

White Pine Blister Rust on High Elevation White Pines in California

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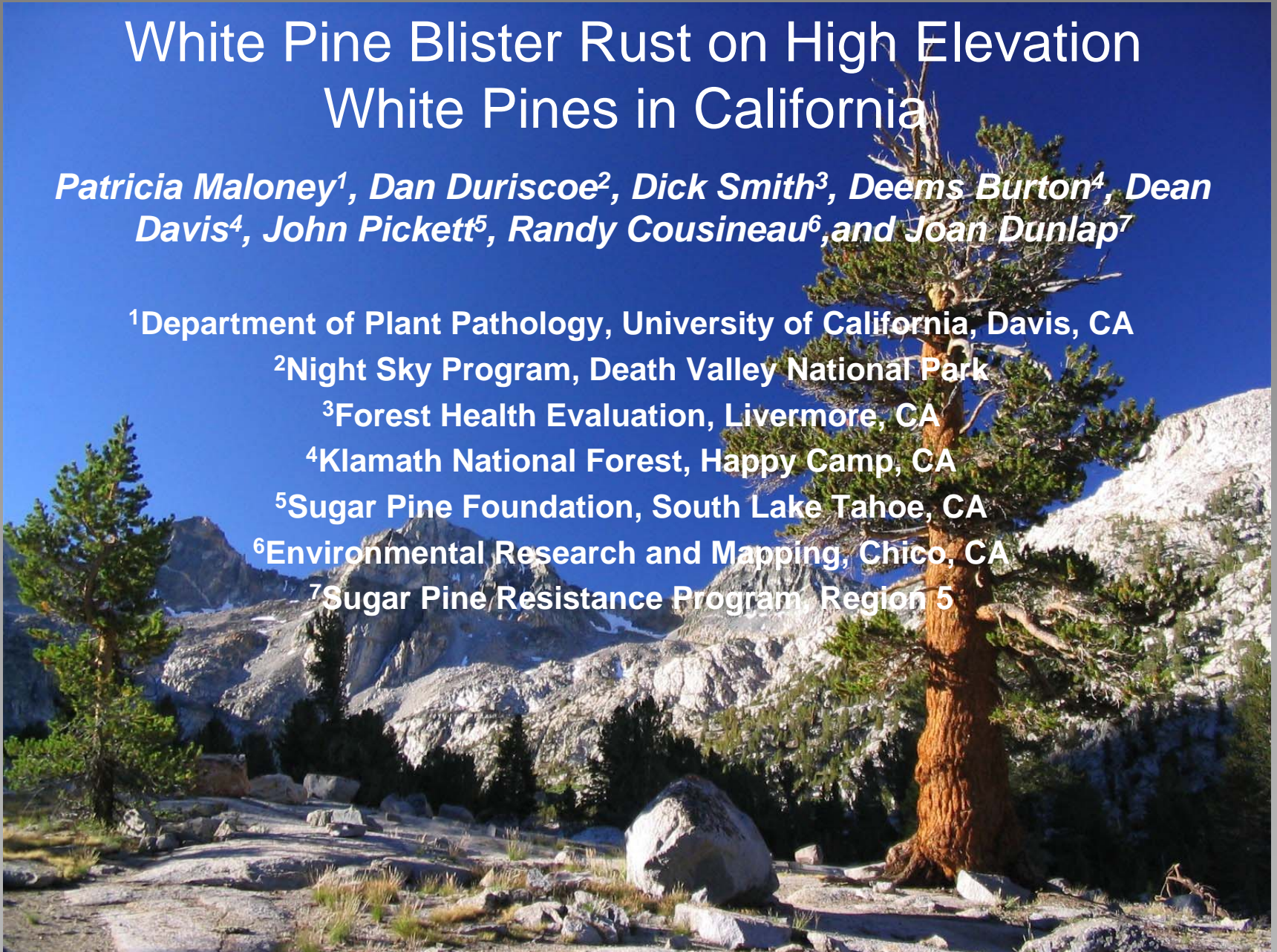
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Project Objectives

- Determine current levels of white pine blister rust associated with **western white pine** (*Pinus monticola*), **whitebark pine** (*Pinus albicaulis*), **foxtail pine**, (*Pinus balfouriana*), **limber pine** (*Pinus flexilis*), and **bristlecone pine** (*Pinus longaeva*) in California.
- Establish a system of permanent plots for long-term monitoring of rust incidence and severity, and its effects on the dynamics of high elevation pine stands over time.

