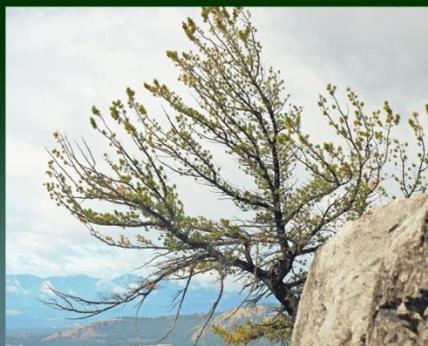


LIMBER PINE IN BRITISH COLUMBIA

FACTSHEET 2



DON PIGOTT

“THE LONELIEST PINE”

RANDY MOODY

Limber pine (Pinus flexilis) is undoubtedly the least common conifer in British Columbia. Although the species is widespread in the western USA, it is at the northern limit of its range in British Columbia and Alberta. Both the common and Latin names refer to the flexible nature of the branches; an adaptation for a tree that must deal with heavy snowpack and ice. (The Tree Book)

INTRODUCTION

Limber pine is a very uncommon species, growing at low to middle elevations in British Columbia on the western slopes of the Rockies, southwestern Alberta, and the western U.S. (Figure 1). It is only known from a limited number of locations in British Columbia, mainly in the upper Columbia Valley and scattered locations throughout the southern Rocky Mountains. Limber pine makes valuable contributions to watershed protection, wildlife cover, and aesthetics. Additionally, it is an important food source for Clark’s nutcrackers, grizzly bears and red squirrels. There is anecdotal information indicating First Nations peoples directed trails past stands of Limber pine in order to harvest the seeds for food and trade. Its abundance throughout North America is declining as a result of the combined effects of mountain pine beetle (*Dendroctonus ponderosae*) epidemic, white pine blister rust (*Cronartium ribicola*), and competition from other tree species as a result of fire suppression. Development in the Rocky Mountain Trench is also likely impacting limber pine through direct removal and habitat reduction.

In BC limber pine mostly occurs as scattered individuals, rather than forming stands. Very little survey data is available for limber pine in BC, as it is a minor species of no commercial timber value. The most extensive survey to date was conducted by C. Smith and P. Achuff from Parks Canada in 2008. This study revealed occurrences of individual trees or small populations at 16 locations. Subsequently, a few additional populations have been discovered. In BC, limber pine is found as far north as the Kicking Horse Pass (near Golden) and as far south as Mount Broadwood (near Elko). Difficult access often limits ground surveys into limber pine habitat, so it may be more widespread than currently known. More extensive surveys are recommended.

Currently there are only a few provincial or national projects underway aimed at developing a better understanding of limber pine’s basic biology, response to fire, insects, disease and other disturbances. While the species is considered a high priority for genetic conservation by the BC Conservation Data Centre, seed collection for genetic testing, gene conservation, and future restoration projects is similarly limited.

Most of the public and even many foresters are unfamiliar with limber pine and unaware that it occurs naturally in BC. It is likely that some limber pine trees have been incidentally removed during timber harvest or land clearing for other industrial development.

SPECIES CHARACTERISTICS

Limber pine is commonly confused with whitebark pine as they share many physical characteristics and in some areas occupy similar habitats. The following characteristics are described to aid in species differentiation between limber and whitebark pine.

Needles

Limber pine needles occur in tight bundles of five. Needles are dark green, slightly curved, rigid, 3-8 cm long, and triangular in cross-section. Like its relative, whitebark pine (*Pinus albicaulis*), limber pine needles tend to be clumped or densely crowded towards the ends of the branches.

Cones



Figure 2: Limber Pine Cones

Mature seed cones are light brown in color, cylindrical in shape, and vary in length from 8-18 cm (Figure 2). Prior to maturing, the cones remain green. There are usually 40-70 scales, slightly thickened at the tips, spoon shaped, without a prickle, and often with reflexed (backward bent) scale tips. Unlike whitebark pine, cones of limber pine open when mature and release the wingless seeds. The cones can be very pitchy. The cones normally fall from the tree in the winter, but sometimes persist through to the following year. Limber pine cones also often remain intact on the ground after falling from the tree, a good indicator to distinguish limber pine cones from those of whitebark pine, which are usually destroyed by foragers on the tree or on the ground. In both species cone crops develop every 2-5 years. The male (or pollen) cones of limber pine are yellow whereas pollen cones of whitebark pine are raspberry red (Figure 3).

