presented at the 2011 FHM Meeting.

Summary Statistics for Sugar Pine Sites in Monitoring Project (Preliminary results only, likely to be changed.)

	SITE	Series	Trees Planted	Trees Previous	Trees Surviving ~2009	% Rust Infection ~2009	Year	Time	Notes
BLM Progeny Trials	Anchor Ranch	BLM 1982	1673	861	993	86	2005,6	220	
	Boulder Creek	BLM 1982	1860	812	812	65	2008	325	Brushed and Retagged
	Jamison Gulch	BLM 1982			--	--	(2010)		
	Hayes Ridge	BLM 1982			--	--	(2010)		
	Rocky Test	BLM 1982			--	--	(2010)		
	Poker Creek	BLM 1983			--	--	(2010)		
IFG Provenance Tests	Fitch-Rantz	IFG 1984	3780	2587	2153	68	2009	300	Thinned after evaluation
	Cannon	IFG 1984	3724	1344	861	<1	2009	50	Severely thinned by Charcoal Root Rot
	Burnt Timber	IFG 1988	3684	974	456	84	2009	140	In 2000, accidentally "pre-commercial" thinned
	Sundown	IFG 1988	3608	2698	1546	74	2009	260	
		Planting series & year planted	Number of trees finally planted (usually less than planned)	Number of trees alive at previous evaluation (1997 or 2001)	Number of trees alive at evaluation time (2009 except for Anchor Ranch)	% of live trees with cankers in 2009	Year that planting was evaluated	Cumulative time spent scouting and evaluating	