Western white pine

Pinus monticola

- Distributed throughout CA mountain ranges in montane & subalpine forests
- 43 plots



Whitebark Pine

Pinus albicaulis

- Subalpine coniferous forests and woodlands, at or near treeline. Widespread in the Sierra Nevada, Cascades, Warner Mountains, and localized in the Klamath Mountains.
- 44 plots



Foxtail Pine

Pinus balfouriana

- Subalpine coniferous forests and woodlands, growing near treeline. An endemic to California. Two disjunct subspecies and populations. One found in the north in the Klamath Mountains and the other in the southern Sierra Nevada.
- 12 plots: 6 north, 6 south



Photo: Courtesy of Deems Burton

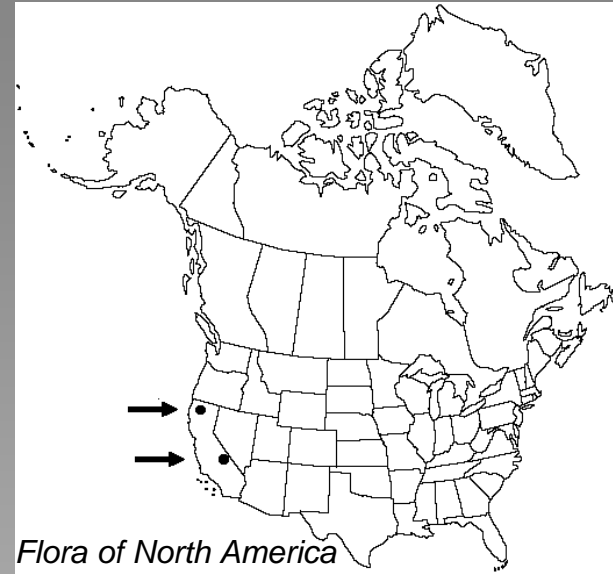


Photo: Courtesy of Dan Duriscoe

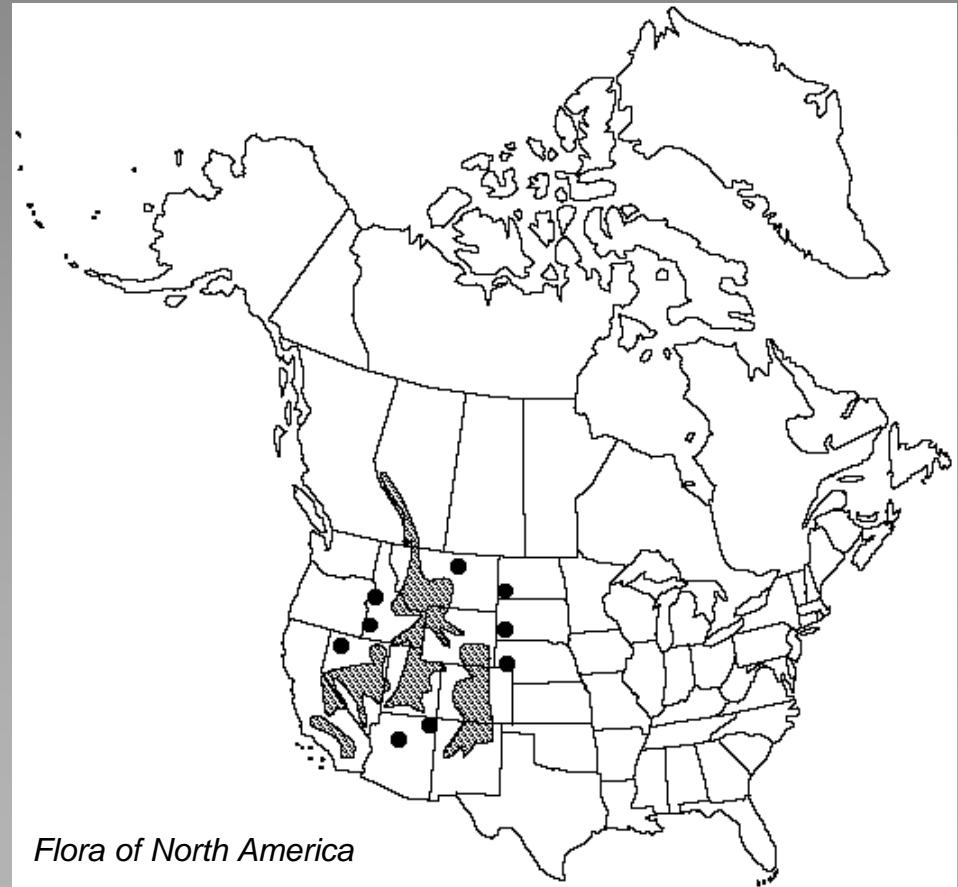
Limber Pine

Pinus flexilis

- Found east of the central and southern Sierra Nevada crest. Also found on dry mountaintops in southern CA and in the desert mountains.
- 10 plots



