

Whitebark and Limber Pine

Pinus albicaulis and *Pinus flexilis*

The decline of whitebark and limber pine across their range is a result of the disease white pine blister rust (caused by the introduced fungus *Cronartium ribicola*), and mountain pine beetle (MPB) infestations. Fire suppression and subsequent loss of habitat are also factors in the decline of these pines in parts of their ranges. As a result, both species are endangered under provincial legislation and whitebark is endangered under the federal *Species at Risk Act*. Limber pine has yet to be assessed at the federal level.

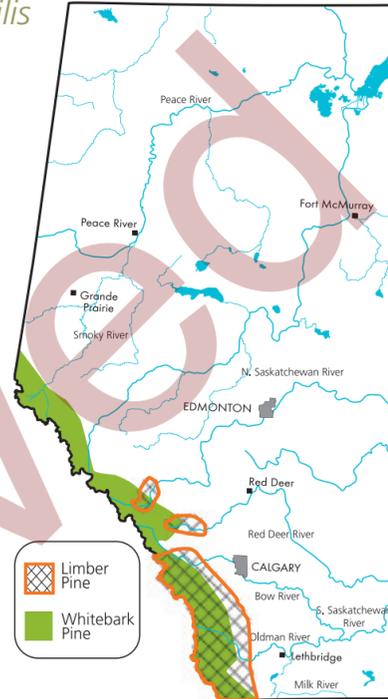
The first step in management of any species is learning its distribution. Alberta is exploring the use of a variety of techniques such as modeling and photo interpretation that will help identify locations and potential habitat for these pines. Regional surveys for these pines are also underway.

Throughout the Alberta ranges of whitebark and limber pine, selected stands are being assessed for health. The number and size of trees, the number of trees infested with blister rust, or attacked by mountain pine beetle, and the number of dead trees is documented. Through these surveys, potentially rust resistant trees can be identified and targeted for cone collection to grow resistant seedlings for replanting and for gene conservation.

Mountain pine beetle attack and kill healthy whitebark and limber pines. In several stands in the province, verbenone, a synthetically produced chemical that deters mountain pine beetles from attacking trees, is placed throughout the stand to protect the trees. It can be used to protect individual trees or stands of trees; however, it is not most effective at low to moderate levels of beetle infestation. Stands with many mature, cone-bearing trees and stands where cones are collected are given priority for protection.

The fungal pathogen causing white pine blister rust has been spreading throughout white pine hosts in Canada for a century. Blister rust damages tree canopies and kills trees by girdling branches and stems. White pine blister rust requires two different hosts to complete its complex life cycle. Spores produced in cankers on whitebark and limber pine trees infect the alternate hosts. Rust spores produced on the alternate hosts then infect other whitebark and limber pines. The main alternate hosts are gooseberry and currant shrubs (i.e. *Ribes* species). Other potential alternate hosts are louseworts and Indian paintbrush. *Ribes* eradications have been attempted in the past but with limited success. Removal of the alternate host may be effective in small isolated stands of trees but not effective on the landscape scale.

Research is important to gain information on how best to manage for these pine species. Currently, research in Alberta includes cone production, tree interactions with other species, the role of prescribed fire, and cone predation by red squirrels.



