



2023

IMPLEMENTATION REPORT:

MULTI-SPECIES ACTION PLAN
for Waterton Lakes National Park of
Canada and Bar U Ranch National
Historic Site of Canada
(2017-2022)



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For copies of the report, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, recovery strategies, action plans and other related recovery documents, please visit the Species at Risk (SAR) Public Registry¹.

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Cover (listed clockwise from top right): Waterton Lakes with the Prince of Wales Hotel in the background, Parks Canada Agency (PCA); Adult Half-moon Hairstreak on buckwheat plant, PCA; Little Brown Myotis, E. Lowe, PCA; Juvenile Bull Trout, PCA.

This page: Maskinonge wetland post Kenow wildfire, PCA. **Page i:** Bull Trout survey, PCA.

Page ii: Bison ceremony and release, PCA. **Page iii:** Plains bison are released back into Waterton's paddock, J. Stoesser, PCA. **Page 1** left to right: Half-moon hairstreak, L. Peta, PCA; Prescribed fire, M. Rance, PCA; Little Brown Myotis, E. Lowe, PCA; Northern leopard frog survey, K. Pearson, PCA; Northern leopard frog, PCA; Whitebark pine cone caging, G. Alger, PCA; Bar U Ranch National Historic Site; PCA. **Page 19:** Waterton Lakes National Park's knowledge weaver Carleigh Grier-Stewart, K. Pearson, PCA; Bull Trout survey, K. Pearson, PCA. **Page 20:** Piikani Youth Field Day at Linnet Lake, K. Pearson, PCA. **Page 21:** Prescribed burning at Maskinonge day use area in Waterton Lakes National Park in March of 2021, with a Blackfoot Confederacy marker emerging from the grass in the foreground, A. Collingwood, PCA.

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¹ <http://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)² agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), action plans outline measures that will be taken to implement recovery strategies for SARA-listed Extirpated, Endangered and Threatened species. Parks Canada's multi-species action plans address a suite of species of conservation concern within one or more Parks Canada managed areas, including species that require an action plan under SARA.

The Minister responsible for the Parks Canada Agency (the Minister of the Environment and Climate Change) is the competent minister under SARA for species found in Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada, and in 2017 published the Multi-Species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada.

Under section 55 of SARA, the competent minister must monitor the implementation of an action plan and the progress towards meeting its objectives, and assess and report on its implementation and its ecological and socio-economic impacts five years after the action plan comes into effect. A copy of the report must be included in the Species at Risk Public Registry. The Minister responsible for the Parks Canada Agency has prepared this Implementation Report: Multi-Species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada (2017-2022).

The achievement of population and distribution objectives identified within the recovery strategy or management plan for a species may require a long time frame. In these cases, a five-year reporting window may not be sufficient to show demonstrable progress towards meeting site-based population and distribution objectives identified for that species within a Parks Canada site-based action plan. Parks Canada monitors, evaluates and, as necessary, adapts measures taken to achieve species survival or recovery, and will report regularly on progress towards meeting site-based population and distribution objectives.

² <http://www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding/protection-federal-provincial-territorial-accord.html>

Acknowledgments

Parks Canada would like to acknowledge those who have contributed to implementation of the Multi-Species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada.

We respectfully acknowledge that Waterton Lakes National Park and the Bar U Ranch National Historic Site are in the traditional territories of the Siksikaitsitapi, (Kainai, Piikani, Siksika and Amskapipikani). Waterton Lakes National Park and the Bar U Ranch National Historic Site fall within Treaty 7 territory which includes the Blackfoot Confederacy, the T'suutina Nation, the Stoney Nakoda Nation and the Metis Nation Region 3 Association's homeland.

The lands and waters of Waterton Lakes and the Bar U have been used for millennia by Indigenous Peoples for sustenance, ceremony, trade and travel. We thank them for their continuous stewardship.

A number of key partners have contributed to implementation of the multi-species action plan and our improved understanding of these Species at Risk. Thanks are extended to: Alberta Community Bat Program, Alberta Environment and Protected Areas, Alberta Native Bee Council, Bayne Lab (University of Alberta), BC Forest Service, Blackfoot Confederacy, Blackfoot Confederacy Native Trout Project, Blackfoot Community Members, Blood Tribe Lands Department, Crown Managers Partnership, Environment and Climate Change Canada, Fisheries and Oceans Canada, Kainai Ecosystem Protection Association (KEPA), Kainai Nation, Lake Louise Yoho Kootenay Field Unit (Parks Canada Agency), Lee-Yaw Lab (University of Lethbridge), Piikani Lands Department, University of Alberta, University of Calgary, University of Lethbridge, University of Montana, Waterton Biosphere Reserve Association, Whitebark Pine Ecosystem Foundation of Canada, Wilder Institute/Calgary Zoo, Dr. Ken Richards, Megan Evans, Erin Low, Elly Knight and many volunteers.

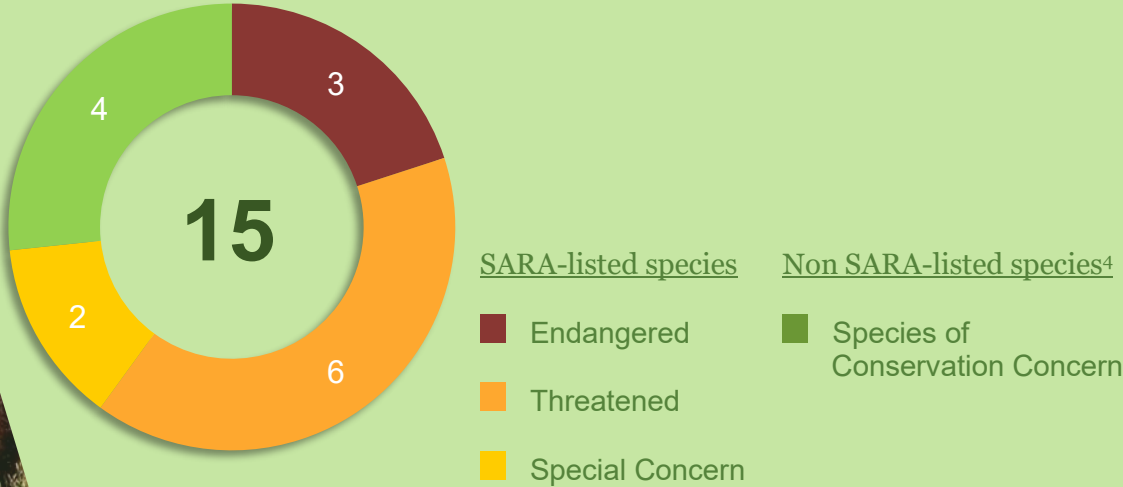
Finally, we acknowledge all those who share in caring for our ecosystem, from the landowners who steward habitat, to the drivers who slow down to allow wildlife to safely cross roads. If we are to succeed in maintaining biodiversity and forever see these sites as places of refuge, resilience and renewal, we must work together as co-stewards of the land.

EXECUTIVE SUMMARY

This document reports on implementation of the Multi-Species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada between 2017 and 2022. It reports on implementation of measures identified in the plan, assesses progress towards meeting site-based population and distribution objectives, and evaluates socio-economic impacts.

Species Addressed³

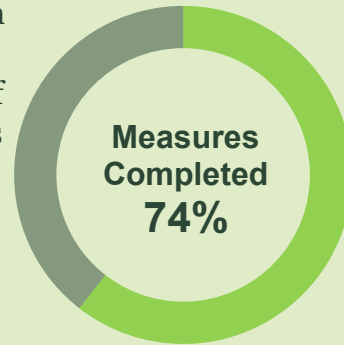
The action plan addressed 11 SARA-listed species and four species of conservation concern. Measures and site-based population and distribution objectives identified within the action plan were focused on 15 species, for which management actions within Waterton Lakes National Park and Bar U Ranch National Historic Site could have a substantive impact on species survival or recovery: Bolander’s Quillwort, Limber Pine, Whitebark Pine, Half-moon Hairstreak, Western Bumble Bee, Long-toed Salamander, Northern Leopard Frog, Bull Trout, Westslope Cutthroat Trout, Common Nighthawk, Lewis’s Woodpecker, Olive-sided Flycatcher, Little Brown Myotis, Grizzly Bear, Plains Bison.



³ The SARA-listing classifications for the species in this report may differ from the Multi-species Action Plan due to changes made to Schedule 1 of the *Species at Risk Act* since the action plan was published.
⁴ Including non SARA-listed species of conservation concern (COSEWIC assessed, provincially listed, culturally significant species) in addition to SARA-listed species provides the Parks Canada Agency with a comprehensive plan for species conservation and recovery at the site.

Implementation of the Action Plan

31 measures (recovery actions) were identified in the multi-species action plan. Implementation of the action plan is assessed by determining progress towards completing each measure and is detailed in Section 2 of this report. During the five-year period, all 31 measures were initiated⁵ and 23 were completed. An additional 7 measures identified in the action plan were implemented because resources and/or partnerships became available to support the work.

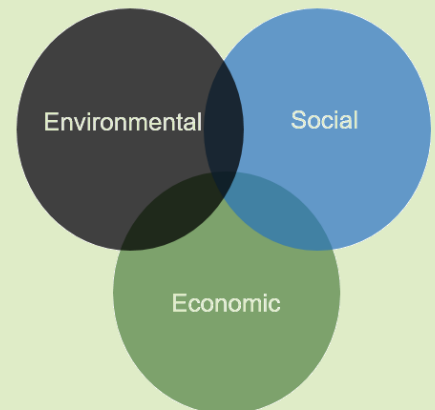


Ecological Impacts

15 site-based, population and distribution objectives (PDOs) were developed in the action plan. Ecological impacts are assessed by measuring progress towards achieving each of the site-based population and distribution objectives and are outlined in section 4. Progress was made on all objectives⁶ including 10 that were fully achieved.

Socio-Economic Impacts

Direct costs for implementing this action plan were borne by Parks Canada. Indirect costs were minor and limited to temporary visitor restrictions. There were benefits to park ecological integrity, greater awareness of species and enhanced opportunities for participation and engagement of visitors, local communities and Indigenous partners.



⁵ Includes measures that are 100% completed.

⁶ Includes PDOs that are fully achieved.

