



Whitebark Pine (*Pinus albicaulis*)

Resource Brief

Background Information

Whitebark pine is a slow-growing, long-lived tree of the upper subalpine zone. A hardy tree, it has adapted well to tolerating the harsh, exposed conditions near treeline, and can establish itself on inhospitable sites with poor, shallow, rocky soils. Because of the harsh conditions and short growing season found in higher elevations, whitebark pine trees grow slowly. Even trees that are 400 years old only have trunks six inches in diameter. Their importance to the upper subalpine is paramount, however. Whitebark pine is considered a keystone species, or a species that increases the biodiversity of a community, because of the important and critical role it plays in the lifecycle of many other species. This invaluable tree provides shelter and food for numerous species, including grizzly and black bears, red squirrels, and Clark's nutcrackers.

Because its seeds are large, less perishable than other foods, and are a rich source of dietary fat (30-50%) and protein, the seeds are a major food source for grizzly and black bears. Pine seeds are especially important to females who need to sustain themselves and their offspring during hibernation and post-hibernation lethargy. In addition, the structure and physical location of the whitebark pine tree offer ideal conditions to control snowmelt in alpine areas. The broad crowns and windswept branches of this hardy tree help to collect snow during winter, then in turn, shade the collected snow as warmer weather approaches. This shaded snow melts out gradually, helping to slow spring runoff and allow for a more continuous water supply throughout the dry summer months.

Status and Trends

Historically, whitebark pine communities were a significant component on up to 20% of forested lands in Glacier National Park. The loss of whitebark pine will have broad ecosystem-level consequences. Scientists predict watershed hydrology, successional timing, animal communities, and the distribution of subalpine vegetation will all be impacted. For example, loss of whitebark pine will cause an overall decrease in forested areas at high elevations. By colonizing upper elevations, whitebark pines create microenvironments for other trees and shrubs. As it is lost at upper elevations, where



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

Threats

Three factors have contributed to the decline of whitebark pine in Glacier National Park. White pine blister rust is a non-native fungus that has caused heavy losses to whitebark pine trees throughout its range. In a 1996 study, whitebark pine mortality was estimated at 44% in the park, and approximately 78% of the remaining trees were infected. These rates continue to grow. For much of the 20th century, the practice of fire exclusion has kept fire from reaching higher elevations 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 with other trees, such as subalpine fir and Engelmann spruce. Mountain pine beetles also kill whitebark pine trees. When mountain pine beetles reach epidemic proportions in lower elevation lodgepole pine stands, the beetles can move upward into whitebark pine stands and kill large numbers of mature pines.

other conifer species cannot grow (and provide adequate shade), snowmelt will be more rapid, resulting in early season flooding, increased soil erosion, and depressed late-season stream flows.

Clark's nutcrackers provide the main seed dispersal source for this long-lived tree by caching the seeds of whitebark pine. By caching more seeds than the nutcracker needs for its annual food supply, the seeds left behind allow for regeneration of new whitebark pine trees. Low numbers of whitebark pine trees, and therefore, their seeds, could lead to local and regional declines in nutcracker populations. This in turn could lead to a decreased likelihood of regeneration of whitebark pine.

Because of their slow growth and long lives (whitebark pines have been found to be 1200 years old), scientists can use growth rings from older whitebark pine trees to provide clues to what the climate was like in the past. In warmer years, trees experience a longer growing season, which create larger tree rings. Just as glaciers are indicators of a changing climate, whitebark pine trees are an additional piece of the puzzle for managers and scientists to reconstruct past climate patterns.

Management Strategy

Scientists and managers agree that whitebark pine will be functionally lost in Waterton-Glacier without active management involvement. The park developed cooperative agreements with partners (US Forest Service, the Blackfeet Tribe, Waterton Lakes National Park, and Montana Conservation Corps) to work together to meet a common restoration goal of reestablishing whitebark pine

populations. A whitebark pine restoration program was initiated in 1998. The goal of the program is to maintain whitebark populations by planting trees with genetic resistance to white pine blister rust. Park staff collects and propagate seeds from healthy trees in blister rust-decimated stands, plant seedlings in areas that are determined to be best suited for reintroduction, and monitor the success of establishment. Since 2000, over 15,000 seedlings have been planted at sites throughout the park. Continued plantings and monitoring will aid managers in determining how to help this extraordinary tree increase its population in the alpine areas of Glacier and the northern Rockies.



A researcher measures the height of a whitebark pine seedling as part of the process of determining the success of a planted site. Continued monitoring is key to the future of whitebark pine restoration efforts.

Resources For More Information

Glacier National Park Staff

- Tara Carolin, Director, Crown of the Continent Research Learning Center
- Dawn LaFleur, Restoration/IPM Biologist

Documents and web sites

- Whitebark Pine Ecosystem Foundation – <http://www.whitebarkfound.org/>
- Whitebark Pine Communities – <http://nrm-sc.usgs.gov/research/whitebar.htm>
- Whitebark Restoration and Monitoring – http://www.fs.fed.us/rm/pubs/rmrs_p063/rmrs_p063_335_337.pdf

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