Seeds

The large wingless seeds of limber pine are similar to whitebark pine (Figure 4). Seeds are about 1 cm long, but slightly more pointed than whitebark seeds. Limber pine is dependent on birds and small

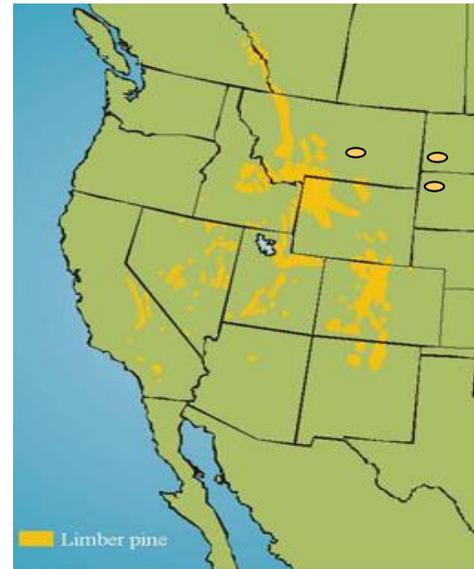


Figure 1: Map of Limber Range



Figure 3: Limber Pine Pollen Cones



Figure 4: Limber Pine Seeds

mammals for dispersal and regeneration. Limber pine did not evolve as closely with the Clark's nutcracker as whitebark pine. Thus, a vestigial wing is often present on limber pine seeds, indicating a past where wind dispersal was possibly important. The seeds germinate easily with normal stratification treatments and the seedlings grow quickly in the first year. Many seeds have a small black spot, the cause and role of which is apparently unknown.

Bark

The bark on young trees is smooth and pale gray. As the tree ages, the bark becomes thicker and rougher, turns dark gray to brown, and forms wide scaly plates (Figure 5).



Figure 5: Mature Bark

Form and Wood

Limber pine often assumes various growth forms depending on local site conditions and competition levels. On exposed sites it often takes a stunted or wind-swept form with long sweeping branches. On competition-free sheltered sites the tree takes on a straight form characteristic of most other pine species. It occasionally occurs in forests with Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*) and ponderosa pine (*Pinus ponderosa*). On these forested sites with greater canopy cover limber pine may grow tall and straight to compete for sunlight.

The wood quality is inferior to most other conifers for construction, decorative and commercial purposes due to its poor live load bending strength, spiral grain, and generally low volumes.

DISTRIBUTION

In BC, limber pine occurs in a clustered distribution throughout its range. A limited number of population centres are known, occurring from Highway 1 between Golden and Field in the north, south along the eastern side of the Rocky Mountain Trench and east from Elko to the Alberta border just south of Highway 3. Many of the known populations are separated by distances of up to 50 km. It is probable that there are more populations than have been reported. Given the extensive population distribution in the U.S., it is likely that some populations are present in the Flathead Valley south of known populations to the Canada/U.S. border. In BC's Rocky Mountain Trench, several scattered individuals have also been reported near Invermere and north of Radium (Figure 6).

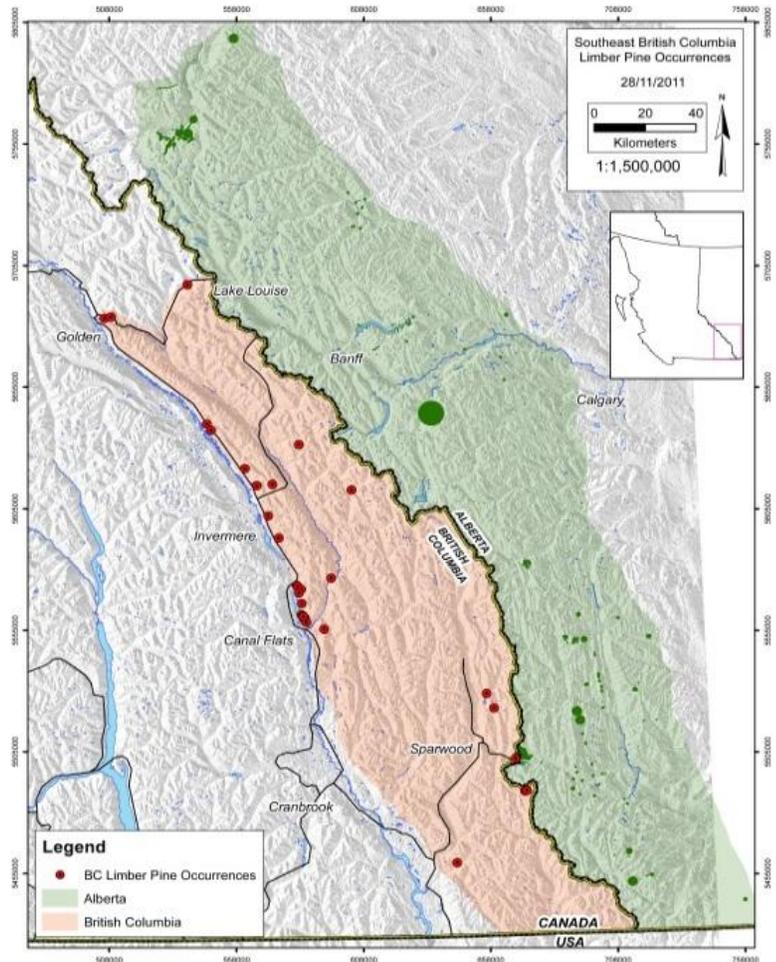


Figure 6: Map of known Limber Locations in BC and Alberta

The best known locations to observe limber pine in BC are in the Kicking Horse Canyon where access is limited to roadside viewing along the Trans-Canada Highway, and along the east shore of Columbia Lake north of the village of Canal Flats. Along Columbia Lake there are ample viewing opportunities for people with a range of physical abilities.