TABLE OF CONTENTS

PREFACE	i
ACKNOWLEDGMENTS	ii
EXECUTIVE SUMMARY.....	iii
1. CONTEXT	1
2. IMPLEMENTATION OF THE ACTION PLAN.....	1
3. ACTION PLAN HIGHLIGHT: Waterton Lakes National Park’s Knowledge Weaver	19
4. ECOLOGICAL IMPACTS	20
5. SOCIO-ECONOMIC IMPACTS	30
APPENDIX A: Technical Compendium – Recovery Measures	33
APPENDIX B: Technical Compendium - Population and Distribution Objectives.....	39



1. CONTEXT

This document reports on implementation of the [Multi-Species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada](#)⁷ between 2017 and 2022, assesses progress towards meeting its population and distribution objectives, and evaluates its socio-economic impacts. It addresses 15 species, including 9 SARA-listed Endangered, Threatened species (for which an action plan is required) as well as 2 SARA-listed Special Concern species⁸ and 4 species of conservation concern.

Site-based population and distribution objectives were developed for 15 species for which implementation measures within Waterton Lakes National Park (WLNP) or Bar U Ranch National Historic Site (BURNHS) could have a substantive impact on recovery: Bolander's Quillwort, Limber Pine, Whitebark Pine, Half-moon Hairstreak, Western Bumble Bee, Long-toed Salamander, Northern Leopard Frog, Bull Trout, Westslope Cutthroat Trout, Common Nighthawk, Lewis's Woodpecker, Olive-sided Flycatcher, Little Brown Myotis, Grizzly Bear, Plains Bison.

2. IMPLEMENTATION OF THE ACTION PLAN

Implementation of the Multi-Species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada is assessed by measuring progress towards completing the recovery measures identified in the action plan (Table 1). Refer to the original action plan for a description of each measure, the desired outcomes, and the threats that each measure addresses. A more detailed description of the implementation of some of the measures is outlined in Appendix A.

In 2017, the Kenow wildfire burned approximately 50% of the vegetated area within WLNP; 44% of the park's vegetated area burned with high or extreme severity, removing all or most organic matter including soil. This wildfire provided both challenges and opportunity in the implementation of recovery measures and is important context for the progress made on recovery measures.

⁷ Parks Canada Agency. 2017. Multi-species Action Plan for Waterton Lakes National Park of Canada and Bar U Ranch National Historic Site of Canada. Species at Risk Act Action Plan Series. Parks Canada Agency, Ottawa. iv + 30 pp.

⁸ The status of these species may have changed over the reporting period.

Table 1. Progress towards completing recovery measures committed to by Waterton Lakes National Park and Bar U Ranch National Historic Site. (* indicates an ongoing measure that may continue into a future multi-species action plan).

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
1) Bolander's Quillwort: Manage visitor activity within and near Bolander's Quillwort critical habitat at Summit Lake.	Minimize human disturbance to Bolander's Quillwort critical habitat at Summit Lake.	Visitor information signage designed but not completed or installed at Summit Lake population. As of 2022, installation is scheduled for 2022-23.	50%*
3) Common Nighthawk: Implement measures (e.g. best management practices, seasonal closures if required) to protect known nest sites and known nesting habitat from destruction or disturbance.	Individuals and their nests are protected from direct disturbance during the breeding season.	Post Kenow wildfire effects analysis indicates nesting locations are not limited to only a few sites, rather are widespread throughout suitable habitat (i.e., high grassland cover and low elevations). Monitoring of two known nesting areas continues and opportunities to incorporate protective measures in the management of invasive plants and commercial horse use are identified for action in 2023.	75%*

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
<p>4) Common Nighthawk, Half-moon Hairstreak, Lewis's Woodpecker, Olive-sided Flycatcher, Whitebark Pine: Implement prescribed burn plans to return regular burning intervals and maintain open forests and grasslands. Take into consideration species-specific needs/sensitivities.</p>	<p>Implement prescribed burns totalling at least 650 ha in grassland and 200 ha in montane/subalpine habitats.</p>	<p>Four prescribed fires were carried out between 2017 and 2022. The extensive impacts of the Kenow wildfire in the fall of 2017 were also considered. For foothills parkland habitat, a total of 4079 ha area burned (1168 ha prescribed fire, 2911 ha wildfire) was achieved. For montane/subalpine habitat, a total 16,641 ha area burned (2.8 ha prescribed fire, 16,638 ha wildfire) was achieved.</p>	<p>100%</p>
<p>5) Little Brown Myotis: Adopt best practices for the maintenance or decommissioning of WLNP and BURNHS infrastructure containing Little Brown Myotis roosts. Work with partners and community to protect important bat sites in buildings.</p>	<p>Mitigation of maintenance and other impacts on infrastructure containing Little Brown Myotis roosts.</p>	<p>Local impact assessments now incorporate best practices and mitigation to reduce potential adverse effects to Little Brown Myotis following <i>Guidance for protecting and managing bats in Parks Canada administered places (2022)</i>. Research partners identified the importance of buildings and infrastructure at low elevation for reproductive female Little Brown Myotis and as a response, emergence counts are completed annually at three known maternity roosts in WLNP. In addition, acoustic monitoring is currently underway to better advise bat-friendly timing windows for construction/renovation projects.</p>	<p>100%*</p>
<p>7) Whitebark Pine: Identify putatively rust resistant individuals (Plus Trees) at high</p>	<p>1. Where conditions permit, identify rust resistant trees or high value individuals and</p>	<p>1. Between 2017 and 2022, 96 putatively rust resistant Whitebark Pine plus trees were identified. Seed from 37 (target was 40) of these trees has been submitted for genetic resistance testing. Scion was collected from</p>	<p>96%*</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
<p>priority sites, conduct Plus Tree seed resistance testing for high probability trees, collect seed for genetic conservation and protect high value Plus Trees from mountain pine beetles.</p>	<p>conserve genetic resources. 2. Where mountain pine beetle protection is required, protect high-value individual Whitebark Pine trees.</p>	<p>30 trees and sent to the BC Forest Service orchard and Bonnyville Forest Nursery for grafting to guard against future losses. 2. An average of 60 Plus Trees with higher risk for mountain pine beetle (large trees or close to previous infestations) were protected annually.</p>	
<p>8) Whitebark Pine: Plant putatively rust resistant seedlings, and, when available, confirmed rust resistant seedlings, in priority restoration sites. Inoculate seedlings with mycorrhizal fungi to improve establishment.</p>	<p>1. Plant a minimum of 3,000 rust-resistant Whitebark Pine seedlings by 2019. Continue annual planting beyond 2019 as resources are available and based on priority areas for restoration need. 2. Where available, inoculate at least 50% of seedlings with mycorrhizal fungi prior to planting.</p>	<p>1. A total of 21, 309 Whitebark Pine seedlings were planted in multiple areas of the park between 2017 and 2022. 2. For the portion of the measure regarding inoculating at least 50% of seedlings with mycorrhizal fungi prior to planting, it was not possible to inoculate seedlings due to unavailability of fungi. This part of the measure was excluded from reporting, as it was not applicable. Surveying for fruiting-bodies of the fungus was initiated in 2020 and will continue annually.</p>	<p>100%*</p>
<p>9) Whitebark Pine: Protect and, where feasible, increase the number and extent of existing stands and of putatively rust resistant individuals through habitat management and restoration.</p>	<p>1. Restore Whitebark Pine habitat (e.g. prescribed fire and mechanical thinning) to a degree that will allow the persistence or expansion of existing stands and the potential for</p>	<p>1. The extensive burn area of the Kenow wildfire achieved most of this objective by completing site preparation for all of the planting sites from 2018-2022, which resulted in 89 ha restored. Mechanical thinning was completed around Plus Trees for growth release and fire smarting was completed to protect one priority stand in 2022. 2. The Kenow wildfire burn area buffers four planted stands, and another three mature stands against future</p>	<p>75%</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
	<p>generation of new stands. Target 39 ha by 2019, and continue beyond as resources are available and based on priority areas for restoration need.</p> <p>2. Mitigate threats in priority high value stands.</p>	<p>wildfire. However it also resulted in the loss of many mature, cone-bearing Whitebark Pine as well as individuals with identified disease resistance.</p>	
<p>11) Common Nighthawk, Half-moon Hairstreak: Continue to implement WLNP invasive plant inventory and control program to maintain habitat, targeting SAR habitats as much as possible. Prepare an invasive plant management plan at BURNHS which may also positively impact SAR.</p>	<p>Reduced priority invasive plant density and distribution, thereby improving SAR habitat quality. Completion of BURNHS invasive plant management plan.</p>	<p>For WLNP, invasive plant cover increased one to two years after the Kenow wildfire, followed by a decrease three and four years after the fire. This decrease was driven mainly by medium priority species with high priority species such as Spotted Knapweed remaining high. Staff continue to focus control efforts on high priority species and habitats.</p> <p>For BURNHS, an invasive plant survey and management recommendation report was completed in 2016. Control work was initiated in 2017 and is ongoing. A draft Invasive Plant Control strategy was completed in 2019 following recommendations from the 2016 report.</p>	<p>100%</p>
<p>12) Common Nighthawk, Half-moon Hairstreak, Little Brown Myotis, Lewis's Woodpecker, Olive-sided Flycatcher: Develop and implement</p>	<p>Any pesticide use is consistent with the needs of aerial insectivore and invertebrate species at risk.</p>	<p>The Integrated Pest Management plan for WLNP was updated in 2021, including considerations for aerial insectivores, invertebrates, and amphibians. Development of best management practices specific to pollinators in WLNP has yet to be completed. These documents will help to inform an Integrated Pest Management Plan for BURNHS into the future.</p>	<p>66%*</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
pesticide best management practices for WLNP and BURNHS with the recovery needs of aerial insectivore and invertebrate species at risk in mind.			
<p>13) Half-moon Hairstreak: Assess Spotted Knapweed invasion effects and control efforts on Half-moon Hairstreak habitat quality and quantity within Blakiston Fan and at any additional habitats identified.</p>	<p>Half-moon Hairstreak-specific needs are identified and integrated in Spotted Knapweed management efforts. Potential habitats are surveyed for additional populations.</p>	<p>Experimental control of Spotted Knapweed was initiated in 2020 to compare effectiveness of herbicide versus physical removal of flowers (to prevent seed set). Additionally, native plant plugs were added to experimental plots in an effort to increase priority plant species for Half-moon Hairstreak. Research partners surveyed the Blakiston Fan in 2021, recording 747 adult butterflies (approximately 14.1 adults / ha). Habitat assessment of Stoney Flats for the possible establishment of a secondary population of Half-moon Hairstreaks was initiated in 2021 and continued in 2022. Final recommendations and feasibility assessment will be determined through a population viability workshop scheduled for spring 2023.</p>	<p>83%*</p>
<p>14) Little Brown Myotis: Limit spread of White-nose Syndrome by adopting and sharing protocols (such as the Canadian National White-nose Syndrome (WNS) Decontamination Protocol).</p>	<ol style="list-style-type: none"> 1. Limit human caused spread of WNS through increased awareness. 2. Establish best practices for Parks Canada staff and stakeholders to address WNS in the maintenance of 	<ol style="list-style-type: none"> 1. Public awareness of White-nose Syndrome has been targeted through online content and educational programs (see Recovery Measure #17). Support for increased surveillance efforts will be communicated in the immediate future (i.e., submission of dead bats in winter/spring to assist with White-Nose Syndrome monitoring). 2. Both research permit and impact assessment processes incorporate best practices to reduce the spread of WNS and other emergent diseases to Little Brown Myotis. 	<p>100%</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
	infrastructure that contains roosts.		
<p>15) All SAR in this plan: Strengthen species at risk recovery by working with Indigenous communities to incorporate Traditional Knowledge into species at risk understanding.</p>	Indigenous Traditional Knowledge incorporated to fill species knowledge gaps.	WLNP engaged with local Indigenous communities on several SAR-related initiatives, including co-development of public messaging, collaboration on restoring SAR, and supporting a number of Indigenous-led SAR conservation initiatives. Specific to the species knowledge gaps or outreach, education and visitor experience measures, our target was to implement at least four activities during the five-year implementation period. Despite the objective within this plan being fully achieved, this is an ongoing measure that requires consistent, long-term effort.	100%*
<p>16) All SAR in this plan: Explore the interests of various Indigenous communities in SAR education and recovery. Collaborate with interested communities on outreach, education and visitor experience actions in mutually agreed upon ways.</p>	Increased Indigenous community involvement in the delivery of SAR outreach, education and visitor experience actions.	See Recovery Measure 15 and Appendix A for additional detailed information.	N/A
<p>17) All SAR in this plan: Increase general awareness about species at risk that are found in the park/site, through interpretive programming, targeted communications,</p>	Increased support and action for SAR conservation and associated management activities. Priority audiences, including park/site visitors, youth, urban	Communications products included interpretive programs, volunteer events, presentations, social media releases, web pages, signage, and media articles focused on species at risk and associated conservation and restoration efforts taking place in WLNP and BURNHS. Our target was to develop and deliver at least five unique communications products annually, which was fully achieved.	100%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
stakeholder engagement and outreach.	and new Canadians, learn about species at risk found in the park/site.		
18) All SAR in this plan: Provide timely and effective species-specific communications to target audiences to disseminate knowledge, enhance understanding, and ensure compliance with SARA requirements.	Visitor activities are successfully managed to prevent habitat destruction or harm to individuals of a species.	Several species-specific communication products have been developed aimed at regulatory compliance. Key messages were ‘Play, Clean, Go’ to stop the spread of invasive plants; fishing regulations and license purchasing; Aquatic Invasive Species watercraft inspection station permits; stopping the spread of White-nose Syndrome; bat-friendly timing windows for construction/renovation projects; and area closures for sensitive species such as Grizzly Bears.	100%
20) All SAR in WLNP/BURNHS: Incorporate within the service delivery agreement law enforcement patrols to prevent disturbance, destruction or removal of species at risk and their habitats.	Law enforcement capacity is improved to prevent disturbance to SAR and their habitats.	Law enforcement considers species at risk and species at risk habitat when planning enforcement presence and priorities. Over the last five years, this included increased patrols in areas with fishing restrictions that support native trout. These additional patrols included areas of Blakiston and Bauerman Creeks, Waterton River, Goat Lake, and the North Fork of the Belly River with an aim of 10 patrols per year. Patrol frequency at each location was dependent on risk, public accessibility and law enforcement capacity.	80%*
22) Whitebark Pine: Continue communication activities aimed at increasing awareness of, and reducing human-caused impacts on, Whitebark Pine as	Increased awareness about this species among priority audiences; reduction in accidental harm/removal of Whitebark Pine trees.	Engaged with Parks Canada communication channels to increase awareness of Whitebark Pine conservation and preservation. A total of 11,474 people were reached with in-person interpretive programming relating to five-needle pines. Forty-four people participated directly in species restoration by volunteering to plant Whitebark Pine, and 2241 people were reached by volunteer communications regarding	100%*

