



HIGH-ELEVATION FOREST MONITORING

IMPORTANCE – Whitebark, foxtail, and limber pine are five-needle white pines that occupy high-elevation Sierra Nevada treeline and subalpine habitats, environments often too harsh for other tree species to thrive. Because these pines often occur in pure to nearly-pure stands, they can have a large influence on key ecosystem processes and community dynamics, such as regulating snowmelt and stream flow and providing habitat and food resources for birds and mammals. These pine species are currently threatened by the combined effects of *Cronartium ribicola*, a non-native fungal pathogen that causes the disease white pine blister rust, outbreaks of the endemic mountain pine beetle, and climate warming. Severe declines in whitebark pine are occurring nearly range-wide, and the species is now being evaluated as a candidate for federal endangered species status. Whitebark and foxtail pine reach their southernmost distribution in the Sierra Nevada range where health conditions are the best for both species.



Foxtail Pine (Shawn McKinney)



Whitebark Pine (Peggy Moore)



Limber Pine (Connie Millar)

WHAT WE ARE DOING – Sierra Nevada Network (SIEN) staff are working with two other Pacific West Region Inventory & Monitoring Networks (KIamath and Upper Columbia Basin) to develop a long-term monitoring protocol for whitebark, foxtail, and limber pine forests. Tree- and plot-level data are collected to determine the status and trends in forest structure, species composition, demographic rates, cone production, incidence and severity of white pine blister rust, occurrence of mountain pine beetle, and dwarf mistletoe infection. Common approaches among these networks will facilitate regional comparisons of high-elevation white pine forest condition. SIEN plans to begin its white pine monitoring program in 2011, focused on whitebark and foxtail pines. Earlier surveys detected low levels of blister rust in Sierra Nevada whitebark pine plots (<5% of trees infected) and none in foxtail pine plots (Duriscoe and Duriscoe 2002).

DISCUSSION – Monitoring white pine populations will increase the likelihood of detecting change of concern in these forests – such as blister rust infections and increased incidence of mountain pine beetle. It also improves understanding of white pine stand dynamics at local and regional scales. This information is important to land managers who make decisions affecting long-term management of these forests, to the research community trying to better understand these important ecosystems, and to the public who enjoys the beauty of these high-elevation forests.

WHERE MONITORED – For SIEN: Sequoia, Kings Canyon, and Yosemite National Parks

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