
Limber and whitebark pine recovery in Alberta 2022



Ministry of Agriculture, Forestry and Rural Economic Development, Government of Alberta

January 2022

Limber and Whitebark Pine Recovery in Alberta [2022 update]

ISBN 978-1-4601-5311-6



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Partners in recovery

Provincial recovery plans for whitebark pine and limber pine cover a large area that crosses jurisdictions. Collaboration and partnerships have been a core part of the process.

Alberta Environment and Parks is the primary responsible agency, as species at risk in Alberta are listed under the *Wildlife Act*. Alberta Environment and Parks is responsible for recovery within provincial parks. Data is stored in the provincial species and ecosystems at risk tracking system (ACIMS: Alberta Conservation and Information Management System).

Agriculture, Forestry and Rural Economic Development's Forestry Division is mainly responsible for operational activities on Crown land.

Co-chairs of the provincial recovery implementation team are Robin Gutsell (Environment and Parks) and Jodie Krakowski (Whitebark Pine Ecosystem Foundation).

Much of the species' range is within Rocky Mountain National Parks. Under the federal *Species at Risk Act*, a draft federal whitebark pine recovery strategy is available and a final version is anticipated soon. Limber pine is being evaluated for federal Endangered listing and, if approved, a recovery plan will be developed. Recovery partners have developed recovery goals, objectives and strategies together to align implementation using best practices.

Academic institutions, government agencies, and non-governmental organizations have collaborated to address identified research gaps. Partners to date include:

- Government of British Columbia: [B.C. Ministry of Forests, Lands and Natural Resource Operations and Rural Development](#); [BC Parks](#);
- Government of Alberta: Agriculture, Forestry and Rural Economic Development; Environment and Parks
- Government of Canada: [Parks Canada Agency](#) (Rocky Mountain National Parks); [Natural Resources Canada-Canadian Forest Service](#) (Pacific, Laurentian and Atlantic Forestry Centres)
- United States Government: [U.S. Department of Agriculture Forest Service-Dorena Genetic Resource Center](#), [Coeur D'Alene Nursery](#) and [Rocky Mountain Research Station](#)
- Academia: Kings University College; Montana State University; University of Alberta; University of British Columbia; University of Calgary; University of Northern British Columbia; University of Victoria
- Non-governmental organizations: [Whitebark Pine Ecosystem Foundation of Canada](#) is a non-profit agency that can leverage funding, provide volunteers and connect partners to enable sharing of information and work on projects related to the recovery plan. Other organizations instrumental in

endangered pine recovery include: [Nature Conservancy of Canada](#); [Crown Managers Partnership High-5 working group](#); [Oldman Watershed Council](#); [Alberta Invasive Species Council](#)

- Generous permission has been granted to access land with endangered pines for surveys and material collection by Stoney Nakoda Nation, Piikani Nation and many private landowners



Accomplishments

Baseline data collection has been key to documenting the status and trends of whitebark pine and limber pine. The recovery plan identifies priorities and actions taken by various agencies. Ongoing monitoring will show their effectiveness over time.

2022-23 and beyond

Whitebark and limber pine trees grow very slowly, requiring a long-term commitment for their recovery. Identifying enough trees that are potentially disease resistant from each region; collecting seeds; testing the parent trees for disease resistance; propagating; planting enough resistant seedlings to restore populations across the range; and monitoring their performance will take decades.

2021-22

Rust-resistant trees for genetic conservation and to produce seed for restoration

- Surveyed the health of 171 plus trees identified in prior years (131 limber, 40 whitebark).
- Collected and processed nearly 3,000 cones to extract seeds from 44 limber pine and 19 whitebark pine trees, yielding over nine kilograms of seed.
- Thirteen high-value sites (research plots, plus trees) in high-hazard area were protected against mountain pine beetle based on 2020 overwinter survival surveys.
- Inoculated seedlings from size limber and 11 whitebark pine Alberta, plus trees for disease resistance screening.
- Planted 200 whitebark pine and 6,950 limber pine plus tree seedlings in four restoration sites in high priority habitat, restoring nearly 13 hectares.
- Established survival and health monitoring plots for every parent tree in each restoration planting site and monitored plots in sites planted in prior years.
- Collected scion from 11 whitebark and 34 limber pine plus trees for grafting to establish expand whitebark and limber pine seed orchards and clone bank.
- Seed orchards contain 224 limber pine and 14 whitebark pine families from Alberta, with nearly 250 grafts pending planting and grafts from 45 families pending grafting.
- Collected age five (planting, age eight seed) data from the limber pine provenance trial, which will be analyzed jointly with the paired trial in Colorado to inform seed transfer.