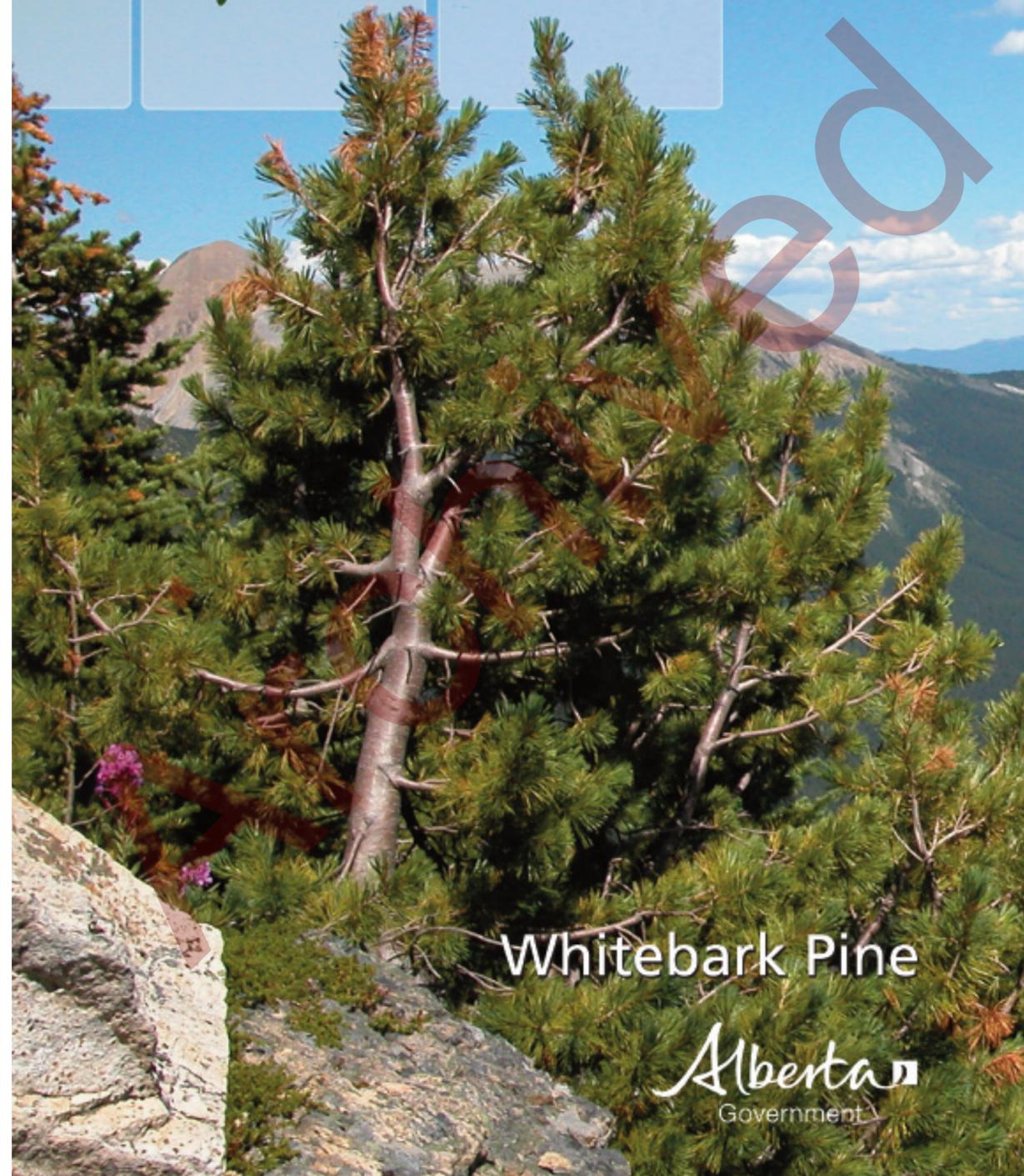
Report the location of any whitebark and limber pine trees you discover, to the Alberta Conservation Management System.

acims.data@gov.ab.ca or by using the form at:
[http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-\(acims\).aspx](http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-(acims).aspx)

More information can be found at:
<http://srd.alberta.ca/BioDiversityStewardship/SpeciesAtRisk/DetailedStatus/InvertebratesPlants.aspx>
<http://www.whitebarkfound.org/>