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
outlined in the Whitebark Pine conservation and restoration (CoRe) project.		five-needle pines. Social media messaging on Whitebark Pine has reached 344,881 people.	
23) Common Nighthawk: Identify breeding and nesting sites opportunistically, targeting high probability sites, and encourage the public to share observations.	Knowledge of Common Nighthawk distribution and, in particular, nesting areas, informs park management.	In 2022, an assessment of ‘Fire Effects on Common Nighthawk Occurrence & Population Density in WLNP’ was completed. The results identify high density areas for territorial males and help to inform potential locations for future nest surveys. Public observations are encouraged through iNaturalist.	100%
24) Lewis's Woodpecker: Survey appropriate habitats to determine the extent to which WLNP is used by Lewis's Woodpecker.	Improved knowledge of Lewis's Woodpecker distribution and habitat use in WLNP.	Lewis's Woodpecker observations were opportunistically recorded, including through citizen science databanks. Targeted surveys completed at four transects in 2016 did not result in any additional detections. Lewis's Woodpecker is considered very rare in WLNP during the spring, summer, and fall seasons (i.e., only a few records exist and individuals are not seen every year, including winter/summer records of usual migrants).	100%
25) Little Brown Myotis: Assess distribution and relative abundance of Little Brown Myotis in WLNP and BURNHS through bat acoustic inventories conducted at 13 sites throughout WLNP in 2015-2017 and through	Increased knowledge of distribution and relative abundance of bats in WLNP and BURNHS.	As per the NABat sampling framework, ultrasonic recorders were deployed annually at 13 sites in WLNP throughout pre- (2015-2017) and post-Kenow fire (2018-2020) periods. All 13 sites were found to be occupied across all years by 40kHz <i>Myotis</i> species, likely predominately Little Brown Myotis (suggested by previous capture data). Several emergence counts have been completed at BURNHS since 2017, documenting the continued presence of a Little Brown Myotis maternity colony of ~350 adults on site.	100%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
construction-related inventories at BURNHS.			
<p>26) Whitebark Pine: Complete predictive habitat model and map of Whitebark Pine distribution for WLNP. Where stand assessments are completed, they include aspects of stand health (i.e., rust presence/absence and stand density).</p>	<ol style="list-style-type: none"> 1. Predictive map of Whitebark Pine distribution and suitable habitat for WLNP. 2. Assessed high-value stands in high risk areas. 3. Data inform targeted and efficient management and recovery as guided by the Crown of the Continent five-needle pine restoration strategy. 	<p>The Crown of the Continent Restoration Strategy was completed in 2022, which includes:</p> <ol style="list-style-type: none"> 1. Predicted habitat for Whitebark Pine; 2. Areas at risk of future threats and areas of highest predicted success for restoration treatments; and 3. A 10-year implementation plan based on this strategy. 	100%*
<p>28) Limber Pine, Northern Leopard Frog: Implement prescribed burn plans to return regular burning intervals and maintain open forests and grasslands. Take into consideration species-specific needs/sensitivities.</p>	Implement prescribed burns totalling at least 650 ha in grassland and 200 ha in montane/subalpine habitats.	This measure was combined with Recovery Measure #4. Four prescribed fires were carried out between 2017 and 2022. The extensive impacts of the Kenow wildfire in the fall of 2017 were also considered. For foothills parkland habitat, a total of 4079 ha area burned (1168 ha prescribed fire, 2911 ha wildfire) was achieved. For montane/subalpine habitat, a total 16,641 ha area burned (2.8 ha prescribed fire, 16,638 ha wildfire) was achieved.	100%
<p>29) Limber Pine: Identify putatively rust resistant individuals</p>	1. Where conditions permit, identify rust resistant trees or high	1. Between 2017 and 2022, 114 putatively rust resistant Limber Pine Plus Trees were identified, however 48 of these burned in the Kenow wildfire. Seed from 29	72%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
<p>(Plus Trees) at high priority sites, conduct Plus Tree seed resistance testing for high probability trees, collect seed for genetic conservation and protect high value Plus Trees from mountain pine beetles.</p>	<p>value individuals and conserve genetic resources. 2. Where mountain pine beetle protection is required, protect high-value individual limber pine trees.</p>	<p>(target was 40) of these has been submitted for screening. Scion was collected from 28 trees to guard against future losses. 2. Limber Pine were not prioritized for mountain pine beetle protection because they had smaller diameters and were thus less at risk for attack. This part of the measure was excluded from reporting, as it was not applicable.</p>	
<p>30) Limber Pine: Plant putatively rust resistant seedlings, and, when available, confirmed rust resistant seedlings, in priority restoration sites. Inoculate seedlings with mycorrhizal fungi to improve establishment.</p>	<p>1. Plant a minimum of 2,000 rust-resistant Limber Pine seedlings by 2019. Continue annual planting beyond 2019 as resources are available and based on priority areas for restoration need. 2. Where available, inoculate at least 50% of seedlings with mycorrhizal fungi prior to planting.</p>	<p>1. From 2017 to 2019, 2,214 seedlings were planted. An additional 6917 seedlings were planted from 2020-2021 and 4,220 in the fall of 2022. 2. For the portion of the measure regarding inoculating at least 50% of seedlings with mycorrhizal fungi prior to planting, it was not possible to inoculate seedlings due to unavailability of fungi. This part of the measure was excluded from reporting, as it was not applicable. Surveying for fruiting-bodies of the fungus was initiated in 2020 and will continue annually.</p>	<p>100%*</p>
<p>31) Limber Pine: Protect and, where feasible, increase the number and extent of existing stands and of putatively rust resistant individuals through</p>	<p>1. Restore Limber Pine habitat (e.g. prescribed fire and mechanical thinning) to a degree that will allow the persistence or expansion of existing stands and the</p>	<p>1. The Kenow wildfire effectively prepared sites for all of the planting completed from 2018-2022, which resulted in 46 ha restored. For this reason, prescribed burns for Limber Pine were unnecessary. 2. The Kenow wildfire burn area buffered the five stands that were planted, and one additional mature stand against future wildfire. Prioritization for</p>	<p>70%*</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
habitat management and restoration.	potential for generation of new stands. Target 4 ha by 2019, and continue beyond as resources are available and based on priority areas for restoration need. 2. Mitigate threats in priority high value stands.	mechanical thinning is now underway, using the spatial modelling from the Crown of the Continent Ecosystem five needle pine restoration strategy.	
32) Long-toed Salamander: Mitigate roadway mortality of Long-toed Salamanders near Linnet Lake through maintenance and/or improvement to the existing directional fence and under-road tunnel system.	Long-toed Salamander roadway mortalities near Linnet Lake are minimized through maintenance and/or improvement to the existing mitigation system.	The original roadway mortality mitigation system (tunnel fencing and crossings) was partly destroyed in the 2017 Kenow wildfire and promptly rebuilt in 2018, providing the opportunity to make improvements. Annual volunteer-based maintenance events have ensured the system functions well in reducing Long-toed Salamander mortality.	100%*
33) Northern Leopard Frog: Reintroduce Northern Leopard Frogs (via egg translocation) to high quality sites within WLNP.	Successful reintroduction of self-sustaining Northern Leopard Frog populations at one or more sites.	As of 2021, self-sustaining reintroduced Northern Leopard Frog populations were confirmed in eight sites within the Waterton River drainage. All six of the short-term indicators of a successful restoration of the species were fully met.	100%
35) Western Bumble Bee, Northern Leopard Frog, Long-toed Salamander: Develop and implement	Any pesticide use is consistent with the needs of aerial insectivore and	This measure was combined with Recovery Measure #12. The Integrated Pest Management plan for WLNP was updated in 2021, including considerations for aerial insectivores, invertebrates, and amphibians. Development of best management practices specific to	66%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
pesticide best management practices for WLNP and BURNHS with the recovery needs of aerial insectivore and invertebrate species at risk in mind.	invertebrate species at risk.	pollinators in WLNP has yet to be completed. These documents will help to inform an Integrated Pest Management Plan for BURNHS into the future.	
37) Grizzly Bear: Actively support partners in Grizzly Bear-human conflict reduction efforts taking place on neighbouring private lands (led by Waterton Biosphere Reserve Association).	Support reduction in Grizzly Bear-human conflicts on neighbouring, private lands.	Since 2018, WLNP has provided significant annual support to Waterton Biosphere Reserve Association's (WBRA) Carnivores and Communities Program (CACP). WLNP's financial contributions to the program have supported CACP in collaborating with agricultural producers to readily remove livestock carcasses from the landscape and to secure other attractants such as feed storage and calving areas. Collaborative support was provided by WLNP staff in a non-voting liaison role on the WBRA Board of Directors. Supporting WBRA in this effort is a tangible way for WLNP to positively impact regional Grizzly Bear conservation.	100%*
38) Plains Bison: Explore with partners how WLNP may support restoration of a free-roaming Plains Bison population in the transboundary region of Montana and Alberta.	As feasible and appropriate, maintain the potential to re-establish Plains Bison in WLNP as part of a landscape-scale, regional population.	Blackfoot community members have been engaged in the return and management of WLNP Plains Bison herd since 2021. WLNP has been a key supporter of Kainai Iinnii Rematriation (on the nearby Blood Reserve) since 2019. WLNP staff have actively participated in various Iinnii Initiative working groups since 2014, in support of regional Indigenous-led Bison restoration initiatives.	100%*
39) Limber Pine: Complete predictive habitat model and map	1. Predictive map of Limber Pine distribution and	Crown of the Continent Restoration Strategy completed in 2022, which includes:	95%*