Information sharing on high value trees and stands

- Active participant in the Canadian Whitebark and Limber Pine Seed Orchard Working Group, a multi-jurisdictional collaboration to support partners sharing data and resources to establish seed orchards and clone banks of rust-resistant whitebark and limber pine in order to maximize seed supply of well-adapted material to support recovery efforts in Canada.
- Annual program database updates to consolidate annual field data related to stands, trees, surveys, collections, projects, grafts and screening.
- Wildfire spatial fuel types update pending for whitebark and limber pine habitat to support improves fire management planning and response.
- Provided referral reviews for diverse proposed projects overlapping whitebark and limber pine habitat to identify high value trees and sites, and share information on high-value elements and best practices so project options could be develop to avoid, minimize and mitigate impacts.
- Posted Best Management Practices and one-page fact sheets for Alberta on the Whitebark Pine Ecosystem Foundation of Canada website, which are available from the recovery team.

Improved mapping of whitebark pine and limber pine

- Measured live mature pine basal area data in 547 plots within six whitebark and 39 limber pine stands to better characterize critical habitat in Alberta.

Recovery plan extension and priorities

- Combined updated recovery plan for both species pending minister approval.
- SAR Series report 166 published summarizing five-year program accomplishments.
- Presented information and data on Alberta recovery program at international and regional conferences and published papers in peer-reviewed journals and conference proceedings.
- Published new research on pathology and genetics of Alberta limber pine in peer-reviewed journals.
- Continued reporting on provincial recovery efforts and conservation status at provincial, national and international forums, as well as online, including workshops, meetings and class lectures for students.
- Supplied extensive data and technical interpretation to the Crown Managers Partnership multi-jurisdictional spatial recovery planning project for whitebark and limber pine spanning the Crown of the Continent region.
- Continued to recognize and work with partners and volunteers in the field for selected activities implementing special safety provisions for COVID-19.

2020-21

Rust-resistant trees for genetic conservation and to produce seed for restoration

- Surveyed the health of 174 plus trees identified in prior years.
- Collected and processed seeds from eight limber pine plus trees.
- Thirteen high-value sites (research plots, plus trees) in high hazard area were protected against mountain pine beetle based on 2019 overwinter survival surveys.
- Continued to support partner disease resistance screening.
- Planted 4,400 whitebark pine and 1,600 limber pine plus tree seedlings in six restoration sites in high-priority habitat.
- Established survival and health monitoring plots in each restoration planting site and monitored plots in sites planted in prior years.

- Collected scion from 50 plus trees for grafting to establish and expand limber pine seed orchard and clone bank, respectively.
- Established the first phase of a limber pine plus tree clone bank at Waterton Lakes National Park comprising grafts of 112 ramets (copies from cuttings) from 31 plus trees currently in rust resistance screening; expansion room is planned to add more genotypes to ensure high diversity and representation of the best tested material. Elk browse protection installed.
- Active participant in the Canadian Whitebark and Limber Pine Seed Orchard Working Group, a multi-jurisdictional collaboration to support partners sharing data and resources to establish seed orchards and clone banks of rust-resistant whitebark and limber pine in order to maximize seed supply of well-adapted material to support recovery efforts in Canada.

Information sharing on high value trees and stands

- All program data has been consolidated and connected in a spatially compatible Access database, connecting fields related to stands, trees, surveys, collections, projects, grafts and screening.
- Developed updates of fuel types in whitebark and limber pine habitat to support improve fire management planning and response.
- Provided referral reviews for diverse proposed projects overlapping whitebark and limber pine habitat to identify high value trees and sites, and share information on high value elements and best practices so project options could be develop to avoid, minimize and mitigate impacts.
- Reviewed the Best Management Practices prior to posting.