ALBERTA'S

Species at Risk

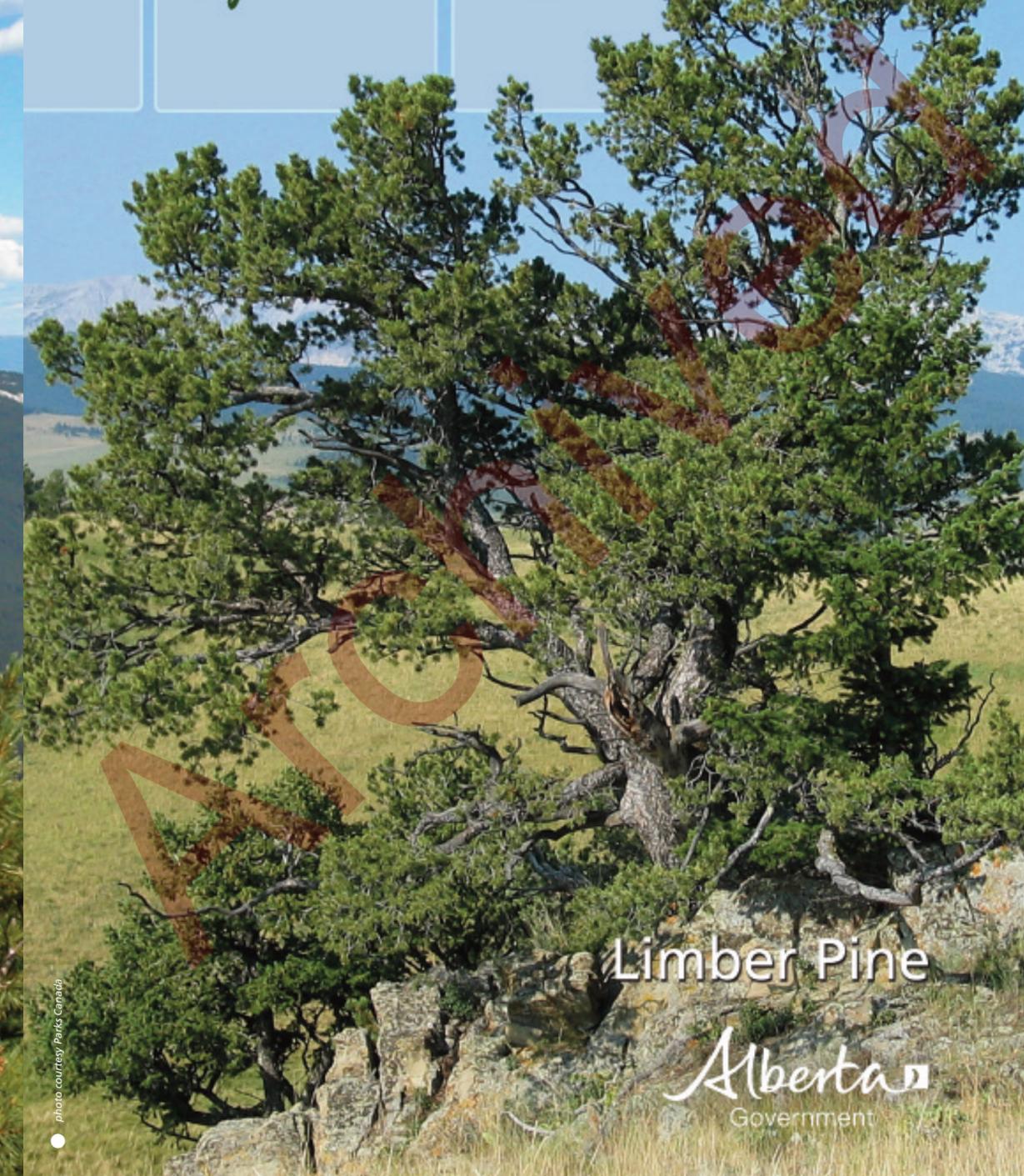


Whitebark Pine

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ALBERTA'S

Species at Risk



Limber Pine

Alberta
Government

DESCRIPTION

You can help by learning to identify these species to prevent unintentional cutting or damaging of whitebark and limber pine. These trees can not be used for firewood, tent poles, Christmas trees, or any other use.

Whitebark and limber pine are long lived trees that establish and grow at high elevations under harsh conditions that many other trees cannot tolerate. They occur in both mixed and nearly pure stands. Because of their ability to grow under windy, arid conditions and in poor soils, whitebark and limber pine may establish rapidly after fire, and aid in early forest establishment. At treeline, whitebark pine helps shade and shelter snowpack, thus regulating downstream flows. The large, nutritious seeds of both pines are an important wildlife food. Whitebark and limber pine form unique forest communities that contribute greatly to the biodiversity of the mountains and hills of Alberta.

These two species look very similar and can be difficult to distinguish where they grow together. The most reliable feature used to tell the two apart are the cones. Whitebark seed cones are oval or egg-shaped, grow at right angles to the branches, and are dark brown to dark purple in color. The cone scales remain closed, holding the seeds, until the cones decay on the ground or are opened by foraging animals. Limber pine seed cones are long and pointed, green when closed, and russet brown when ripe and open to drop their seeds. Pollen cones of these trees also differ in color. The pollen cones of whitebark pine are purple-red, while those of limber pine are yellow. Pollen cones are present before seed cones have grown in size and are distinguishable.