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
<p>of Limber Pine distribution for WLNP. Where stand assessments are completed, they include aspects of stand health (i.e., rust presence/absence and stand density).</p>	<p>suitable habitat for WLNP. 2. Assessed high-value stands in high risk areas. 3. Data inform targeted and efficient management and recovery as guided by the Crown of the Continent five-needle pine restoration strategy.</p>	<ol style="list-style-type: none"> 1. Predicted habitat for Limber Pine; and 2. Areas at risk of future threats, and areas of highest predicted success for restoration treatments. 3. A 10-year implementation plan based on this strategy is currently under development. 	

Additional measures were identified in the action plan that would be beneficial to complete should resources become available. Table 2 describes the actions that Waterton Lakes National Park and Bar U Ranch National Historic Site were able to initiate between 2017 and 2022. Measures from the action plan that were not initiated will be carried forward for consideration in an amended action plan.

Table 2. Progress towards completing additional recovery measures implemented because partnerships and/or resources became available (progress is influenced by the amount of funding / support received).

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
<p>6) Westslope Cutthroat Trout: Assess candidate site suitability and feasibility for conservation and restoration of genetically pure Westslope Cutthroat Trout; conduct translocations and removals where appropriate.</p>	<p>Priority sites for Westslope Cutthroat Trout conservation and restoration are identified. Translocations and removals are initiated as feasible and appropriate.</p>	<p>Initial steps towards determining priority sites are underway including gathering tissue samples for more advanced genetic analysis and increasing staff knowledge through participation in recovery projects in other jurisdictions.</p> <p>WLNP plans to complete a ‘Feasibility Assessment’ by 2025 to determine where re-introduction efforts may be successful and through which methods. This Feasibility Assessment, will investigate the possible use of chemical removal methods for non-native trout species in historic habitat.</p>	<p>30%*</p>
<p>10) Westslope Cutthroat Trout: Determine distribution of pure Westslope Cutthroat Trout vs.</p>	<p>Improved knowledge of distribution of pure and hybrid Westslope Cutthroat Trout in WLNP and BURNHS.</p>	<p>Approximately 70 tissue samples have been collected in 2021/22 from three populations in WLNP to test for genetic purity, genetic diversity, and population relatedness (with other Alberta populations). These will be assessed in 2023/24 using advanced genetic</p>	<p>70%*</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
hybrids in WLNP and BURNHS waterbodies.		analysis methods. The last genetic analysis was completed in 2010 for 5 populations, and in 2016 for one population. Tissue sample collection was attempted at one additional location in 2022, but no Westslope Cutthroat Trout were present.	
19) All SAR in WLNP/BURNHS: Integrate use of a mobile species occurrence reporting application for WLNP and BURNHS staff, volunteers and visitors to electronically submit species at risk observations which inform management activities.	Improved knowledge of SAR abundance and distribution. Engagement of staff, volunteers and visitors in SAR protection and recovery.	The iNaturalist project for WLNP was created in 2018 and formally promoted through the volunteer program. There are currently 40 registered users in the iNaturalist project, 14052 observations and 1528 species provided by 795 users, including staff.	100%
21) Westslope Cutthroat Trout: Pursue co-operative partnerships with other government agencies, industry and public stewardship groups to conduct Westslope Cutthroat Trout management and restoration efforts within the Belly River,	Interagency meetings and other co-operative efforts are held to discuss native trout management and restoration possibilities, with a view to collaboration on potential reintroductions.	WLNP has worked with other mountain national parks, the University of Montana, Fisheries and Oceans Canada, Alberta Environment and Protected Areas, and the Blackfoot Confederacy on Westslope Cutthroat Trout recovery projects that include genetic assessment and methods development for native trout restoration.	100%*

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Waterton River and Pekisko Creek watersheds.			
<p>27) Bull Trout: Assess candidate site suitability and feasibility for conservation and restoration of genetically pure Bull Trout; conduct translocations and removals where appropriate.</p>	<p>Priority sites for Bull Trout conservation and restoration are identified. Translocations and removals are initiated as feasible and appropriate.</p>	<p>Population structure, abundance, and reproductive assessments have been conducted for two existing populations of Bull Trout in WLNP. These are assessed through redd surveys, electrofishing, and snorkel surveys at multiple sites within the two populations. In anticipation of genetic testing becoming available in the near future, approximately 150 tissue samples have been collected from both populations.</p> <p>A feasibility assessment of Bull Trout recovery methods, including non-native fish removals and translocations, will be initiated in 2023 and is planned to be completed in 2025.</p>	<p>40%*</p>
<p>36) Bull Trout: Pursue co-operative partnerships with other government agencies, industry and public stewardship groups to conduct Bull Trout management and restoration efforts within the Belly River, Waterton River and</p>	<p>Interagency meetings and other co-operative efforts are held to discuss native trout management and restoration possibilities, with a view to collaboration on potential reintroductions.</p>	<p>WLNP has worked with other mountain national parks, Fisheries and Oceans Canada, the University of Montana, Alberta Environment and Protected Areas, and the Blackfoot Confederacy on Bull Trout recovery projects that include development of genetic analysis methods, population assessments, and delineation of critical habitat.</p>	<p>100%</p>

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Pekisko Creek watersheds.			
40) Western Bumble Bee: Consult with experts to determine abundance and distribution of Western Bumble Bee in WLNP and BURNHS.	Improved knowledge of Western Bumble Bee abundance and distribution in WLNP and BURNHS.	An inventory project in WLNP was completed by regional bee experts during 2016-2018, and continued in 2021. Trends in distribution and abundance were determined in relation to a study conducted in WLNP in the mid-1990s.	100%

3. ACTION PLAN HIGHLIGHT: Waterton Lakes National Park's Knowledge Weaver

Parks Canada is making concerted efforts to build and strengthen relationships with Indigenous communities within whose territories it operates. Paahtómahksikimi, the Blackfoot name to describe the area of Waterton Lakes National Park, is within the territory of the Siksikaitsitapi or Blackfoot People. In April 2021, through the Nature Legacy Program, Waterton Lakes National Park introduced a new and innovative position titled Knowledge Weaver. The purpose of this position is to create respectful, meaningful, and reciprocal connections between Indigenous and non-Indigenous ways of knowing, understanding, and interacting with the land in the Paahtómahksikimi region.

Carleigh Grier-Stewart, whose Blackfoot name is Natoyanshkiaakii (Holy Singing Woman), is from Piikani Nation within the Blackfoot Confederacy, and has held this position since its inception. She has undertaken various projects and activities within and beyond the park's boundaries. These include accompanying

field crews to learn about Parks Canada's western science-focused work with species at risk such as Limber Pine, Bull Trout and Northern Leopard Frog, and supporting Blackfoot nations with species at risk projects. For example, Carleigh has supported Piikani Nation's collaborative project focused on building capacity for species at risk conservation efforts and facilitating Piikani youth engagement. Through this project, approximately 150 youth from Carleigh's community have spent time on the land in 2021 and 2022, learning and engaging in caring for species at risk and the lands that support them.