Photo: Courtesy of Dan Duriscoe



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Great Basin Bristlecone Pine

Pinus longaeva

- Subalpine coniferous woodlands in the Great Basin region of CA. Extensive populations in the White Mountains. Other populations in the Inyo, Last Chance and Panamint mountains.
- 5 plots



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Methods

- Permanent plots are 30 x 50 m, with the length adjustable to include 50 trees (w/ 30 alive).
- **Plot Data** - Environmental variables: GPS coordinates, elevation, degree slope, aspect, slope position, photographic records. Biological variables: Plant association, P/A Clarks Nutcracker, P/A rust on ribes, % cover ribes, Rust phenology on pine, P/A Pedicularis, P/A Castilleja. Number seedlings/saplings.
- **Tree Data** - Species, dbh, status (L/D), P/A WPBR, # branch or stem cankers (active or inactive), crown position, unknown flagging, P/A cones, crown condition, and P/A MPB and other pests.

Distribution of high elevation white pine plots and white pine blister rust in California

Results

114 survey plots established

No blister rust found on Great Basin bristlecone pine, limber, and the southern population of foxtail pine.

Statewide averages:

WWP mean = 15.3%

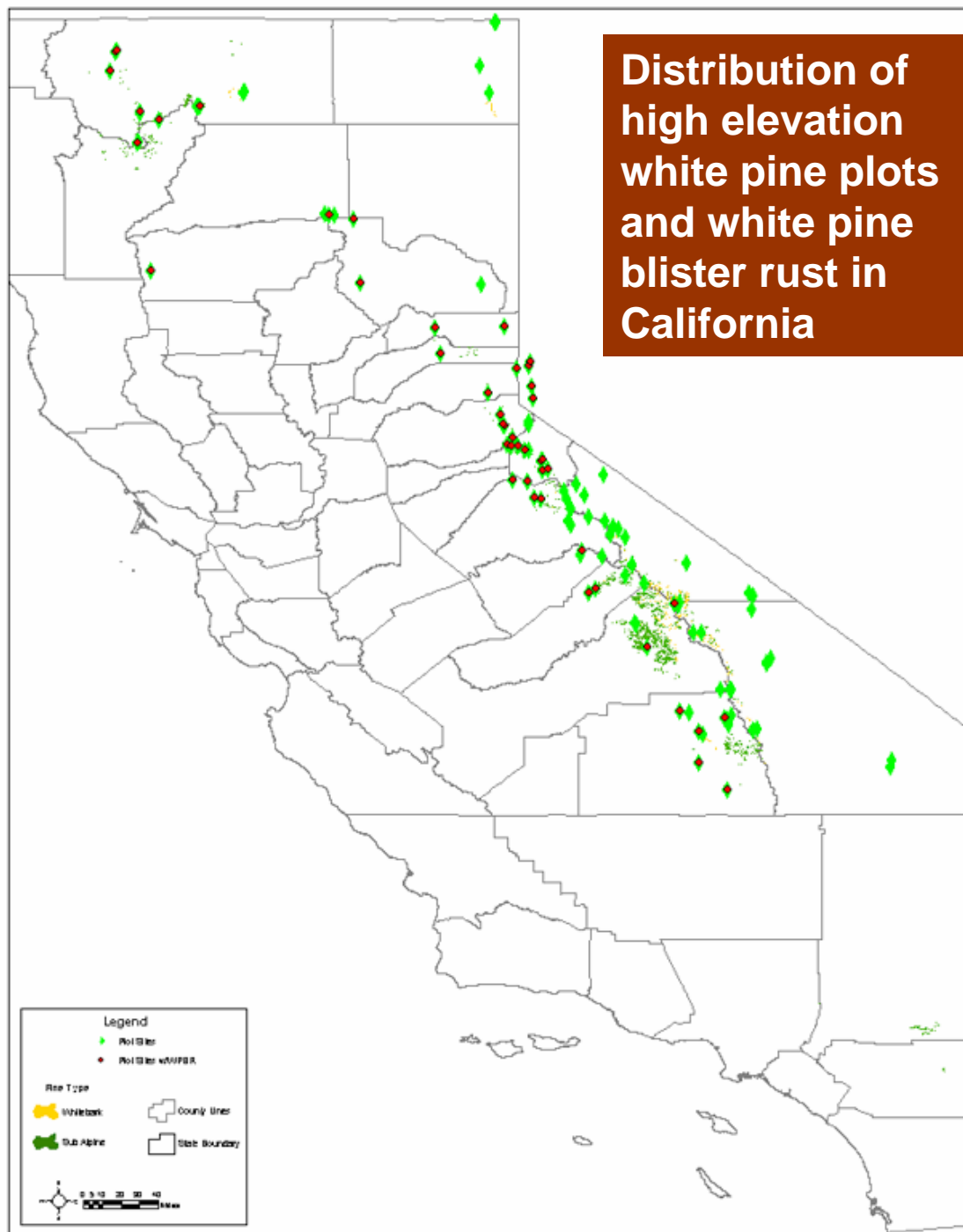
(range: 0-92%)

