



Monitoring Limber Pine Woodlands in Craters of the Moon

Network parks where resource is being monitored

- Craters of the Moon National Monument (CRMO)

Importance: White Pine Blister Rust and Stand Health

White pine blister rust, an introduced disease which causes mortality in five-needled pine trees, including limber pine (*Pinus flexilis*) is caused by the fungus *Cronartium ribicola*. The disease is widespread and may be considered the most significant disease affecting five-needled pines, resulting in altered stand structure in infected areas. The fungus must use an alternate host, usually *Ribes spp.*, to move from an infected tree to one that is healthy. Infection from white pine blister rust can directly kill the tree, while leaving surviving trees more susceptible to attack from mountain pine beetles and mistletoe infections. The limber pine population in CRMO is susceptible to these diseases and insects. Predicted impacts of climate change also extend to CRMO limber pine woodlands because drought stress can increase their vulnerability.

Limber pine woodlands in CRMO are a unique and important ecological resource for the park, and widespread infection and mortality from white pine blister rust and pine beetles in CRMO could be very destructive. Monitoring of limber pine woodlands for white pine blister rust as well as for changes in rates of regeneration and mortality will provide information about the status of the disease in the park and overall stand health, and will support more informed management decision-making.

Preliminary Results

CRMO and the UCBN have joined with two other Pacific West Region Networks to develop a coordinated protocol. Pilot monitoring was conducted in CRMO in 2009 and 2010. Blister rust infections were found in the park in 2006, but no active infections are known in the park currently. Mistletoe infections are widespread in CRMO limber pine stands but don't appear to be adversely impacting the population. Evidence of a low-level pine beetle infestation was found in some stands. A draft protocol supporting monitoring in CRMO as well as in the Klamath and Sierra Nevada Networks was submitted for peer-review in August 2010.

Objectives

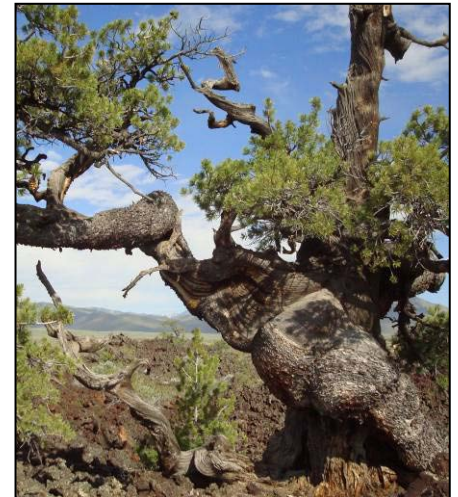
- Estimate status and trend in *Cronartium ribicola* infection in the park.
- Measure key attributes of stand health, including structure and composition, mortality, and regeneration.

Management Applications

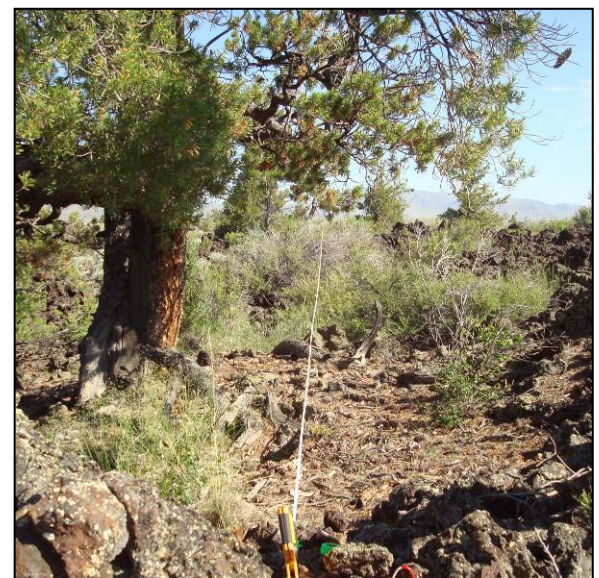
- Provide information about *Cronartium ribicola* distribution in the park.
- Update park management knowledge of limber pine stand health and population dynamics, including impending threats to its long-term persistence, and potential management options.
- Support park resource planning and land health reporting efforts, and inform resource management planning in the park.

Contact Information

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Limber pine in CRMO contribute substantially to the striking landscape in the park and are important to visitors' experiences.



Limber pine monitoring plot locations are permanently marked and plot boundaries are re-established using tapes and compasses during each survey visit.