In addition to its positive impacts beyond park boundaries, Carleigh's work is helping Waterton Lakes National Park build and strengthen relationships with Indigenous partners while caring for species at risk.



4. ECOLOGICAL IMPACTS

Ecological impacts of the action plan are assessed by measuring progress towards meeting the site-based population and distribution objectives described in the action plan (Table 3). See the original action plan for national Population and Distribution Objectives (where available) and General Information and Broad Park Approach for each species. A more detailed description of progress made towards the site-based population and distribution objectives for some of these species is outlined in Appendix B.

Table 3. Progress towards achieving site-based population and distribution objectives for Species at Risk Act Endangered and Threatened species, in addition to other species of conservation concern, in Waterton Lakes National Park and Bar U Ranch National Historic Site.

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
Bolander's Quillwort	Maintain the three self-sustaining populations (Summit Lake, Upper and Lower Boundary Creek Ponds) and, if feasible and appropriate, restore the possibly	Repeat Smith and Bradley (2008) methods every 5 years (next in 2018) to determine each population's status and trend.	Surveyed in 2019, all existing populations are present and stable. Population trend analysis is underway by an external partner, to be completed by March 2023. Historic records have not been confirmed for a possibly extirpated Carthew population, therefore restoration is not currently feasible or appropriate.	100%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
	extirpated Carthew population.			
Common Nighthawk	Maintain occupancy of Common Nighthawk at confirmed sites in appropriate habitat in WLNP.	Conduct crepuscular surveys in historically occupied and other potential habitats, and record opportunistic observations.	Acoustic data were collected from 2019-2021 and in-person point count surveys were completed before (2016) and after (2018) the Kenow wildfire. Analysis of these surveys found Common Nighthawk optimal habitat suitability tied to high grassland cover and low elevation. This analysis provides a baseline model for Common Nighthawk habitat use in WLNP.	100%
Half-moon Hairstreak	To ensure the persistence of Half-moon Hairstreak at its known location within WLNP.	Half-moon Hairstreak adult population size index and trend based on Kondla (2009).	In 2021, research partners led adult and larvae surveys, establishing 153 transects that covered the Blakiston Fan. At the base of Silvery Lupin plants, surveys found 136 larvae with the vast majority associated with ants. Between July 6 and July 21, 747 adult butterflies were located which equates to approximately 14.1 adults / ha.	80%
Lewis's Woodpecker	Maintain appropriate habitats for Lewis's Woodpecker	Opportunistically record observations and conduct targeted surveys in historically	Lewis's Woodpecker observations were opportunistically recorded. Targeted surveys completed at four transects in 2016 did not result in any additional detections. The Kenow wildfire and the successful Red Rock and Y-Camp prescribed fires effectively	100%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
	breeding within WLNP.	occupied and other potential habitats.	maintained or increased the availability of a full range of structural stages and habitat features for Lewis's Woodpecker such as openings, snags and recent burns.	
Little Brown Myotis	Maintain Little Brown Myotis occupancy and extent of distribution in WLNP and BURNHS.	Use the North American Bat Monitoring Protocol (NABat) and opportunistic observations to monitor species occurrence at established monitoring sites, roosting sites, hibernacula and flyways in natural areas and human structures. Monitor these sites to detect any changes.	As per the NABat sampling framework, ultrasonic recorders were deployed at 13 sites throughout pre- (2015-2017) and post-Kenow wildfire (2018-2020) periods. Across all years, all 13 sites were found to be occupied by 40kHz <i>Myotis</i> species, likely predominately Little Brown Myotis (given previous capture data). Over the short term, bat activity did not change pre- to post-fire, however activity did increase in burned areas and decrease in unburned areas. Annual emergence counts have been completed since 2020 at three maternity colonies within the Waterton Townsite, with no detection of impactful change.	100%
Olive-sided Flycatcher	Maintain Olive-sided Flycatcher occupancy and extent of	1. Continue annual bioacoustic bird monitoring surveys within	Occupancy and extent of distribution are maintained over the short-term, following the Kenow wildfire.	100%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
	distribution in WLNP.	<p>montane and subalpine habitats.</p> <p>2. Conduct Olive-sided Flycatcher-specific surveys in potentially suitable habitats.</p> <p>3. Collect and compile incidental observations, including those found on external databases such as eBird.</p>	<p>1. Annual bioacoustic bird monitoring surveys continue, with supplementary efforts undertaken by research partners.</p> <p>2. In-person point-count surveys were completed in 2016 and 2017. Additional opportunistic transects were completed in 2018 and 2019.</p> <p>3. Incidental observations continue to be collected.</p>	
Westslope Cutthroat Trout - Alberta population	1. Protect and maintain at self-sustaining levels any existing ≥ 0.99 pure populations within WLNP which genetic testing confirms are of Westslope subspecies.	Determine subspecies and genetic purity of existing and re-established Westslope Cutthroat Trout populations.	<p>1. Previously determined to be genetically pure, the Goat Lake population has been protected and maintained, however, advancements in genetic analysis require the reassessment of populations. Approximately 70 tissue samples were collected in 2021/22 from three populations for this purpose.</p> <p>2. Not currently feasible. Parks Canada staff have participated in recovery efforts in other</p>	55%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
	2. Where feasible, re-establish and maintain at self-sustaining levels pure populations of Westslope Cutthroat Trout within their historical range in WLNP that recognizes diversity of life history strategies in Alberta.		jurisdictions to gain skills and knowledge that will be applied to future recovery efforts in the park.	
Whitebark Pine	To establish a self-sustaining, rust-resistant population of Whitebark Pine that demonstrates natural seed dispersal, connectivity, genetic diversity and adaptability to changing climate.	<ol style="list-style-type: none"> 1. Disease infection, stand density and mortality rate via stand health transects. 2. Hectares of habitat created or restored. 3. Number of potentially resistant trees identified and protected and 	<p>Whitebark Pine populations across the park are declining. The White Pine Blister Rust infection rate increased from about 72% to 80% of live trees from 2014 to 2019. A number of recovery activities are currently underway including identifying and testing potentially disease resistant parent trees, and planting large numbers of seedlings. However, because of the long generation time of Whitebark Pine it will take many years for these activities to impact population measures.</p> <p>See Appendix B for more information.</p>	29.7%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
		<p>number of these with stored seeds.</p> <p>4. If fire is applied, the amount of regeneration 5-years post-fire.</p> <p>5. Conduct annual Clark's nutcracker surveys in conjunction with the Whitebark Pine Ecosystem Foundation.</p>		
Bull Trout - Saskatchewan-Nelson Population	<p>1. Protect and maintain existing pure Bull Trout populations within WLNP at self-sustaining levels.</p> <p>2. Where feasible, re-establish and maintain pure Bull Trout populations</p>	Conduct annual redd counts to determine spawning activity. Measure genetic purity.	1. Known populations of Bull Trout in WLNP are protected and maintained; the two main populations were monitored using annual redd surveys, electrofishing, and snorkel surveys. In anticipation of genetic testing becoming available for Bull Trout in the near future, approximately 150 tissue samples have been collected from these two populations.	55%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
	in sites within their historical range in WLNP that recognizes diversity of life history strategies in Alberta.		2. Not currently feasible. Parks Canada staff have participated in recovery efforts in other jurisdictions to gain skills and knowledge that will be applied to future recovery efforts in the park.	
Grizzly Bear - Western Population	To contribute to the long-term viability of a self-sustaining Grizzly Bear population in the WLNP region.	Continue to participate in regional monitoring efforts as they occur. Partner with Alberta Government on monitoring of BMA 6 as per Alberta Grizzly Bear Recovery Plan.	Government of Alberta monitoring for Grizzly Bear population estimates in BMA 6 was last completed in 2014 and a repetition has not yet been initiated. Parks Canada continues to maintain a collaborative working relationship with the Government of Alberta and other regional partners and shares mortality and other relevant observations with regional researchers and biologists. Within WLNP, Grizzly Bear are a target species of the multi-species occupancy monitoring program, which includes annual efforts to record occupancy data via remote cameras. WLNP uses Grizzly Bear as an umbrella species to assist in maintenance of sensitive species habitat.	100%
Limber Pine	To establish a self-sustaining, rust-resistant population of Limber Pine that	1. Disease infection, stand density and mortality rate via	Infection rates and mortality caused by White Pine Blister Rust appears to have increased from 2014 to 2019; however, this is difficult to quantify as all of the	7.95%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
	<p>demonstrates natural seed dispersal, connectivity, genetic diversity and adaptability to changing climate.</p>	<p>stand health transects.</p> <p>2. Hectares of habitat created or restored.</p> <p>3. Number of potentially resistant trees identified and protected and number of these with stored seeds.</p> <p>4. If fire is applied, the amount of regeneration 5-years post-fire.</p> <p>5. Conduct annual Clark's nutcracker surveys in conjunction with the Whitebark Pine Ecosystem Foundation.</p>	<p>monitoring transects burned between re-measurements and had to be re-established. A number of recovery actions are currently underway including identifying and testing potentially disease resistant parent trees and planting seedlings. It will take time to see the benefits of these actions due to the slow growing nature of these species. See Appendix B for more information.</p>	