WBP mean = 11.7%

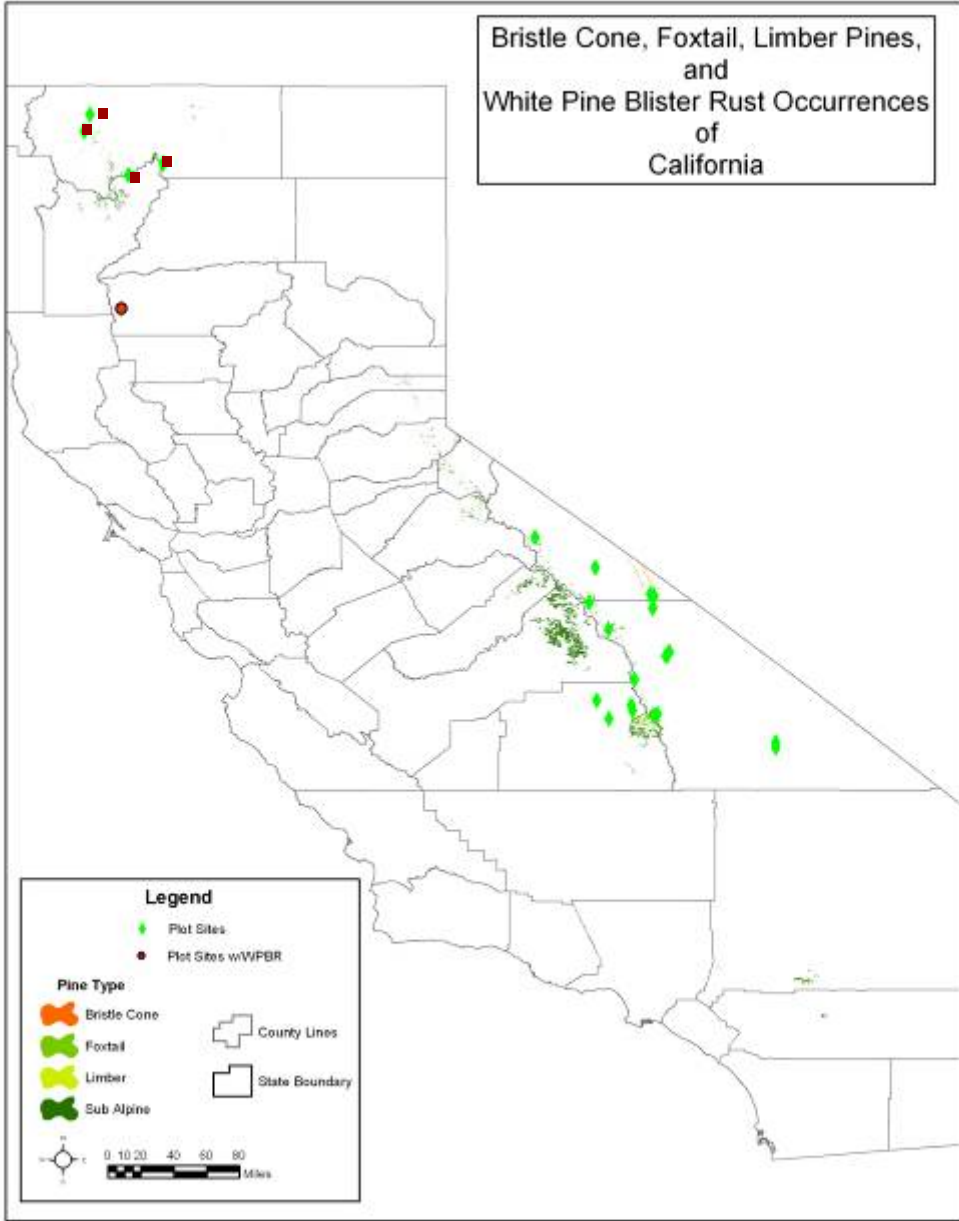
(range: 0-71%)