Better mapping of whitebark pine and limber pine

- Measured stand basal area in 88 sites within 13 stands to improve delineation of critical habitat based on thresholds in the federal draft recovery plan for whitebark pine. Current density data is limited to stands with maximum stand density which does not represent the range of habitats.

Recovery plan extension and priorities

- Combined updated recovery plan for both pending final approval prior to posting.
- SAR Series report summarizing five-year program accomplishments pending publication.
- Continued reporting on provincial recovery efforts and conservation status at provincial, national and international forums, as well as online, including workshops, meetings and class lectures for students.
- Active participant in Crown Managers Partnership multi-jurisdictional spatial recovery planning project for whitebark and limber pine spanning the Crown of the Continent region.

- Continued to recognize and work with volunteers in the field for selected activities implementing special safety provisions for COVID-19. Volunteers participated from NGOs, other GOA departments, industry and individuals.



2019-20

Monitoring long-term plots to quantify status and trends across the Rocky Mountains

- Trained field crews together for consistency in data collection between Alberta, Parks Canada and B.C. teams. Crews remeasured about 250 long-term monitoring plots in the B.C. and Alberta Rocky Mountains – for most plots this was the fourth measurement. Some new plots were established to fill spatial gaps and replace burnt plots.
- Plot data was analyzed to determine status and trends of the species and prioritize areas and regions for key recovery actions.
- Data on fuels and fire history was also collected during monitoring to evaluate large-scale trends between whitebark and limber pine regeneration and fire at the species' northern limits, and develop best practices for managing fire in northern stands.

- An exposure analysis was done to identify stands or stand characteristics at higher wildfire risk.

Rust-resistant trees for genetic conservation and to produce seed for restoration

- Plus trees in high-hazard sites were protected from mountain pine beetle with Verbenone.
- Continued to send seeds of potentially resistant trees for disease resistance screening.
- Planted over 7,200 disease-resistant limber pine seedlings in restoration projects in Castle and Beauvais Lake provincial parks and through partners in Piikani Nation lands and Waterton Lakes National Park, and in a climate change resilience project in Star Creek watershed in the Crowsnest Pass area. Volunteers from Shell Canada and Oldman River Watershed Council also participated.
- Seedlings planted in 2018 were monitored by Parks Canada staff for survival.

Recovery plan update

- A completely revised and updated long-term recovery plan for both species was drafted based on Open Standards planning workshops hosted by Parks Canada involving recovery partner agencies in 2018 and 2019, and submitted for consultation.
- A workshop among recovery partners in Canada was held to standardize plans and next steps to establish seed orchards in order to maximize seed production of rust-resistant whitebark and limber pine for each seed zone.

Information sharing on high value trees and stands

- Submitted documentation to support improved LAT (Landscape Analysis Tool) layers for disposition reviews to proactively avoid impacts to endangered species.

Program extension

- Presented Alberta recovery program accomplishments at international conferences and professional workshops.
- Participated in “outdoor school” day where 154 grade 4 to 6 students learned about limber pine, and each planted a rust-resistant seedling in a restoration project.

Material sharing for value-added research projects

- Donated and contributed seeds for various genomics projects to support development of genomic selection and rapid identification tools for rust-resistant individuals.

2018-19

Rust-resistant trees for genetic conservation and to produce seed for restoration

- Continued training for field crews, parks staff and NGO volunteers.
- Surveyed the health of over 200 plus trees identified in prior years.
- Collected and processed approximately 175,000 seeds from 100 limber and 13 whitebark pine plus trees.
- No candidate trees needed protection against mountain pine beetle because they were in low-hazard areas based on 2017 surveys.
- Continued to send seeds of potentially resistant trees for disease resistance screening.
- Planted 1,050 disease-resistant seedlings in a restoration monitoring project in Castle and Waterton,
- Established a thinning release project to test optimal radius to thin competition around whitebark saplings in cutblocks.

Information sharing on high value trees and stands

- Sent updated geographic information system (GIS) links or data on potentially rust-resistant tree locations and value to forest companies, researchers and development proponents to support planning and management.

Better mapping of whitebark pine and limber pine

- Determined additional field verification required before density modelling of whitebark and limber pine was adequate for public release.