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
Long-toed Salamander	Maintain occupancy of Long-toed Salamander at known locations in WLNP.	Species presence at ecological monitoring sites.	Annual visual encounter surveys are part of Parks Canada's annual Ecological Integrity Monitoring Program. In 2016, Long-toed Salamanders were present at 11/15 sites. Since 2018, in an effort to improve statistical power to detect trends, total sampling sites increased from 15 to 30 across foothill and montane ecoregions. As of 2022, Long-toed Salamanders were present at 20/30 these sites.	100%
Northern Leopard Frog - Western Boreal/Prairie Populations	Re-establish one or more self-sustaining Northern Leopard Frog populations in WLNP.	Conduct surveys for breeding individuals at reintroduction and/or other suitable sites.	Annual surveys for Northern Leopard Frog confirmed breeding evidence at two reintroduction sites and six other sites where the species has self-distributed throughout the Waterton River drainage.	100%
Plains Bison	Maintain existing demonstration herd. As opportunities arise, explore with partners a landscape-scale, regional Plains Bison population.	As appropriate, collaborate with partners to monitor distribution, density and abundance of any Plains Bison that may enter WLNP as part of the Innnii Initiative.	A herd of six individuals was returned to the bison paddock in winter of 2021, following a three year absence to allow range regrowth after the Kenow wildfire. WLNP have provided ongoing support to Indigenous-led bison restoration efforts since 2014, such as taking part in Innnii Initiative working groups and supporting Kainai Nation in establishing an ecocultural Plains Bison herd on the Blood Reserve in 2021. Monitoring of Plains Bison entering WLNP	100%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
			as part of the Iinnii Initiative is not relevant given that herd is currently fenced. Despite the initial objective within this plan being achieved, this is an ongoing measure that requires consistent, long-term effort.	
Western Bumble Bee - Southern subspecies	Maintain occupancy of Western Bumble Bee in WLNP.	Opportunistically record observations via researchers, volunteers, etc.	Specialists completed bumble bee surveys and found that Western Bumble Bee was observed to be widely distributed throughout lower elevation areas of WLNP, although overall abundance appears to be declining. The species shifted from being the most commonly observed species in WLNP in the mid-1990s to the least commonly observed species in recent surveys.	75%



5. SOCIO-ECONOMIC IMPACTS

The *Species at Risk Act* requires the responsible federal minister to report on the socio-economic costs of the multi-species action plan (MSAP) and the benefits derived from its implementation. The MSAP only applies to protected lands and waters under the authority of the Parks Canada Agency, which are often subject to fewer threats (e.g., industrial activities) compared to other areas as the lands are managed to preserve ecological and commemorative integrity. This section does not include socio-economic impacts of existing permitted activities that may be occurring in Parks Canada places as those have been addressed through other processes (e.g.: impact assessments). This socio-economic assessment is narrow in scope, as it is focused on the measures implemented within the action plan, and primarily focuses on Indigenous partners, leaseholders, licensees, residents and visitors. The overall socio-economic impacts of the multi-species action plan for Waterton Lakes National Park and Bar U Ranch National Historic Site, described as costs and benefits, are outlined below.

Costs

The majority of costs to implement this action plan were borne by Parks Canada. Action plan measures were integrated into the operational management of Waterton Lakes National Park. These costs were covered by prioritization of existing funds and salary dollars and did not result in additional costs to society. However, many partners also contributed resources and collaborated on these measures.

The multi-species action plan did not bring any restrictions to land use outside the national park or historic site. As such, this action plan placed no extraneous socio-

economic costs on the public. However, some minor restrictions were placed on visitor activities on park lands and waters to protect and recover species at risk. Examples include temporary area closures to protect sensitive species such as Grizzly Bear or to ensure public safety during active management operations such as prescribed fires. To reduce risks to aquatic systems, including species at risk, watercraft were subject to aquatic invasive species inspections and permitting, whereas fishing regulations and licensing were maintained.

Benefits

Measures presented in the action plan contributed to meeting recovery strategy objectives for Threatened and Endangered species, and to management objectives for species of conservation concern.

The measures sought a balanced approach to reduce or eliminate threats to populations and habitats. Measures included use of active management for habitat such as prescribed fires or invasive species prevention and control. Other measures included direct protection of individuals and their habitat such as establishing best practices to limit the spread of White-nose Syndrome in bat populations. Actions supported conservation and recovery programs through developing and contributing to multiple partnerships, increasing public awareness and stewardship through signage, visitor programs, and highlights in communication media. In addition, many partnerships and collaborations were developed with academic researchers as part of the post-Kenow wildfire research and monitoring program, leveraging a better understanding of fire effects on species at risk in support of management towards conservation and recovery.

Benefits in this period include highlights such as the return of the regionally extirpated Northern Leopard Frog to Waterton Lakes National Park through reintroduction efforts. Working with partners and many volunteers, staff enhanced 89 ha of Whitebark Pine habitat and 46 ha of Limber Pine habitat in planting putatively resistant seedlings. Improvements to the quality of species at risk habitat was achieved by applying prescribed fires over 1171 ha in Waterton Lakes National Park, in addition to the continued implementation of an invasive plant inventory and control program that incorporates best management practices for species at risk. Overall, the actions taken to

implement the multi-species action plan have an overall positive impact on ecological integrity and enhanced opportunities for appreciation by visitors and the public. Furthermore, implementing these measures resulted in benefits to Canadians, such as positive impacts on biodiversity and the value individuals place on preserving biodiversity.



Potential economic benefits of species at risk recovery at these sites cannot be easily quantified, as many of the values derived from ecology are non-market commodities that are difficult to appraise in financial terms. Flora and fauna, in all their forms, have value in and of themselves, and are valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons. The conservation of flora and fauna at risk is an important component of the Government of Canada's commitment to conserving biological diversity, and is important to Canada's current and future economic and natural wealth. Maintaining healthy ecosystems is important to visitor experience and the Waterton-Glacier International Peace Park is recognized as a UNESCO World Heritage Site in part because of its unique assemblage and high diversity of flora and fauna concentrated in a small area.

Implementing this action plan had positive benefits for park visitors and local residents. Through interpretive programming, over 26,500 park visitors learned about species at risk, gaining a greater appreciation for management of their conservation and recovery. Further communications were targeted through volunteer events, signage, social media releases, web pages, and media articles to support dissemination of knowledge, enhanced understanding, and promoting compliance with *Species at Risk Act* requirements. As part of volunteer programs, 44 people participated directly in Whitebark Pine restoration by planting seedlings, and 795 users were engaged through the iNaturalist project.

Summary

The recovery measures in the action plan had limited socio-economic impact and placed no restrictions on land outside the boundaries of the national park. The majority of direct costs were borne by Parks Canada, along with some contributions from partners and collaborators. Indirect costs were minor and limited to temporary visitor restrictions. Benefits included positive impacts on park ecological integrity, greater awareness of species and enhanced opportunities for participation and engagement of visitors, local communities and Indigenous groups.

Appendix A: Technical Compendium – Recovery Measures

Recovery Measure #4 and #28 – Implement Prescribed Fire Plans

Parks Canada carried out four prescribed fires from 2017 to 2022, following up on past prescribed fires in the grassland and montane areas of Waterton Lakes National Park. These prescribed fires took place between early March and mid-May and met the objective of returning regular burning intervals to the landscape. While planning prescribed fires, Parks Canada staff considered species-specific needs and sensitivities and focussed on maintaining open grassland and reducing shrub and tree encroachment.

In early 2017, a prescribed fire burned an area of 8.6 hectares in the Compound Meadows Sub-Unit, followed shortly after by the Eskerine Unit achieving an additional 778 hectares of burned area. On September 11, 2017, the Kenow wildfire subsequently affected 19,303 hectares of grassland, montane, and subalpine habitats within Waterton Lakes National Park (Figure 1); triggering a re-assessment and adaptation of the prescribed fire program and some of Waterton Lakes National Park’s Multi-Species Action Plan commitments. Prescribed fires were once again implemented in 2021, with an area burned of 10 ha in the Maskinonge Unit (Figure 2), and in 2022, with an area burned of 650 ha in the Y-Camp Unit (Figure 3).

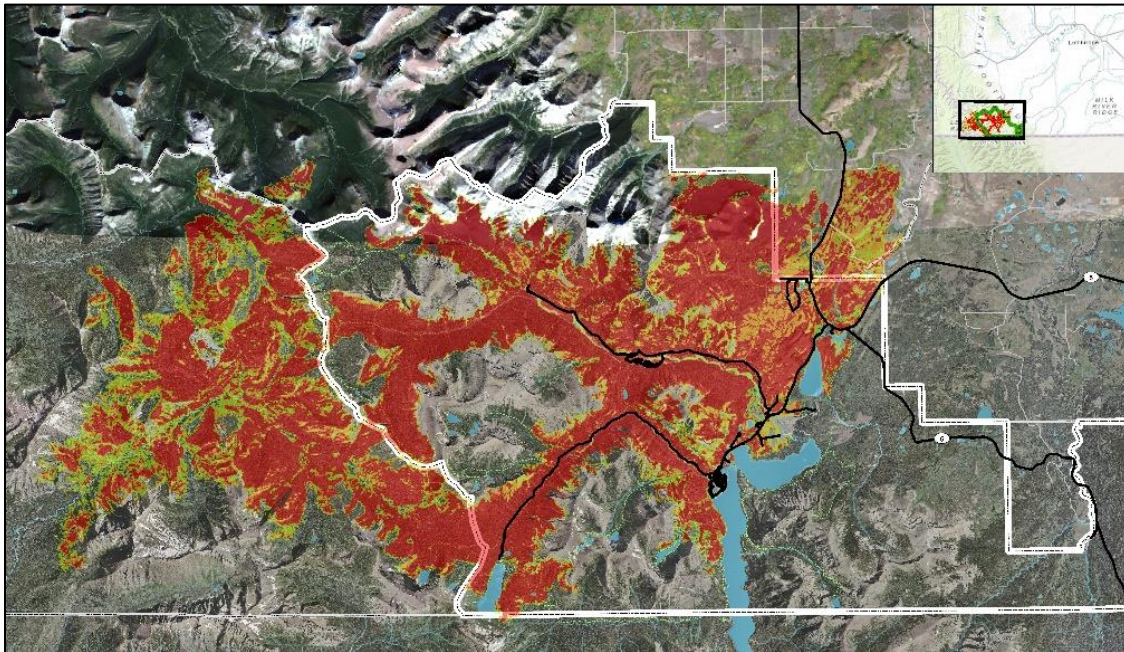


Figure 1. Kenow wildfire area map showing burn severity and including areas burned in British Columbia and Alberta Crown and private lands. (Photo credit: Parks Canada)



Figure 2. Prescribed burning at Maskinonge day use area in Waterton Lakes National Park in March of 2021, with a Blackfoot Confederacy marker emerging from the grass in the foreground. (Photo credit: A. Collingwood, Parks Canada).



Figure 3. Y-camp prescribed burn (i.e., ignition of main unit) in Waterton Lakes National Park on May 5 2022. (Photo credit: M. Rance, Parks Canada)

While the area burned targets for this measure were fully achieved through wildfire and implementation of prescribed fire plans, it should be noted that the Kenow wildfire had vastly different impacts compared to the planned prescribed fires, which typically burn cooler and do not consume high volumes of organic matter. The Kenow wildfire was an extreme event driven by extreme conditions, burning approximately 50% of the vegetated area within Waterton Lakes National Park; 44% of the park's vegetated area burned with high or extreme severity. High and extreme severity results in removal of most or all organic matter, including soil. Much of the park's infrastructure was impacted and has since been rebuilt.