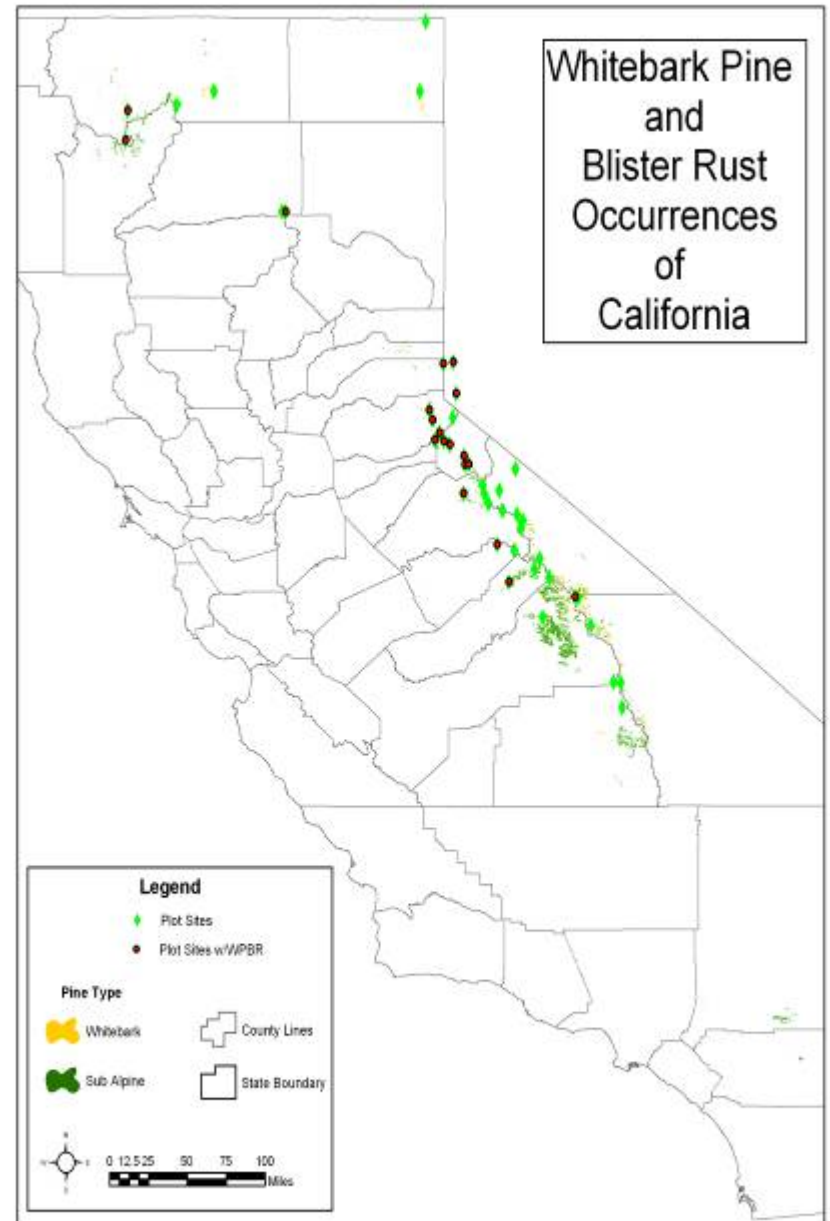
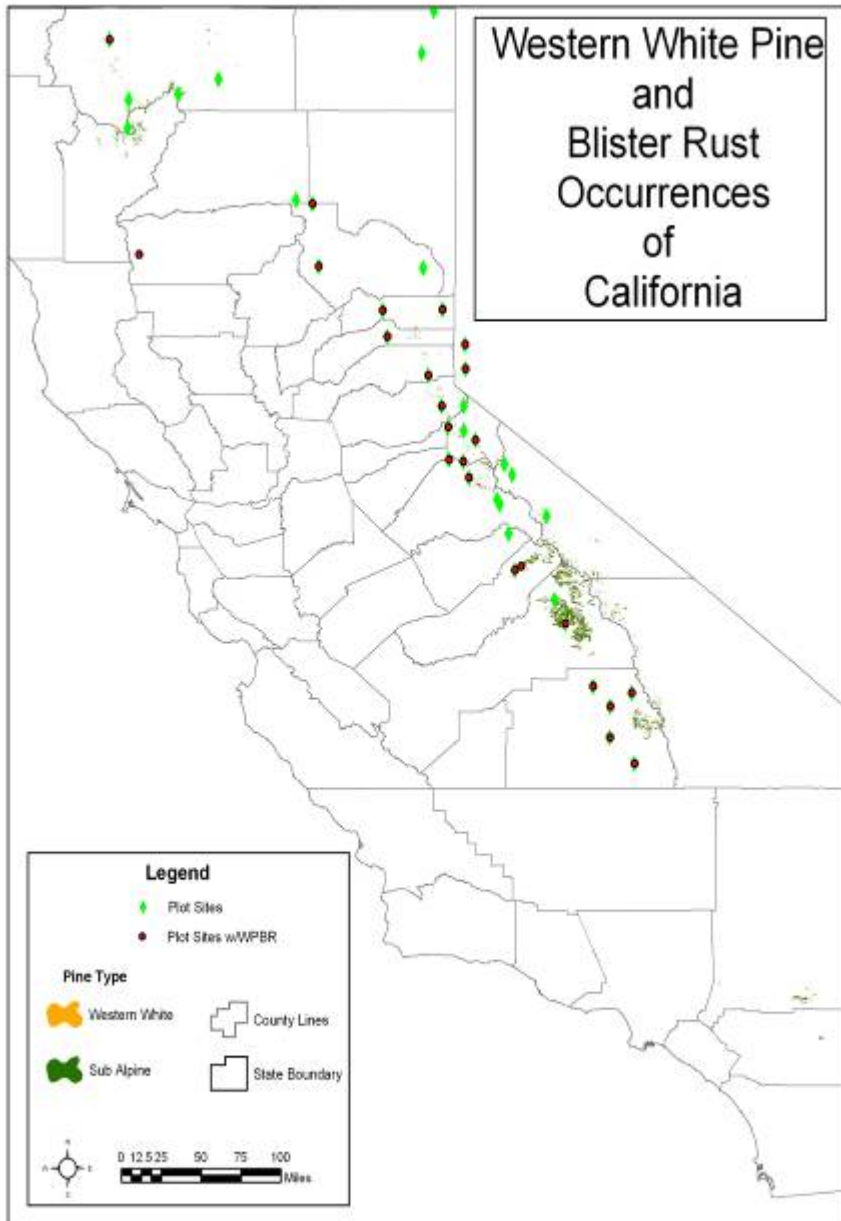
FP(N) mean = 15%

