

## **Developing Disease Resistance to Non-native Pathogens: Status of Programs for Oregon and Washington**

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Non-native, invasive pathogens continue to take large tolls on our native trees species and their associated ecosystems. In many cases, disease resistance programs that utilize the low frequency of natural genetic resistance present in our tree species offer the best opportunity to counter the invading pathogens. The Pacific Northwest Region (Region 6) of the USDA Forest Service encompasses both Oregon and Washington and currently has operational programs to develop resistance to two non-native, invasive pathogens. The programs are based at the regional forest genetics facility, Dorena Genetic Resource Center, in Cottage Grove, Oregon. The program to develop genetic resistance to white pine blister rust (caused by the pathogen *Cronartium ribicola*) in native white pines has been active for 50 years. The program to develop *Phytophthora lateralis* resistance in Port-Orford-cedar (POC) has been in the operational phase for just over a decade.

The blister rust program has evaluated progenies of thousands of western white pine (WWP) and sugar pine field (SP) selections and has recently begun to evaluate resistance of progeny of whitebark pine field selections. Breeding zones have been delineated for WWP and SP, and the first orchards have been established. Further breeding will be needed to increase the level and mix of rust resistance to be used in restoration and reforestation efforts. The operational program to develop populations of POC with resistance to *P. lateralis* has made rapid progress, and orchards for several breeding zones are now producing resistant seed.

Artificial inoculation of young seedlings and subsequent assessment for resistance responses is a key element to both resistance programs. Region 6 has developed extensive expertise in screening for resistance. Partners and cooperators also play an important role, and include federal, state, county, tribal, and private landowners. Field tests to validate the short-term screening results and to examine the durability of the resistance have been established. The Forest Service program primarily focuses on developing durable disease resistance while maintaining genetic diversity and adaptability. By their nature, resistance breeding programs are long-term, and further progress will require continuity of funding and staff. Challenges to proceeding with restoration on federal lands exist, as well as opportunities to enlist other landowners in increasing the deployment of resistant material in the Pacific Northwest.