HABITAT

Limber pine is almost exclusively found on warm aspects, calcareous soils, talus slopes, and limestone outcrops throughout its range in BC (Figure 7). It typically occurs on hot and dry sites, though the species is known to grow on calcium rich seepage sites near Columbia Lake. (Figure 8) Most sites on which limber pine occurs offer it limited competition since calcareous soils are unfavourable to many other species. Seed caching habits of the Clark's nutcracker also influences the distribution and occurrence of limber pine. The species elevation range is generally between 1,000 and 1,500 metres, though it has



Figure 7: Limber pine veteran growing on limestone talus at Andy Good Creek

been observed as low as 900 metres in the Invermere area and as high as 1,900 metres in the Crowsnest Pass area, where it mixes with whitebark pine. Limber pine occupies some of the most rugged, inhospitable, steep, and rocky parts of the East Kootenays; sites which are capable of supporting few other species.

IMPORTANCE FOR WILDLIFE

Limber pine seeds, like those of whitebark pine, are a high fat important food-source for mammals and birds. Squirrels cache the cones whole in middens (food storage cells) for their winter food supply. These middens are sometimes raided by scavenging black and grizzly bears. Clark's nutcrackers extract the seeds from the un-opened or opening cones on the trees and deposit them in suitable caching sites such as open, south facing slopes and cliff faces. Chipmunks, squirrels, and a variety of seed-eating birds also consume the seeds.



Figure 8: Limber Pine Overlooking Columbia Lake

FIRST NATIONS USE

Although there is limited information about the traditional use of limber pine and its seeds in BC and Alberta, given the size of the seeds and their energy content it is likely that they were traditionally used by First Nation peoples. It seems likely that aboriginal peoples saw enough value in the trees to help propagate them in new areas. In other areas of North America, there is evidence of First Nations role in expanding the distribution of limber pine.

The extent and abundance of limber pine is far greater southward in the US than in Canada. Not surprisingly, use by First Nations is also much better documented in the US. There, the seeds were often roasted and hulled, or sometimes ground (shell and all), and eaten. The plant was also used as a Romah drug (ceremonial medicine) by the Romah Navahjo. The wood was used to make a small bow and arrow used in traditional Witch and Shooting chants. Some parts of the plant were smoked for “good luck.” There is evidence that the seeds were used as a food source by certain Great Basin tribes, such as the Northern Shoshone. Numerous grinding stones at Alta Toquima Village, a prehistoric site in central Nevada, also suggest use of pine nuts as food, with limber pine the likely source (Lanner 1996). Although poorly documented, it is probable that Canadian First Nations also utilized limber pine.

HEALTH AND THREATS

Limber pine is Blue-listed in BC (Conservation Data Centre, 2008), indicating that its population is at-risk and of conservation concern. This listing is a result of its scarcity (between 2,500 and 10,000 individuals) and threats including: white pine blister rust, mountain pine beetle, fire suppression, and land development.

White Pine Blister Rust

White pine blister rust is a serious disease affecting all five-needle pines (Figure 9). Blister rust is caused by the fungus *Cronartium ribicola*, which requires alternate hosts from the *Ribes* (currant and gooseberry), *Pedicularis* (lousewort), or *Castilleja* (Paintbrush) genera.



Figure 9: White pine blister rust showing orange fructing bodies.

The disease was introduced to British Columbia in 1910 when infected eastern white pine nursery stock was imported from Europe. Within 25 years the disease swept across most of the known range of the three native five-needle pine species in BC; western white pine (*Pinus monticola*), whitebark pine, and limber pine. The disease has also expanded into the western United States and throughout eastern North America (due to an introduction event on the East Coast).

Fungal spores are released from the leaves of the *Ribes* plants in the spring and land on the needles of the pine trees, where they enter through tiny pores (stomata) in the needles. The fungus then travels from the needles down the branch

to the main stem, where it can eventually girdle and kill the tree. The orange fructing body of the rust often appears within a blister rust canker, which is a swelling around the infection. This

canker site is rich in sugars and highly prized by rodents such as red squirrels and porcupines who often eat both the fruiting body and canker. These foragers may either accelerate the ultimate death of the tree through girdling or destroy the fungus and prolong the tree's survival.