Since 2017, the post-Kenow wildfire research and monitoring program has examined the ecological impacts of this extreme fire and the renewal taking place since. Through collaborations with academic researchers this work has examined a suite of ecological focal areas such as vegetation, fungi, forest hydrology, amphibians, invasive plants, carbon exchange, bats, aerial insectivores, and bees. The program is informing park management and future monitoring and research, including species at risk conservation and recovery efforts. It also serves to inform managers of other national parks and beyond of the impacts of extreme wildfire and ecological responses in a changing climate.

Recovery Measure #15 and #16 – Indigenous Community Collaboration in Species At Risk Education and Recovery.

Waterton Lakes National Park collaborates with Indigenous communities on many species at risk related initiatives, through sharing messaging with the public and implementing impactful recovery projects. For example, from 2015-2019, there was very high attendance for the Blackfoot-led interpretive program called Blackfoot Crafts and Stories. This program included messaging on Plains Bison and other species of Blackfoot cultural significance. Further to this, Blackfoot community members co-developed engaging display content for the new visitor centre that opened in 2022, including messaging related to species at risk. Other collaborations include engaging Blackfoot community members in the return and management of the Waterton Lakes' Plains Bison herd since 2021 (Figure 4). Parks Canada has also been a significant supporter of the Kainai Ininii Rematriation (the Blood Tribe-led establishment of an ecocultural Plains Bison herd on the Blood Reserve) since 2019.



Figure 4. A Blackfoot plains bison specialist releases WLNP's Plains Bison herd upon their return, following a 3-year absence due to the Kenow wildfire and subsequent range regrowth. (Photo credit: J. Stoesser, Parks Canada).

The Blood Tribe and the Waterton Lakes National Park fire program have begun to develop an important relationship regarding fire management. Recently, the two partners signed a letter of agreement to work cooperatively on fire management projects, including the support of Blood Tribe members to Parks Canada by participating in the May 2022 Y-camp prescribed fire in Waterton, followed by Parks Canada staff assisting a Blood Tribe-led burn on Iitaika'kiakio'pi (the Blood Timber Reserve) two weeks later. In aquatic-related projects, Blood Tribe Lands Management participated in monitoring the restored Northern Leopard Frog population in the Waterton drainage since 2019 and is collaborating with Parks Canada toward Northern Leopard Frog restoration in the Belly River drainage, including Iitaika'kiakio'pi (Figure 5). Parks Canada staff are further supporting Piikani Lands Department, Blood Tribe Lands Management, and Blackfoot Confederacy in planning and implementing their Summit to Sage Priority Place Initiative, Environment and Climate Change Canada funded projects focused on terrestrial species at risk and culturally significant species. This includes conducting amphibian eDNA surveys, Piikani and Kainai youth engagement in Waterton Lakes' conservation and restoration work, and community-based creation of an ecocultural restoration plan for Iitaika'kiakio'pi. Please note that, despite the original objectives within the Multi-Species Action Plan being fully achieved, these are ongoing measures and efforts that requires consistent, long-term effort.



Figure 5. Blood Tribe Land Management and Waterton Lakes National Park staff eDNA sampling at the Blood Timber Reserve. (Photo Credit: J. Stoesser, Parks Canada)

Recovery Measure #21 and #36 – Partnerships on Westslope Cutthroat Trout and Bull Trout objectives.

Parks Canada staff have pursued cooperative partnerships to support recovery planning and actions for Westslope Cutthroat Trout and Bull Trout. These include gaining valuable skills and knowledge to apply during future Westslope Cutthroat Trout and Bull Trout recovery efforts in the park. Waterton Lakes Field Unit staff have observed and participated in recovery projects in other jurisdictions. For example, joining Lake Louise, Yoho, & Kootenay Field Unit on staff training and developing methods for chemical removal of non-native fish species from historic Bull Trout and Westslope Cutthroat Trout habitat, and for Westslope Cutthroat Trout gamete collection methods from pure populations for reintroduction of the species to historically occupied waterbodies. Waterton Lakes staff have participated in efforts that Alberta Environment and Protected Areas has taken to establish a Westslope Cutthroat Trout restoration broodstock for populations within the Oldman River watershed.



Figure 6. Left: Parks Canada staff from Lake Louise, Yoho and Kootenay and Waterton Lakes Field Units, along with Alberta Environment and Protected Areas Fish Culture staff, wrapping up Westslope Cutthroat Trout gamete collection at Fish Lakes in Banff National Park in July 2022. Gametes collected from this event were used in Westslope Cutthroat Trout recovery efforts in Hidden Lake, Banff National Park. (Photo Credit: S. Crowshoe, Parks Canada). Right: Fertilized Westslope Cutthroat Trout eggs being sterilized and counted by AEP staff in July 2021. These eggs were collected from a pure Westslope Cutthroat Trout population and were used in recovery efforts in Hidden Lake, Banff National Park. (Photo Credit: S. Crowshoe, Parks Canada).

Further to this, a three-year contribution agreement exists between Alberta Environment and Protected Areas and the University of Montana to support collaboration on future genetic testing and analysis for three native trout species (Westslope Cutthroat Trout, Bull Trout, and Athabasca Rainbow Trout). Parks Canada has access to this agreement through Alberta Environment and Protected Areas to ensure genetic results are consistent across the species range. Fisheries and Oceans Canada has also delineated critical habitat for Bull Trout within Waterton Lakes National Park and Bar U Ranch National Historic Site.

Waterton Lakes National Park has been a key supporter of the Blackfoot Confederacy Native Trout Project since 2020 and collaborative project work includes field support during annual Bull Trout redd surveys in North Fork Belly River since 2020, and ongoing logistic support for this Indigenous-led work. Recovery of native trout in the eastern slopes is a collaborative and ongoing effort.

Appendix B: Technical Compendium - Population and Distribution Objectives

Half-moon Hairstreak

Since 2019, staff from the Wilder Institute-Calgary Zoo (hereafter called Wilder Institute) and Parks Canada have joined together to develop and implement conservation research and monitoring programs for the Half-moon Hairstreak (*Satyrrium semiluna*) butterfly in Waterton Lakes National Park (Figure 7).



Figure 7. Half-moon Hairstreak butterfly feeding on species of buckwheat (*Eriogonum* sp.). (Photo Credit: Parks Canada)

A. Conduct surveys for adult and larval Half-moon Hairstreak in known habitats within Waterton Lakes National Park.

The Wilder Institute designed a new monitoring program to detect larvae, pupae and adult hairstreaks on known habitat within the Blakiston Fan. Larval surveys run from early May until late June and switch to record the transition from larvae to pupae in late June and early July. Surveys continue into mid-August, with adults typically emerging in mid-July.

For the first time in Canada, this research recorded the larval and pupae stages of this butterfly and confirmed a symbiotic relationship with ant species. The vast majority of larvae were observed with the ant species *Lasius americanus* (Figure 8). However, other ant species observed protecting and grooming Half-moon Hairstreak larvae include *Formica argentea*, *Formica neogagates*, and *Formica obscuripes*. In addition, when Half-moon larvae were disturbed, they were observed going into the nest galleries of their host ants for protection.



Figure 8. Half-moon Hairstreak larvae with attending ant species and pupae. (Photo credit: Wilder Institute)

B. Habitat assessment and restoration plan for the Blakiston Fan population in Waterton Lakes National Park.

Along each of the transects used for larval and adult surveys, researchers also recorded the occurrence of key plant species – the larval food plants Silky and Silvery Lupine (*Lupinus sericeus* and *L. agenteus*), adult food plants Yellow and Sulphur Buckwheat (*Eriogonum flavum* and *E. umbellatum*), and the invasive Spotted Knapweed (*Centaurea stoebe*) – a key threat to Half-moon Hairstreak critical habitat.

Using this information, researchers will be able to determine areas for priority habitat restoration which will include the control of Spotted Knapweed and revegetation of the native plant community.

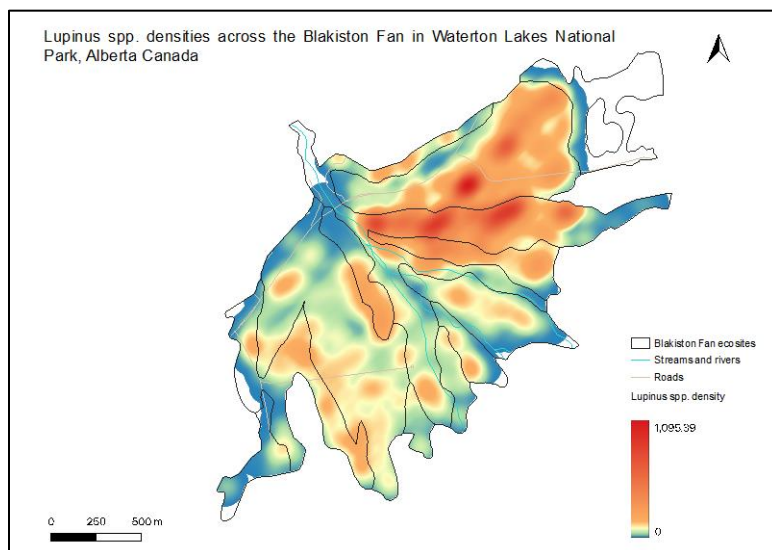


Figure 1. Silky and silvery lupine species densities - Blakiston Fan in 2021. Blue to red is low to high density.

C. Collection of the genetic samples of the Waterton Lakes population versus other populations in the United States and British Columbia as part of a feasibility study of wild-to-wild translocations.

The Wilder Institute and Parks Canada partnered with the Dr. Felix Stirling Lab at the University of Alberta, along with Dr. Zac MacDonald, and Dr. Julian Dupuis to plan and run full genome analysis for the Half-moon Hairstreak. Samples were collected from populations in Waterton Lakes National Park, British Columbia and Montana with plans for additional samples to be collected from additional populations in 2023. The full genome was run by Dovetail Genomics and the data are currently being analyzed by the University of Alberta Lab. Additionally, 16 DNA samples were sent for genetic analysis to the University of Calgary, to determine population genetics and differences between the Waterton Lakes National Park, British Columbia, and Montana populations. The results of these genetic studies will help determine feasibility of wild-to-wild translocations.

