

Limber pine and grazing – Beneficial Management Practices

Limber pine – a unique, endangered tree

Limber pine is a picturesque iconic tree growing in southwest Alberta's Montane and Foothills natural subregions, extending from the grasslands to the treeline. Usually found in dry habitats where it can persist better than faster-growing competitors, they can live over 1,000 years. Limber pines provide unique values:

- Large seeds with very high fat and protein content provide very important wildlife food
- many parts of the tree were used for Indigenous cultural purposes including ceremonies, food, medicine, and trading
- extensive roots anchor fragile, steep soils
- trees and tree clumps shade melting snow which extends snowmelt for 2 to 3 weeks, cooling montane streams and extending streamflows key to sensitive fish habitat.

Their rugged habitat and slow growth mean a limber pine tree takes 30 to 50 years to begin to mature, reaching full pollen and seed production decades later. The large, rich seeds take so much energy to produce, that trees across a region usually have a large cone crop together every 2 to 4 years, with few or no cones in between.

You'll often hear the Clark's nutcracker's raucous call in limber pine habitat as the seeds are an essential food source. This striking, super-smart cousin of crows pecks seeds from the cones, rolls them into a pouch under its tough bill, and caches up to 100,000 each year. Many other wildlife species also prize the seeds, including birds, squirrels and bears. When food is scarce nutcrackers dig up their caches. Seeds left behind grow into new trees, sometimes forming clumps from seeds cached in groups¹.

Habitat

Limber pine usually grows on dry rocky ridges, and slopes with warm aspects. Limestone and calcium-rich sandstone outcrops are common, usually supporting thin, silty soils. It may grow with Douglas-fir, lodgepole pine and occasionally aspen. Limber pine habitat generally has low forage value and is too dry to support closed-canopy forests².

Threats

Limber pine is Endangered because populations are declining much faster than they are regenerating. There are several main threats in Alberta¹:

- The number one threat in Alberta and Canada is the disease white pine blister rust. It is fatal to all except rare naturally resistant pines. It was introduced into North America about 100 years ago and the fungus that causes it has spread throughout the range of the species.
- Mountain pine beetle attacks limber pine, preferring large mature trees which produce the most seeds. Disease-resistant trees are key to restoration so their loss is a blow to recovery.
- Human changes to fire cycles affect limber pine. Fire suppression favours more shade-tolerant competing species, building up fuel resulting in more severe and larger wildfires than in the past, killing trees that might have survived more historically frequent surface fires.
- Climate change affects these threats: warmer winters increase beetle populations; hotter, drier conditions make fires more frequent and severe; drought-stressed trees are more susceptible to disease and insects.
- Human development overlaps limber pine in many areas of Alberta, causing direct impacts.

Limber pine restoration

Restoring limber pine ecosystems will take generations, because a seed planted now needs at least 50 years to become a tree producing its own seeds. Recovery plans address each threat and focus on priority areas and actions for success¹. New research on limber pine gets included in plans and actions.

Disease resistance

The core of restoration is natural genetic resistance to white pine blister rust. Trained experts identify healthy trees in heavily infected stands across the species' range to maximize diversity. Seeds from those selected trees, called "plus trees," are key for restoration as seedlings grown from susceptible trees will likely die from blister rust before they

reproduce. Their cones are protected early from wildlife while seeds mature on the tree, or all get eaten before they can be collected.

Plus tree seeds are tested to confirm if they are passing on heritable disease resistance to seedlings. Testing takes 7 years from seed. Despite diligent selection, not all plus trees are resistant enough to become tested “elite trees.” Shoot cuttings from elite trees are grafted onto rootstock and planted in specially designed seed orchards which are managed to maximize early production of rust-resistant seeds. Seed orchards from cuttings should yield seeds in 10 to 20 years, decades earlier than seedlings. Other benefits of seed orchards include: gene conservation as they contain copies of each elite tree in case the original tree in its habitat dies or becomes inaccessible; higher rust resistance in the next generation of seeds as they are pollinated by genetically diverse resistant trees in the orchard; and cost-effectiveness and safety compared to travelling to many remote locations and climbing up trees to protect cones and later collect seeds.

Beetle battles

Provincial forest health surveys identify where mountain pine beetle attack risk is high. High-value trees such as plus trees and research plots are protected by applying pheromones. These are chemical signals the beetles use to tell each other trees are already full, so they move to another spot.

Location, location, location

Habitat is mapped in government tools so permit applicants can see where there is a risk to limber pine, and adjust plans to avoid or minimize impacts. Agencies including Alberta wildfire use plus tree and research site locations to protect and include them in fire and resource management planning.

Populations and landscapes

Restoration protects and restores populations at the landscape scale for long-term adaptation and sustainability. A population must be large enough (minimum 4, ideally at least 40 hectares) and have a minimum of 500, ideally at least 5000, unrelated cone-producing trees to support genetic diversity and produce enough seed to reliably attract Clark’s nutcrackers for regeneration. Connectivity is key. Populations should be no more than 12 km apart for seed and pollen dispersal. Natural regeneration, especially from disease-resistant trees, supplements planted seedlings from those trees, which are protected from beetles, competition, and fire³.

Recovery and partnerships

Alberta has a dynamic recovery program for limber pine, together with whitebark pine, which faces the same threats¹. These long-lived, bird-dispersed endangered trees need coordinated actions on multiple fronts over many decades for recovery. Monitoring tracks status and trends in health, regeneration, survival and growth, using consistent methods so different time periods and areas can be compared.

Partnerships across jurisdictions and agencies are essential for success. Partners collaborate on restoration and recovery across western Canada and the USA. Agencies track and report their progress every year, and share knowledge about new research and new methods.

Best Management Practices for limber pine in ranchlands

Grazing impacts

Limber pine sites are usually dry and nutrient-poor, supporting an average of 500 kg per hectare of low-quality forage, about half grasses and 15 to 25% shrubs. In the Montane natural subregion sites have a carrying capacity of 0.05 to 0.15 AUMs per acre. Cattle avoid steep, rocky areas where limber pine often thrives. Stock may use areas with larger trees for shade, forage in flatter, sparsely treed sites, or travel through limber pine stands to access preferred grazing.

- Monitoring in routinely grazed sites shows little to no limber pine regenerating there
- Cattle break branches of mature trees up to shoulder height, reducing cone production
- Entire trees in scrubby stands can be snapped by trampling
- Extensive use over longer periods can compact finer-textured soils, and seedlings cannot germinate

Best Management Practices

Limber pine may occupy only a small part of the available range. Where possible, we recommend diverting cattle to other areas with better forage quality that are more resilient to promote regeneration and increase cone production by leaving pollen- and cone-bearing branches intact.

- Grazing:
 - Intensive Grazing – avoid in limber pine stands, damages or kills seedlings and saplings
 - Rotational Grazing – if using the area is essential, include a long rest rotation in these sites, e.g., graze a maximum 25% of yearly forage production. Most forage species in these sites have a fairly short growing season and may only support one annual grazing rotation.
 - Very low carrying capacity for stock (0.05 to 0.15 AUMs per acre)
 - Keep cattle moving through the pine stand, focus grazing on other pastures
- Fencing:
 - Use fences or drift fencing to guide cattle towards pasture that is more resilient to grazing
 - Use existing pathways to direct cattle movement
- Salt blocks: place to direct cattle away from limber pine stands
- Water sources: place to direct cattle away from limber pine stands
- Shade:
 - consider directing cattle towards other areas for shade such as Douglas-fir or aspen
 - create some alternate shade

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References

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