Recovery plan extension and priorities

- Collaborated with partners to support activities identified in recovery plans and planned for the 2019 remeasurement of the network of 250 long-term monitoring plots.
- Drafted revised combined recovery plan for both species (currently in review).
- Prepared a Best Management Practices draft.
- Continued reporting on provincial recovery efforts and conservation status at provincial, national and international forums, as well as online.
- Continued to recognize and work with staff and volunteers in the field.

2017-18

Rust-resistant trees for genetic conservation and to produce seed for restoration

- Continued to search for potentially disease-resistant trees and collected seeds.
- No candidate trees needed protection against mountain pine beetle because they were in low hazard areas based on 2016 surveys.
- Continued training for field crews, parks staff and NGO volunteers.
- Continued to send seeds of potentially resistant trees for disease resistance screening.

Information sharing on high value trees and stands

- Sent updated GIS links or data on potentially rust-resistant tree locations and value to stakeholders in order to support planning and management.

Better mapping of whitebark pine and limber pine

- Completed quality control for density modelling of whitebark and limber pine and released the models.

Recovery plan extension and priorities

- Collaborated with partners to support activities identified in recovery plans.
- Finalized Best Management Practices, in collaboration with the Crown Managers Partnership, for working with these species at risk.
- Continued reporting on provincial recovery efforts and conservation status at provincial, national and international forums, as well as online.
- Continued to recognize and work with staff and volunteers in the field.
- Produced and established interpretive signs to increase awareness of the recovery program and activities in the field at trailheads, caged trees and interpretive centres.

2016-17

Long-term monitoring for status and trends

- Established and measured two long-term monitoring plots in the northernmost stands of whitebark pine.
- Established a long-term limber pine provenance trial testing 1,320 seedlings, grown from 145 trees, representing 30 populations from Alberta to New Mexico. The project was led by the USDA Forest

Service, Fort Collins, Colorado, and supported by University of British Columbia (one site is in Alberta and one is in Colorado).

Rust-resistant trees for genetic conservation and to produce seed for restoration

- There was sparse-to-no cone crop in Alberta for either species in almost all regions.
- No candidate trees needed protection against mountain pine beetle because they were in low hazard areas based on 2015 surveys.
- Field crew revisited 383 trees from which Alberta has collected seed. They documented the parent tree health status and also identified and documented 51 new potentially rust-resistant limber pine trees and 47 whitebark pine trees.
- Built an app to more efficiently and accurately collect and manage field data on candidate trees and stands.
- Continued training for field crews, parks staff and NGO volunteers.
- Sent seeds from 50 potentially resistant limber pine trees to United States Department of Agriculture facilities at Dorena (limber pine) and seeds from eight potentially resistant whitebark pine trees to British Columbia Ministry of Forests, Lands and Natural Resource Operations at Kalamalka Forestry Centre (whitebark pine) for disease resistance screening.

Information sharing on high value trees and stands

- Sent updated data on potentially rust-resistant tree locations and value to stakeholders to support planning and management.
- Collaborated on logistics, access and field work with Alberta Environment and Parks, Parks Canada and local volunteers.
- All locations of plus trees are now available to Alberta Government staff internally via GIS.

Better mapping of whitebark pine and limber pine

- Completed quality control for habitat suitability models for whitebark and limber pine across Alberta. The models provide reliable information to support management and recovery actions. The models are intended to predict suitable habitats rather than precisely where every tree is. This represents a significant advance because it is the first reasonably accurate map of these species in Alberta.
- Posted these models to the provincial spatial GIS data warehouse to be available to all Alberta Government staff. They have also been posted online to the Open Data site to support public use and conservation of these species. Data will be used to identify core areas for recovery work.
- Completed density mapping for both species across their provincial ranges. Data quality control is pending before its release.

- Developed a citizen science app enabling interested volunteers to document trees and stands and submit data to the province.

Recovery plan extension and priorities

- Collaborated with partners to support activities identified in recovery plans.
- Produced and distributed extension materials to increase awareness of these species and programs.
- Developed various Best Management Practices for working with these species at risk in collaboration with the Crown Managers Partnership.
- Continued reporting on provincial recovery efforts and conservation status at provincial, national and international forums, as well as online.
- Continued to recognize and work with staff and volunteers in the field.
- Participated in the Whitebark Pine Ecosystem Foundation (WPEF) Annual Science and Management Workshop in Jasper, a joint U.S.-Canada WPEF event.

