

# Patterns of Resistance to *Cronartium ribicola* in Rocky Mountain Bristlecone Pine (*Pinus aristata*)

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The core distribution of Rocky Mountain bristlecone pine (*Pinus aristata*) extends from central Colorado into northern New Mexico with a disjunct population in northern Arizona (USA). Populations are primarily at high elevations and often define the alpine treeline, but the species is also found in open mixed-conifer stands with ponderosa (*P. ponderosa*) or pinyon (*P. edulis*) pines. On dry, exposed sites the stands are open and bristlecone is commonly the only species present. The combination of the pine's adaptive traits with infrequent disturbance has enabled trees on these sites to attain ages of more than 2,500 years. These same traits and conditions will inevitably hinder the ability of bristlecone pine to adapt to novel anthropogenic stresses such as climate change and infection by the nonnative pathogen (*Cronartium ribicola*) that causes the lethal disease white pine blister rust (WPBR). Infection of bristlecone pine by *C. ribicola* was first documented in the field in 2003 in south-central Colorado (Blodgett and Sullivan 2004). These threats and the species' unique aesthetic and ecological roles make bristlecone pine a species of conservation interest, and we have begun implementing the Proactive Strategy (Schoettle 2004).

The frequency of genetic resistance to WPBR will affect the trajectory of bristlecone pine populations in the future. Here we report results from two of our studies of rust resistance for bristlecone pine families

(Schoettle et al. 2011). Seeds collected in 2001 from 184 individual trees across 11 sites throughout Colorado were sown in 2002. The 3-year-old seedling families were inoculated with *C. ribicola* at Dorena Genetic Resource Center (Cottage Grove, Oregon, USA) in 2005. Seeds for an additional smaller test were sown in April 2009 and seedlings inoculated with *C. ribicola* in September 2009. Needle infection lesions (spots) were easily identified on needles of the seedlings inoculated at a young age (2009 trial), but were less obvious on needles of the seedlings inoculated when older (2005 trial). However, WPBR stem symptoms developed on many of the older seedlings in the 2005 trial for which infection spots were not observed, suggesting that needle lesions are not a good early measure of infection in older bristlecone pine seedlings. Bristlecone pine expresses multiple WPBR-resistant phenotypes, including canker-free seedlings, seedlings with partial bark reactions, seedlings developing stem infections later or showing longer survival with stem infections, and seedlings developing stem infections with infections becoming inactive over time; the frequency of each varied geographically.

## REFERENCES

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