(range: 2-33%)

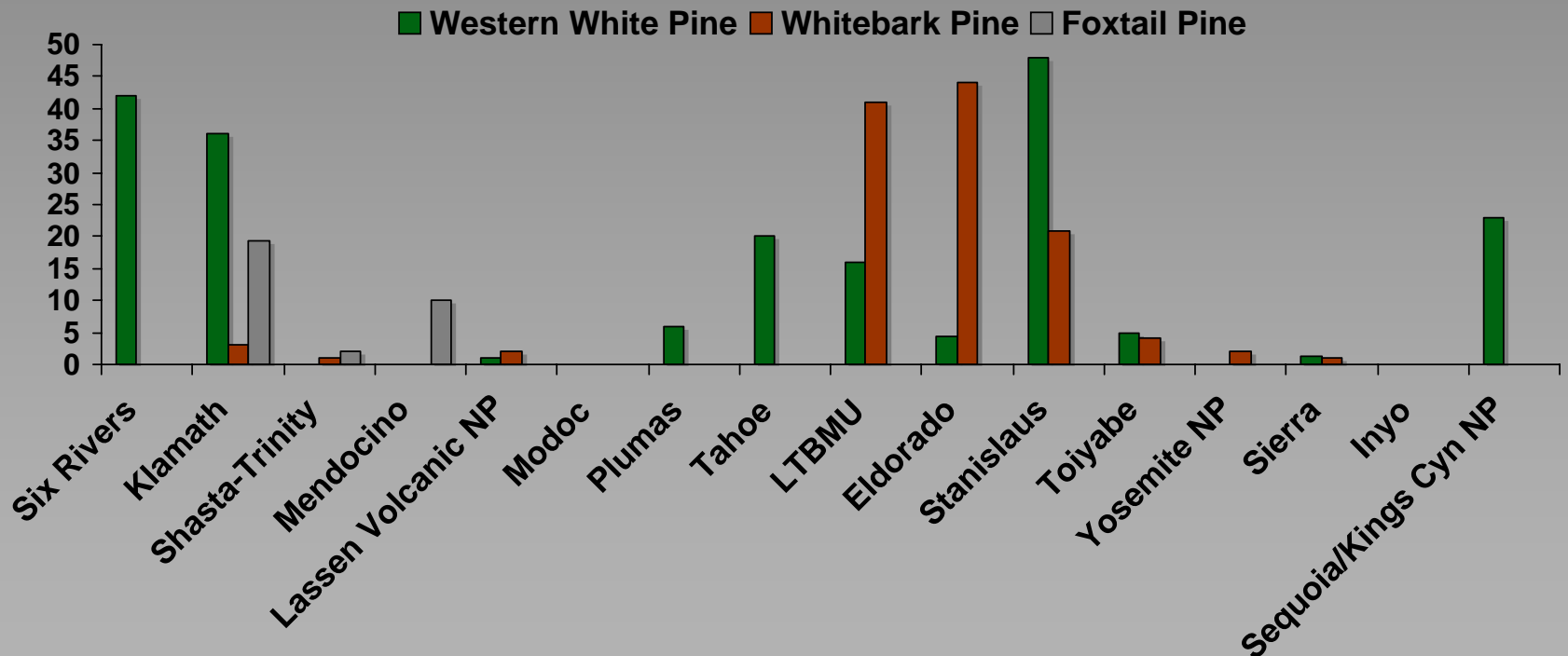


Bristle Cone, Foxtail, Limber Pines,
and
White Pine Blister Rust Occurrences
of
California



