

White Pine Blister Rust on High Elevation White Pines in California

Part I. Whitebark Pine in the Sierra Nevada

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Project Objectives

- **Determine current levels of white pine blister rust associated with five needle pine species in California (western white pine, whitebark pine, foxtail, limber, and bristlecone pine).**
- **Establish permanent plots for long-term monitoring of rust incidence and severity.**
- **Determine the effects on forest dynamics of high elevation white pines.**

Ecology and biology of hosts and pathogen

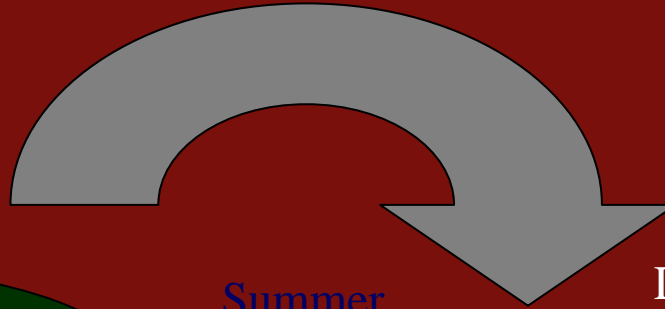
- *Pinus albicaulis* and *Ribes* species
- Distribution
- Ecological function



- *Cronartium ribicola*
- Introduced/exotic pathogen - 1900s
- Southward and eastward spread from So. BC
- Heteroecious rust
- Wind dispersed



Late spring-early summer



Dispersal-local and long range

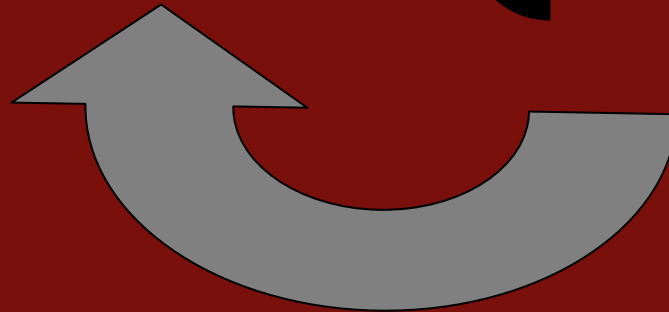
Five-needle pine

Summer



Dispersal-short range

Ribes



Late summer-early fall

RH >90% and temp >1°C

Objectives

- **1. Determine current levels of white pine blister rust associated with whitebark pine in California**
- **2. Establish permanent plots for long-term monitoring of rust incidence and severity.**
- 2004 season establish plots within whitebark's distribution in the Sierra Nevada
- 2005 continue work in the Sierra Nevada as well as in the Warner Mtns, and in the Shasta and Lassen areas