Whitebark Pine

Whitebark pine is a small to medium-sized tree that grows to a height of 5 to 20 meters., the tree often assumes a multi-stemmed, shrubby form. On harsh sites at higher elevation or with shallow soil, exposure to wind and/or heavy snow cover, trees grow shorter with twisted stems and are more mat-like or "krummholz." On less harsh sites and at the lower elevational limit of whitebark pine, the tree grows with a tall, straight trunk. Branches of upright trees tend to sweep up, which gives the tree a round appearance. The color of the bark of young whitebark pines, which is light grey to whitish, explains the common name of the tree. As the tree ages, the smooth bark becomes rough and scaly.



Limber Pine

Limber pine also grows upright or shrublike depending on the harshness of the site. Limber pine is generally a shorter tree than the whitebark, growing up to 15 meters. Branches grow along the entire stem. Lower branches are long and drooping with upturned tips. Branches are very flexible and can bend significantly without breaking which is why the species' scientific name, flexilis, was chosen. Bark of young trees is smooth and grey or nearly white, becoming rough, scaly and darker as the tree ages.



photo courtesy Parks Canada

LOOK-ALIKE SPECIES

Whitebark and limber pine can easily be distinguished from the more common species of pines found in Alberta, lodgepole and jack pine, by the number of needles in a group. Whitebark and limber pine have five needles per group, while lodgepole and jack pine have two.

Jack Pine
Pinus banksiana



Lodgepole Pine
Pinus contorta
var. *latifolia*



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HABITATS

Whitebark pine can grow at treeline, on steep, rocky cliffs with shallow soil, on sites exposed to strong winds, as well as on less harsh subalpine forest sites. These trees are important for soil stabilization and reduced erosion on these sites. On sites that receive most of their moisture in the form of snow in the winter, the trees are important for accumulating snow and prolonging snow melt.

Limber pine also grows on these harsh, high elevation sites, but also at elevations as low as the grassland foothills of southern Alberta where whitebark does not grow. Where limber pine grows at high elevations, it also plays an environmentally important role in soil stabilization, erosion reduction, snow accumulation and regulated melting.

Whitebark pine grows at higher elevations than limber pine. Whitebark generally grows from 1500 meters up to treeline while limber pine can grow up to 2000 meters in Alberta.

In southern Alberta the ranges of these pines overlap; however, their northern extent differs. Whitebark are found as far north as the Kakwa Wildland Interprovincial Park, while the northern most limber pines have been found near Kootenay Plains in the David Thompson corridor. In the northern part of its range, whitebark pine is restricted to the acidic soils of the Main Range of the Rocky Mountains.

INTERACTIONS WITH OTHER SPECIES

Seeds are an important food source for red squirrels and bears, and a number of small birds and rodents.

Squirrels gather cones and store them in middens so they can eat the seeds at a later time.

Black bears and grizzly bears dig up the squirrel middens and also eat seeds from cones still in the trees where they can reach them.

Seed-eating rodents, such as chipmunks, may help disperse limber pine seeds.

THREATS

White pine blister rust is a fungal disease that affects all five-needle white pine trees. It was introduced into Canada in the early 1900s from Europe. The rust originally came from Asia.

Infected seedlings and young trees usually do not reach cone-producing age (40-70 years). Branch infections can spread to the main stem of a tree. Main stem infections in young trees almost always result in tree death. Large trees can live with main stem infections, but suffer from losses of living branches which leads to reduced cone production. Blister rust-infected trees are also more susceptible to mountain pine beetle attack.

Mountain pine beetle is an out-breaking forest insect that attacks and kills any species of pine. The beetle prefers to attack large, mature trees; infested trees die within one year of attack. Mountain pine beetle outbreaks have currently subsided in the Alberta range of whitebark and limber pine. The number of cone-producing whitebark and limber pine trees are reduced during an outbreak as the large, mature trees are infested and die.