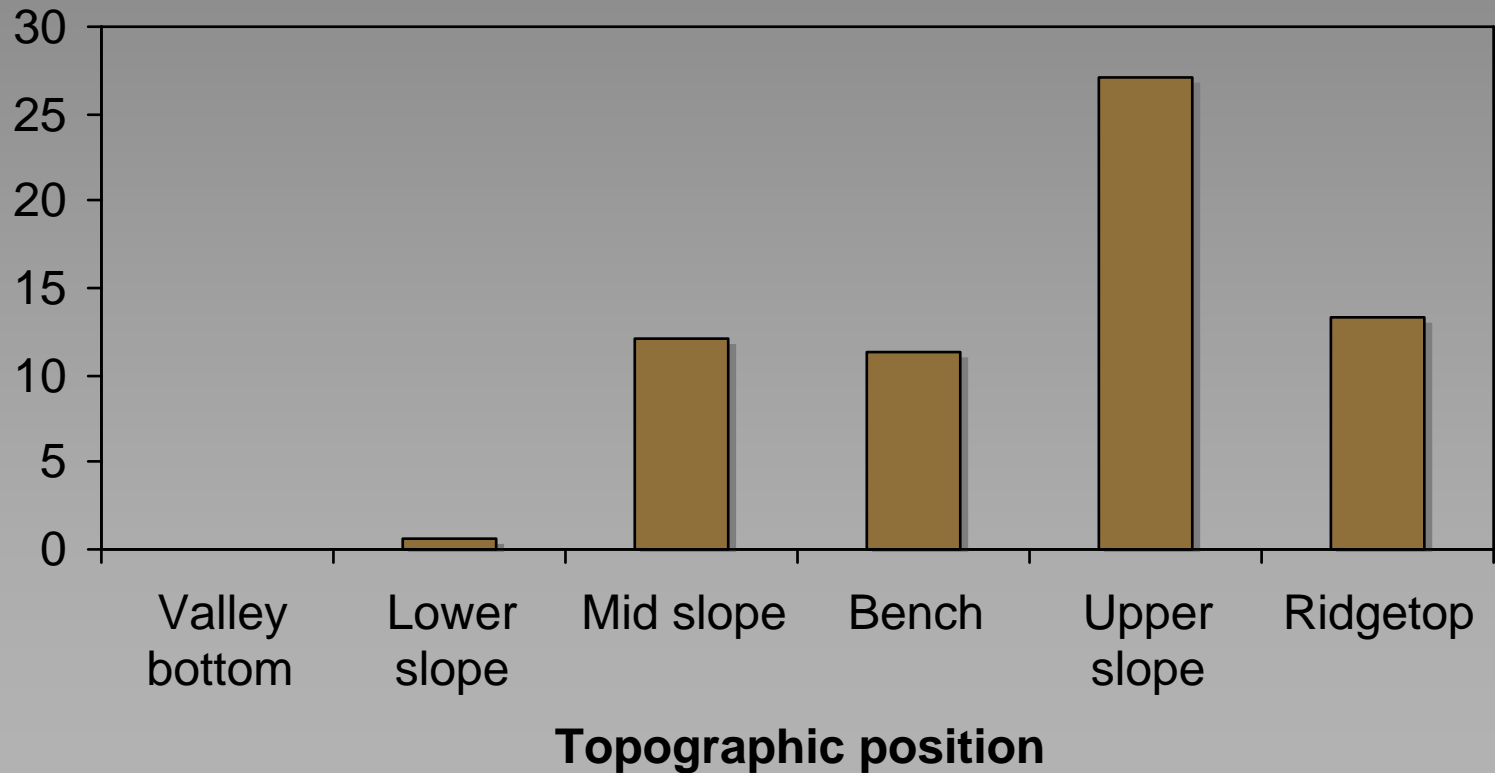


Results: High elevation rust incidence from north to south in California



National Forest and/or National Park from North to South

Results: Topographic position



Results: Forest type & WPBR-ribes association

Vegetation Zone	Observed ribes infections	BR incidence-Ribes relationship
Lower elevation Montane mixed-conifer	+	$r = 0.55$
Upper montane - subalpine	-	$r = 0.22$

Summary

- Moderate to high disease incidence on high elevation white pines in 3 regions of CA: north central Sierra Nevada, nw California, and southern Sierra Nevada (west slope).
- Topographic position of high elevation white pines may be a factor in disease incidence. Subject to local mountain wind and nocturnal wind currents as well as regional circulation patterns for dispersing inoculum.
- No observations of infected ribes in upper montane and subalpine forests.
- Lower montane forests may be potential source of inoculum for high elevation white pine communities.

