



Resource Bulletin

Whitebark Pine

Decline of a Keystone Species

Whitebark pine is a keystone species of the upper subalpine zone. It is hardy, tolerating the harsh, exposed conditions near treeline. Whitebark pine becomes established on inhospitable sites with poor, even fire-damaged soils. It then can foster establishment of other species, including subalpine fir and Engelmann spruce. The seeds are important food for many wildlife species and the pine communities provide valuable wildlife habitat.

A wide variety of wildlife depends upon the high-fat whitebark pine seeds for food, including grizzly and black bears, red squirrels, and Clark's Nutcracker. The seeds are a major food source for grizzly bears in some parts of their range, including the East Front of the Rocky Mountains, Greater Bob Marshall Wilderness, and the Greater Yellowstone Ecosystem. They are valuable because they're large, less perishable than other bear foods, and are a rich source of dietary fat (30-50%) and protein. Pine seeds are especially important to females who need to sustain themselves and their offspring during hibernation and post-hibernation lethargy.

Historically, whitebark pine communities were a significant component on up to 20% of forested lands in Glacier National Park. While still present in these areas, nearly half the trees are dead and of the remaining live trees, more than 75% are lethally infected with white pine blister rust, an introduced fungal disease. The infected trees are likely to die within the next 20 years.



The resistant skeletons of whitebark pines hold on at high elevations in Glacier National Park. Possibly decades earlier, they succumbed to either white pine blister rust or mountain pine beetles that kill trees and thwart regeneration.

Three factors -- white pine blister rust, fire exclusion, and mountain pine beetles -- have contributed to the decline of whitebark pine in Glacier. White pine blister rust has caused most losses in the northwestern United States and southwestern Canada. This is a disease of five-needled pines and all native North American white pines are highly susceptible to the rust, including western white pine, sugar pine, limber pine, and bristlecone pine.

For much of the 20th century fires were suppressed at low elevations, essentially excluding fire from reaching higher elevation habitats where whitebark pine occurs. Fire exclusion limits the regeneration and restoration of whitebark pine stands and has resulted in widespread successional replacement of

whitebark pine in the center of its range—the inland west of United States and adjacent Canada. Whitebark pine in many areas is being replaced by shade-tolerant species, such as subalpine fir and Engelmann spruce. Fires in the late 1990s and early this century have burned through potential whitebark pine habitat and have begun to reverse this trend. Historic fire return intervals ranged from 50 to 300 years, so the effect of fire exclusion on stands in Glacier is uncertain.

Mountain pine beetles also kill whitebark pine trees. When mountain pine beetles reach epidemic proportions in lower elevation lodgepole pine stands, they can move upward into whitebark pine stands and kill large numbers of mature pines. The history of mountain



Montana Conservation Corps crews plant whitebark pine seedlings on West Flattop Mountain in 2001.



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Resources for More Information

Subject Area Specialist at Glacier National Park:
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Documents and web sites:

Whitebark Pine Ecosystem Foundation
<http://www.whitebarkfound.org/>

Whitebark Pine Communities
<http://nrmsc.usgs.gov/research/whitebar.htm>

Last chance for whitebark pine http://www.hcn.org/servlets/hcn.Article?article_id=10133

Whitebark and limber pine restoration underway in Glacier National Park.
http://www2.nature.nps.gov/YearInReview/yir2000/pages/05_restoration/05_03_williams.html

Rapid Decline of Whitebark Pine in Western Montana
<http://www.bitterroot.com/grizzly/pine%20decline.html>

Whitebark pine communities in Glacier National Park
<http://www.nps.gov/glac/pphtml/32highlights173.html>

Assessing trends in whitebark pine population decline
http://www.y2y.net/science/grants/03_smith.asp

pine beetle attack on whitebark pine is not well-documented in the park. Many whitebark pine snags show evidence of mountain pine beetle galleries, and it is likely trees were killed during epidemics in the 1930s and late 1980s. In recent years mountain pine beetle epidemics have occurred in British Columbia and Alberta to the north and in the Greater Yellowstone Ecosystem to the south, including impacts on whitebark pine.

Many Ramifications

The loss of whitebark pine will have broad ecosystem-level consequences. Scientists predict the distribution of subalpine vegetation, watershed hydrology, successional timing, and animal communities will all be impacted. For example, loss of whitebark pine will cause an overall decrease in forested area at high elevations with fewer suitable microhabitats for other tree species. As whitebark pine is lost at the upper-elevational limits where other conifer species cannot grow, local and regional watershed hydrology will be affected. Snowmelt will be more rapid, resulting in early season flooding, increased soil erosion, and depressed late-season stream flows.

The decline of whitebark pine will also result in fewer whitebark pine seeds, decreasing the ability to support pine seed-eating mammals and birds. Midcontinental populations of grizzly bears, which use whitebark pine seeds as a major food source, are threatened by this loss. Regional populations of Clark's Nutcracker, the primary disperser of whitebark pine seeds, are also jeopardized. Low numbers of whitebark pine seeds could lead to local and regional declines in nutcracker populations, in turn leading to a decreased likelihood of regeneration of whitebark pine. Fewer nutcrackers would be caching seeds, therefore fewer seeds will grow into trees.

Glacier's Management Strategy

Glacier would like to maintain all healthy whitebark pine trees and restore whitebark pine ecosystems within the park. Scientists and managers agree that whitebark pine will be functionally lost in the park without active management intervention.

A whitebark pine restoration program was initiated in 1998. The goal of the program is to maintain whitebark pine populations by planting stock that appear to be genetically resistant to white pine blister rust within appropriate areas in the park. Park staff collect and propagate seeds from healthy trees in blister rust-decimated stands, plant seedlings, and monitor the success of establishment. The park developed cooperative agreements with partners (US Forest Service, the Blackfoot Tribe, Waterton Lakes National Park, and Montana Conservation Corps) to work together to meet a common restoration goal.

Glacier has also planned to allow naturally occurring fire in whitebark pine communities within a range of predetermined prescription parameters. Because of the extent of the 2003 fires, we will not conduct burns in the near future. We are also developing a strategy for determining which areas are best for reintroduction. The park continues to inventory and monitor whitebark pine stands to document the extent of the infestation. The park is also beginning to monitor Clark's Nutcracker in an effort to understand the current status of this species.



An example of whitepine blister rust on a young western white pine.