Another potentially significant threat to both species is habitat loss resulting from fire suppression and climate change. Seedlings of species such as subalpine fir and spruce are more shade tolerant than are whitebark and limber pine seedlings. These other species are able to outcompete the whitebark and limber pine, resulting in reduced pine regeneration. Under a natural fire regime, low intensity fires would burn through stands, removing the understory and allowing the whitebark and limber pine time to establish. As the climate warms, shade tolerant trees will be able to establish farther upslope and compete with whitebark and limber pine for growing sites.

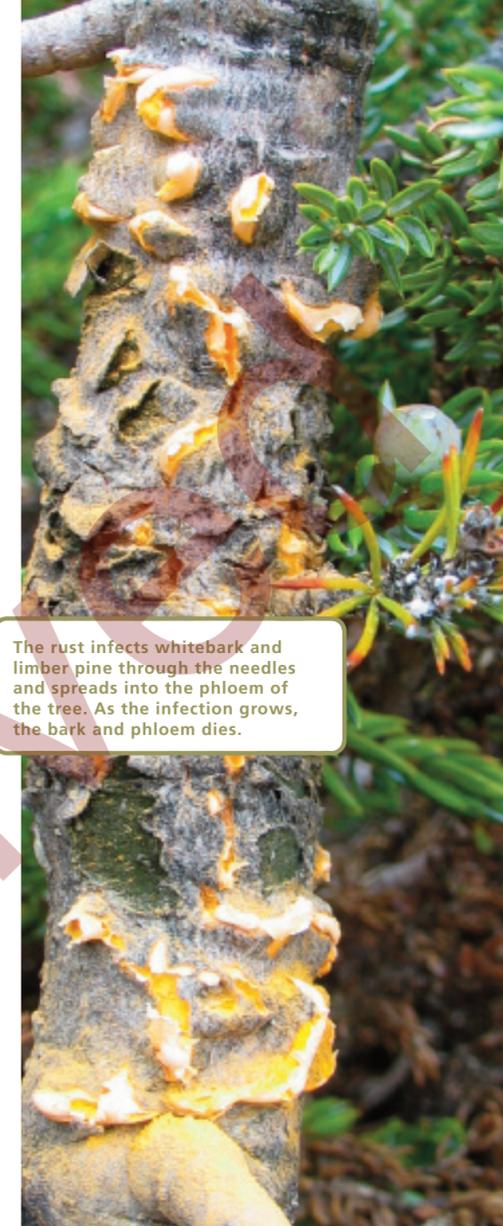
All of these threats and impacts are much better documented and understood for whitebark and limber pine in the southern Rocky Mountain ranges of North America than in their northern ranges. More research is needed on these threats and impacts on the ecology of whitebark and limber pine ecosystems in Alberta. Information will help guide the development of effective management strategies, including provincial and federal recovery plans, for protecting Alberta's remaining ecosystems of whitebark and limber pine for future generations.

photo courtesy Diana F. Tomback

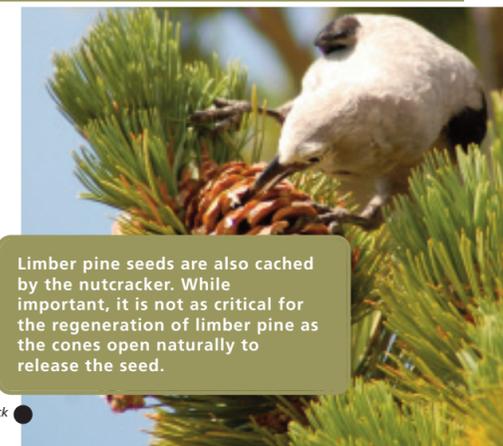
Without the Clark's nutcracker, very little regeneration would occur.

The Clark's nutcracker, a bird related to crows and jays relies heavily on the seeds of whitebark and limber pine as a food source. These birds serve as the main seed disperser for whitebark pine as they open the cones with their strong beak, pick out the seeds, and store them in small clusters or "seed caches" buried a few centimeters under soil, gravel or forest litter. They use these caches for winter and spring food. Seeds not retrieved may germinate after snow melt and rain.

photo courtesy Diana F. Tomback



The rust infects whitebark and limber pine through the needles and spreads into the phloem of the tree. As the infection grows, the bark and phloem dies.



Limber pine seeds are also cached by the nutcracker. While important, it is not as critical for the regeneration of limber pine as the cones open naturally to release the seed.