Still to do:

Continued data analysis

Relate disease incidence to climate data (PRISM) for high elevation forests as well as lower montane forests.

Age cankers - Frequency of infection periods (wave years).

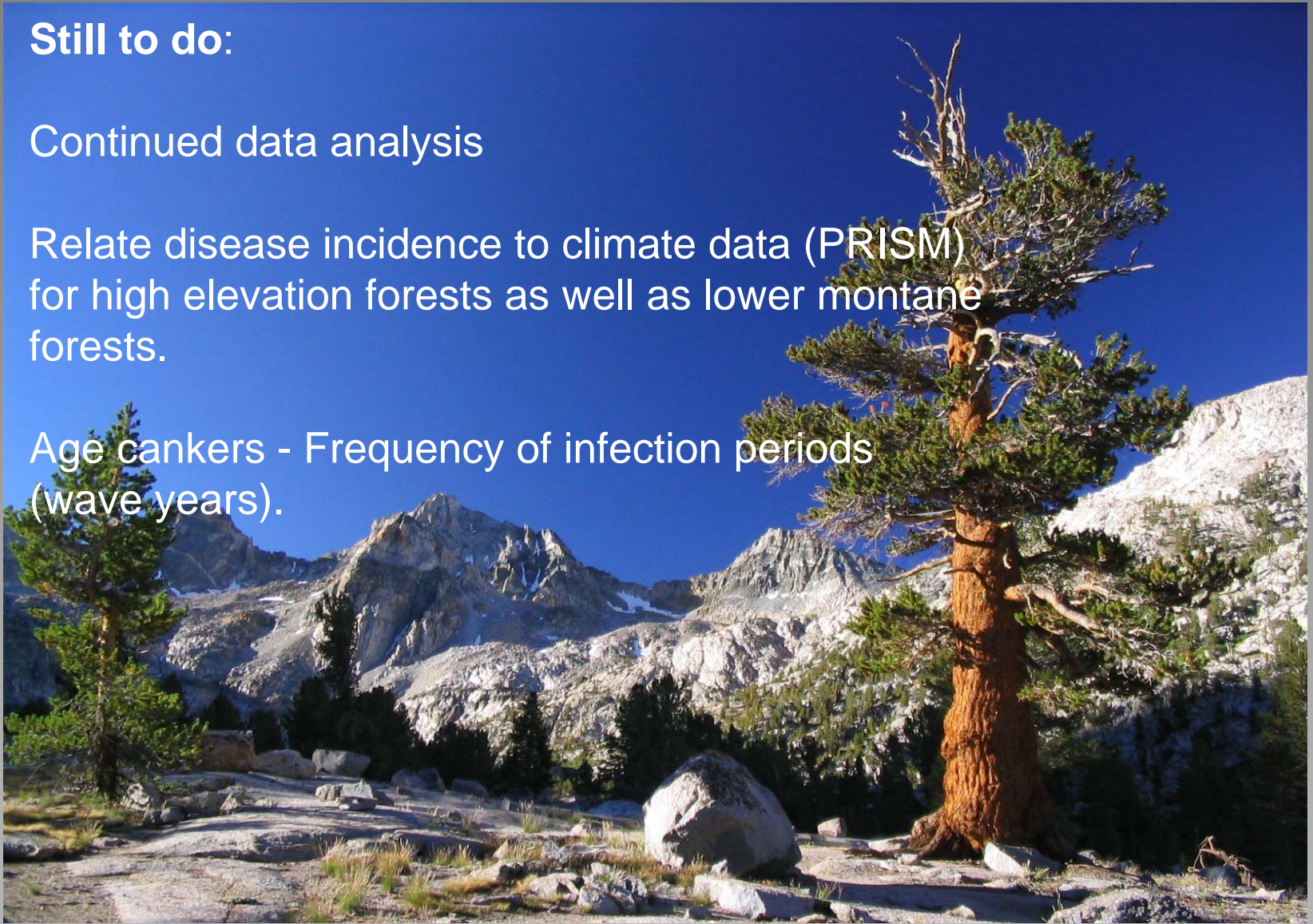


Photo: Deems Burton



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- Yosemite NP
- Death Valley NP

Photo: Courtesy of Dan Duriscoe