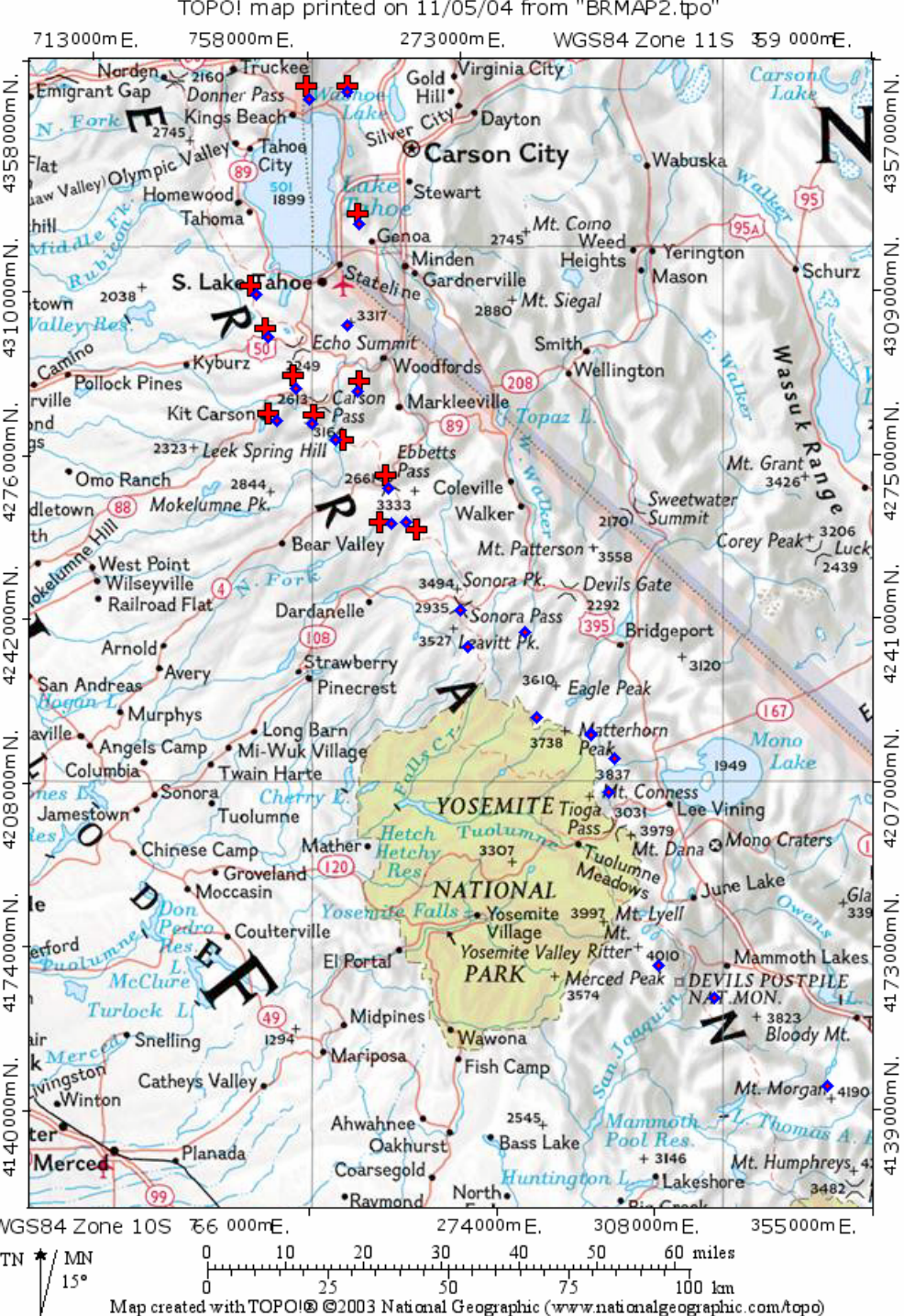
Methods

- Standard 30 x 50 m plots/watershed, sampling 50 trees; plots extended where necessary
- Data collected: environmental and stand variables, GPS coordinates, tree data (sp, dbh, ht, crown class), disease data (+/- WPBR, # stem and branch cankers /active or inactive, +/- Ribes), +/- unknown flagging, +/- mountain pine beetle, other pests, regeneration, etc...

Results: Incidence of WPBR in subalpine and whitebark forest communities in the Sierra Nevada. 54% (13 of 24) of plots established infected with WPBR.

National Forest	Disease Incidence-Whitebark and Western White Pine (# plots)	Disease Incidence-Ribes
Tahoe	+	0
LTBMU	41% (5)	0
Eldorado	44% (4)	0
Stanislaus	20% (3)	0
Toiyabe	5% (8)	0
Inyo	0% (4)	0

Note: 2005 establish more plots in the Eldorado, Stanislaus, Inyo, and Sierra NF's as well as in the high country of Yosemite and Kings Canyon NP



Results cont.

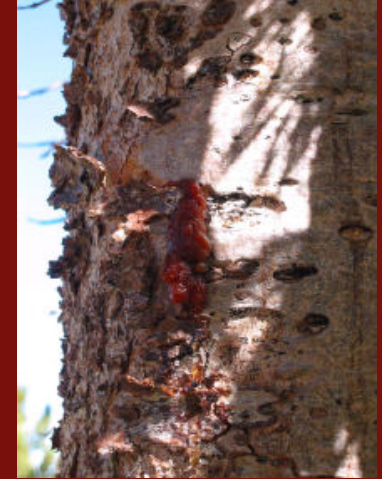
Disease found mainly in the northern range of whitebark's distribution in the Sierra Nevada

Function of historical establishment in California?

Biotic and abiotic conditions not conducive for infection?

Resistant populations?

Results cont. Mountain pine beetle (*Dendroctonus ponderosae*) activity in subalpine/whitebark forest communities in the Sierra Nevada



Mountain Pine Beetle Activity	Percentage of plots
<i>Recent</i>	29% (7)
<i>Past and recent</i>	87% (21)
<i>No signs</i>	12% (3)

Determine the effects on forest dynamics of high elevation white pines(long-term monitoring)

Demographic effects:

Juvenile mortality of individuals with lethal stem cankers

Reduced cone production of reproductive individuals with branch cankers.

Trophic effects:

Reduced cone production: loss of food resource

Clark's Nutcracker

Small mammals



Multiple threats to subalpine ecosystems: *White Pine Blister Rust, Mountain Pine Beetle and Changes in Climate*



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