2015-16

Rust-resistant trees for genetic conservation and to produce seed for restoration

- Identified, tagged and documented 85 potentially rust-resistant limber pine trees (candidate trees) and stand data.
- Collected a total of 12.4 kg of seed (152,500 seeds) as well as cuttings from these candidate trees.
- Recorded the locations of candidate trees so they could be protected against mountain pine beetle attack.
- Sent seed from 50 candidate limber pine trees to the United States Department of Agriculture facility in Dorena, Oregon to verify their level of disease resistance.
- Grafted cuttings from 48 candidate trees as a trial using non-dormant shoots, which saved on costly return visits in winter when shoots are usually collected.
- Collected cuttings from selected whitebark pine trees being tested for rust resistance at the United States Department of Agriculture Facility in Coeur D'Alene, Idaho, adding to their gene archive for that breeding zone.
- Sent seed from eight candidate whitebark pine trees to the provincial program at the Kalamalka Research Station in Vernon, British Columbia, where up to 40 trees per year are tested for rust resistance. This was the first time they accepted material from outside British Columbia.

- Trained provincial and federal staff to identify white pine blister rust, select and document potentially resistant trees, and collect cones.

Information sharing on high value trees and stands

- Sent candidate tree locations to identify species at risk in the South Saskatchewan Regional Plan.
- Wildfire Management Branch incorporated candidate tree locations in fire management planning.
- Sent candidate tree locations and associated data to Alberta Environment and Parks to incorporate into their management planning and the provincial Alberta Conservation and Information Management System database.

Improved mapping of whitebark pine and limber pine

- Worked with a contractor to develop a spatial provincial range-wide habitat suitability model for both species (excluding national parks) after typical forest inventory (AVI: Alberta Vegetation Inventory) was determined to be unreliable for documenting occurrence and abundance of limber and whitebark pine. Sixty-eight townships had additional remote sensing vegetation analysis to model stand density.
- Collected additional field data to verify the habitat models.
- Conducted range-wide reconnaissance for cone crops to most efficiently plan next field season's activities.

Other recovery plan activities

- Used health monitoring plot data to identify high-priority areas for recovery activities.
- Shared information on Alberta's whitebark and limber pine recovery program with diverse agencies and non-government organizations involved in species at risk, native plants and ecosystem recovery.
- Developed a communications plan to increase awareness of species issues.
- Collaborated with Alberta Environment and Parks to update their whitebark and limber pine web pages.
- Prepared a draft strategy for whitebark pine and limber pine intended to align with Alberta's Wetland Policy. Activities impacting these species and habitats would be mitigated or compensated by implementing recovery plan activities (currently under review).

Pre-2015

- 1978-2014: Collected and submitted location records for existing seed collections to provincial Alberta Conservation and Information Management System database.
- Since 1995: Federal and provincial agencies established and measured about 250 long-term monitoring plots to identify trends, health status and stand dynamics. This data was essential for provincial and federal endangered status listings.
- 2002- 2014: Gathered seed from unselected trees in an Alberta range-wide collection and stored at the Alberta Tree Improvement and Seed Centre.
- 2008: Conducted cross-species compatibility grafting tests between limber and whitebark pine.
- 2010: Tested seed from 10 whitebark pine trees through the United States Department of Agriculture Forest Service Intermountain Region whitebark pine recovery program. This program includes a seed zone overlapping southwestern Alberta and northern Montana, and has an established seed orchard and clone bank in Idaho.
- 2010: Sent seed from Alberta limber pine collections to Canadian Forest Service labs to study whether individual trees can be multiplied through somatic embryogenesis.
- 2012-2014: Conducted seed germination and viability studies to maximize collection and storage efficiency.
- 2013-2014: Planted seed and seedlings from Alberta limber pine populations in various small post-fire restoration trials with Kings University College.
- 2014: Received ministerial approval for provincial species recovery plans.
- 2014-Present: Tested seed from five Alberta limber pine populations through a partnership between Canadian Forest Service-Pacific Forestry Centre and United States Department of Agriculture to survey for major single-gene resistance at Dorena Genetic Resource Center in Oregon.