Mountain Pine Beetle

The current mountain pine beetle (*Dendroctonus ponderosae*) infestation in British Columbia is an epidemic of a scale not seen before. Over 13 million hectares have been beetle-affected to varying degrees. Although many BC residents are familiar with the unprecedented mortality in lodgepole pine stands, few realize that other pine species (such as ponderosa and the five-needle pines) were also impacted. Limber pine killed by mountain pine beetle has been observed along the east shore of Columbia Lake (Figure 10). Older stands and trees already infected by white pine blister rust appear to be more susceptible to attack.



Figure 10: Limber pine killed by mountain pine beetle near Columbia Lake.

Human development

Limber pine occurs in a small area of the East Kootenay extensively used by humans for grazing, logging, mining, roads, vacation resorts, and housing. Although there is almost no inventory data on the original extent of limber pine populations, we can assume it was historically much greater based on the scattered individuals found throughout the region today. Although much of what remains of limber pine occurs on cliffs and other rugged terrain, it seems probable that historically limber pine was more common in the valleys. The poor inventory of limber pine makes it difficult for developers to properly account for limber pine impacts during development. The widening of Highway 1 in the Kicking Horse Pass near Golden resulted in many limber pines being cut with no mitigation actions.

Private Property Owners

If you have limber pine on your property, consider it a special asset since this interesting tree species is rare in BC. Though identified elsewhere on conservation properties and First Nations lands, consultations with landowners between 2010 and 2013 identified only two limber pine locations on private land. To assist limber pine on your property, look for ways to reduce competition as limber pine is a poor competitor and prefers full sunlight. Look for younger limber pine in the area and consider thinning the forest around them to facilitate their growth and maturation. When searching for limber pine, remember that it may superficially look like lodgepole pine (which only has 2 needles per cluster) or ponderosa pine (which only has 3 needles per cluster), since in closed forests it can grow straight and tall.

Several cultivars of limber pine have been created for the landscaping industry and it makes an ideal plant for xeriscaping within its native range. Several native plant nurseries are producing native stock and most nurseries carry cultivars. If you require further suggestions on managing whitebark pine on your property, contact the Whitebark Pine Ecosystem Foundation (www.whitebarkfound.org) or the BC Conservation Data Centre (www.env.gov.bc.ca/cdc/).

CONSERVATION ACTIVITIES

To properly address conservation concerns we need to improve our inventory data on limber pine, address pest and pathology issues, and work on active restoration.

Better inventory

As limber pine habitat is often difficult to access, conducting an accurate inventory is a challenge. Remote sensing techniques can be useful to provide preliminary estimates of the range and population sizes, but verification through low elevation aerial photography, helicopter surveys and field checks on the ground are needed (Figure 11).



Figure 11. Limber pine growing in rugged habitat.

Rust Screening

Screening programs to assess the levels of blister rust infection and damage can be expensive and require many years to complete. In the short term, identifying and collecting seed from apparently healthy individual limber pine trees for propagation of potentially rust-resistant trees is a feasible alternative to intensive rust screening.

Mountain Pine Beetle Control with Verbenone

Mountain pine beetles communicate through a complex array of chemical (pheromone) signals. To effectively attack a tree, a minimum threshold of beetles is needed to overcome the tree's defenses—pitch produced to drown the insects. During an attack, beetles emit an aggregation pheromone to attract other beetles to the tree. Once enough beetles have amassed, they emit an anti-aggregation pheromone to indicate the tree is full and that additional beetles should stay away. Verbenone is a synthetic anti-aggregation pheromone, which indicates to other beetles that a certain tree is at capacity and that the beetles should seek other hosts. Verbenone is generally applied by stapling a pouch of the chemical to susceptible trees once or twice each year.

Planting

Limber pine seeds germinate readily, and it is possible to produce good quality seedlings for outplanting in one growing season. Survival after planting appears to be high and planting is one of the more productive restoration activities that lends itself well to volunteer participation.

Conserving what we have

Limber pine is the most uncommon tree species in British Columbia. In order to reduce the loss of these trees or their habitat, it is important to communicate with private land owners, resource managers, community members and youths about the importance and plight of this unique and rare species.

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Acknowledgements

Production of this brochure was supported through funding provided by Columbia Basin Trust and the Columbia Valley Local Conservation Fund. Columbia Basin Trust supports efforts to deliver social, economic and environmental benefits to the residents of the Columbia Basin. The Columbia Valley Local Conservation Fund is a program provided by the Regional District of East Kootenay and Administered by the East Kootenay Conservation Program.

Steve Arno, Joanne Vinnedge, and Alana Clason reviewed this document and provided constructive recommendations.

Thanks also to Shannon at Eyeland Graphics and Robert at Impact Visual Communications for their assistance in the production and printing of this brochure.



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