Westslope Cutthroat and Bull Trout

Westslope Cutthroat Trout (Alberta population) are one of the few species for which genetic purity is specified in the Recovery Strategy and is the determining factor in population classifications. Populations which have been tested and show greater than 99% alignment with genetic markers associated uniquely with Westslope Cutthroat Trout are considered genetically pure. Populations with genetic purity between 95 and 99% are considered near-pure, and populations with genetic purity of less than 95% are considered hybridized.

Genetic testing of Westslope Cutthroat Trout populations in Waterton Lakes National Park was first undertaken using microsatellite markers in 2010. A total of six populations were tested, resulting in identifying four hybridized populations and two near-pure populations. Since 2010, a new method of genetic testing using single nucleotide polymorphisms has replaced microsatellite testing as the acceptable standard for determining genetic purity. This method is more sensitive, accurate, and can differentiate between hybridization with Rainbow Trout and other non-native sub-species of cutthroat trout. As of July 2022, the new testing has been completed on one of the near-pure Westslope Cutthroat Trout populations in Waterton Lakes National Park and tissue samples have been collected to allow future testing of the other second near-pure population.



Figure 2. Westslope Cutthroat Trout captured during an angling survey at Goat Lake, Waterton Lakes National Park, September 2021. Tissue samples were collected at this time for single nucleotide polymorphisms testing in the near future. (Photo Credit: N. Waters, Parks Canada)

Additionally, restriction site-associated DNA (RAD capture or Rapture) technology has been effective in gathering other genetic information for use in restoration planning. Rapture analysis is able to determine the degree of inbreeding and genetic variation within isolated and bottlenecked populations, and provides insight into the relatedness between populations. Both of these recent advancements can provide significant direction to restoration plans, resulting in the reintroduction of the most genetically fit individuals to historically occupied waterbodies. Rapture analysis can be used to inform the source of donor populations for future reintroduction projects in the park.

As of July 2022, no acceptable test of genetic purity exists for the Alberta population of Bull Trout and the Recovery Strategy does not define how a 'pure Bull Trout population' would be determined. However, tissue samples have been collected and genetic purity can be assessed when testing becomes available.

Parks Canada has not investigated the genetic purity of Westslope Cutthroat Trout in Pekisko Creek at the Bar U Ranch National Historic Site, although Alberta Environment and Protected Areas identifies this area as genetically hybridized based on tissue samples collected further upstream. The presence of Bull Trout in Pekisko Creek has not been investigated since 2017, when the Alberta Conservation Association identified migratory Bull Trout and breeding sites in the area just downstream of the national historic site.



Figure 3. Waterton Lakes aquatics staff electrofishing for Bull Trout as part of a population survey in Blakiston Creek, Waterton Lakes National Park, July 2021. Captured fish are released after samples are taken. (Photo Credit: S. Crowshoe, Parks Canada)



Figure 4. Waterton Lakes aquatics staff surveying Bull Trout use of winter pool habitat in Blakiston Creek, Waterton Lakes National Park, March 2021. (Photo Credit: A. Greenburg, Parks Canada)

Parks Canada staff are currently working towards the feasibility and planning of future recovery efforts in the park. Reintroduction events for both species are likely five to ten years away and depend on appropriate recipient habitat, cooperation with other organizations for access to donor populations, health of donor populations, results of disease testing, and funding availability.

Whitebark and Limber Pines

The following table contains detailed information on the summary population and distribution progress statements for both Whitebark and Limber Pines in Table 3.

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
Whitebark Pine	To establish a self-sustaining, rust-resistant population of Whitebark Pine that demonstrates natural seed dispersal, connectivity, genetic diversity and adaptability to changing climate.	1. Disease infection, stand density and mortality rate via stand health transects.	<p>1. The average infection rate of live trees on the health transects in 2019 was 80.0% and the average percent dead was 62.7%. The average stand density was 2.8 m²/ha. In 2014 the average infection rate was 71.9% and on average 53.1% of trees were dead.</p> <p>It is important to note that due to the Kenow wildfire, some transects had to be removed in 2019 as they had burned, and some new transects were added to replace these. Of the transects that were measured on both visits, the average change in infection was an increase of 12%.</p>	0%
		2. Hectares of habitat created or restored.	2. Based on the recently developed crown of the continent restoration strategy, around 50,000 planted Whitebark Pine seedlings will be required to restore Whitebark Pine habitat in WLNP. Between 2017 and 2022, 21, 309 putatively rust resistant seedlings were planted.	48.5%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
		<p>3. Number of potentially resistant trees identified and protected and number of these with stored seeds.</p> <p>4. If fire is applied, the amount of regeneration 5-years post-fire.</p>	<p>3. Between 2017 and 2022, 96 potentially resistant trees were identified. An average of 60 trees that were identified as higher risk for mountain pine beetle were protected annually. We collected and stored seed from 27 of the newly identified trees, as well as an additional 10 previously identified trees. Several trees were collected from multiple times. In order to contribute to a genetically diverse seed orchard, we need to identify 10 trees with a positive breeding value. Our tested trees have not yet been ranked; once ranked, we will be able to determine how close we are to meeting this goal, at which point we will measure results against the Conservation Standards objectives.⁹</p> <p>4. As a result of the Kenow wildfire, 89 hectares of habitat were planted with putatively resistant seedlings. We did not carry out any site preparations using prescribed fire because such a large area had already burned in the wildfire. Natural</p>	<p>0%</p> <p>0%</p>

⁹ The Conservation Standards (formerly known as the Open Standards) Whitebark and Limber Pine Working Group has drafted recommendations for the number of resistant trees needed for restoration in a region: good condition is > 10 confirmed resistant (elite) trees and > 100 parent trees, fair condition is 50-100 parents and 5-10 elite trees and poor condition is < 5 parent trees and < 5 elite trees. We will measure our progress against “good condition”.

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
		5. Conduct annual Clark's Nutcracker surveys in conjunction with the Whitebark Pine Ecosystem Foundation.	regeneration was not measured, but has been observed at very low levels. 5. Annual surveys completed for Clark's Nutcracker.	100%
Limber Pine	To establish a self-sustaining, rust-resistant population of Limber Pine that demonstrates natural seed dispersal, connectivity, genetic diversity and adaptability to changing climate.	1. Disease infection, stand density and mortality rate via stand health transects. 2. Hectares of habitat created or restored.	1. The infection rate in 2019 was 71.8% and the average percent dead was 26.3%. Stand density could not be measured as the majority of trees were krummholz. In 2014 the infection rate was 57.1% and the percent dead was 47.3%. However, these numbers should not be compared, as all original plots burned in the Kenow wildfire in 2017, and new ones had to be established for the 2019 survey. 2. Based on the recently developed crown of the continent restoration strategy, around 40,000 planted limber seedlings will be required to restore Limber Pine habitat in WLNP. We have planted 12,737 putatively rust	1.0% 31.8%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
		<p>3. Number of potentially resistant trees identified and protected and number of these with stored seeds.</p>	<p>resistant seedlings between 2017 and 2022.</p> <p>3. Between 2017 and 2021, 114 potentially resistant plus trees were identified. None of the limber pine were deemed high risk for mountain pine beetle attack, therefore none were prioritized for protection. We collected and stored seed from 31 of the newly identified trees, as well as eight previously identified trees. Several trees were collected from multiple times. In order to contribute to a genetically diverse seed orchard, we need to identify 10 trees with a positive breeding value. Our tested trees have not yet been ranked; once ranked, we will be able to determine how close we are to meeting this goal, at which point we will measure progress against the Conservation Standards objectives.¹⁰</p>	<p>0%</p>

¹⁰ The Conservation Standards (formerly known as the Open Standards) Whitebark and Limber Pine Working Group has drafted recommendations for the number of resistant trees needed for restoration in a region: good condition is > 10 confirmed resistant (elite) trees and > 100 parent trees, fair condition is 50-100 parents and 5-10 elite trees and poor condition is < 5 parent trees and < 5 elite trees. We will measure our progress against “good condition”.

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population and distribution objectives	Progress (% achieved)
		<p>4. If fire is applied, the amount of regeneration 5-years post-fire.</p> <p>5. Conduct annual Clark's Nutcracker surveys in conjunction with the Whitebark Pine Ecosystem Foundation.</p>	<p>4. We restored 46 ha with planted seedlings as a result of the Kenow wildfire having completed site preparation. We did not carry out any site preparation using prescribed fire because such a large area had already burned in the wildfire. Natural regeneration was not measured, and has not been observed.</p> <p>5. We do not have transects for nutcracker surveys in limber pine habitat, however, transects are completed in Whitebark Pine habitat as described above.</p>	<p>0%</p> <p>Not reportable</p>

A monitoring program began in 2003 to measure the condition of Whitebark and Limber Pine in the Canadian Rocky and Columbia Mountains. Permanent plots extending from the Canada-United States border to the Willmore Wilderness area in the north have been re-measured every five years. Data collected include blister rust infection levels, tree mortality and natural regeneration. These data informs and provides direction for restoration action across national parks, provincial parks, and Alberta and British Columbia provincial lands. While these data are important, Whitebark Pine trees are very slow-growing, and it will take many decades for this type of population monitoring to respond to restoration action such as seed collecting, seedling planting (Figure 13), or prescribed fire.



Figure 5. Waterton Lakes staff Fynley Kuijt (left) places cages over Whitebark Pine cones. (Photo Credit: D. Still, Parks Canada) Restoration crew member Celsa Cestnick plants a Whitebark Pine seedling (right) in Waterton Lakes National Park. (Photo credit: G. Alger, Parks Canada)

Since the Multi-Species Action Plan was written, restoration experts have identified goals to measure progress towards population and distribution objectives for Whitebark and Limber Pine recovery¹¹. The approach, which can be refined for a region, recommends a network of “component populations” that consist of more than 5,000 mature parent trees located within 12 km of another component population (within 30% of the species’ regional range). Given existing seedling survival estimates (~50%), roughly 10,000 putatively resistant seedlings should be planted in each component population. This approach combines the best available datasets and science into a flexible, data-informed decision-making process that can be applied consistently across large geographic areas. Importantly, this approach allows Parks Canada to measure progress towards recovery. Moving forward, monitoring the condition of “component populations” may be identified as the approach to measure progress towards meeting population and distribution objectives.

¹¹ Peer reviewed paper published on Forest Ecology and Management: <https://doi.org/10.1016/j.foreco.2022.120282>