2021

IMPLEMENTATION REPORT:

MULTI-SPECIES ACTION PLAN for Grasslands National Park of Canada (2016-2021)

Parks Canada Parcs Canada

Canada

Recommended Citation

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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 Registry[1].

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Cover illustration, clockwise from top left: Plains Bison, S. Liccioli, Parks Canada Agency (PCA); Prescribed fire, S. Hunt, PCA; Parks Canada staff member, J. Crowe, PCA; Black-tailed Prairie Dogs, S. Liccioli, PCA; Burrowing Owl, S. Liccioli, PCA; Greater Sage-grouse, PCA. **This page:** Grassland landscape, L. Gardiner, PCA; **Page i-ii:** Grassland landscape, PCA; **Page iii:** Plains Bison, S. Liccioli, PCA; **Page 1, left to right:** Parks Canada staff member, L. Gardiner, PCA; Greater Short-horned Lizard, L. Gardiner, PCA; Plains Bison, Purple Milkvetch, Common Nighthawk, Pronghorn Antelope, S. Liccioli, PCA; Staff member holding a Greater Sage-grouse, PCA; Winter grassland landscape, L. Gardiner, PCA. **Page 16:** Ranchers herding cattle, PCA; **Pages 17-19:** Grassland landscapes, 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 Grasslands National Park of Canada, and in 2016 published the Multi-species Action Plan for Grasslands National Park 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 Grasslands National Park of Canada (2016-2021).

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 on progress towards meeting site-based population and distribution objectives every five years.

[2] https://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 all staff, partners, stakeholders, neighbors, volunteers and researchers who have contributed to implementation of the Multi-species Action Plan for Grasslands National Park of Canada.

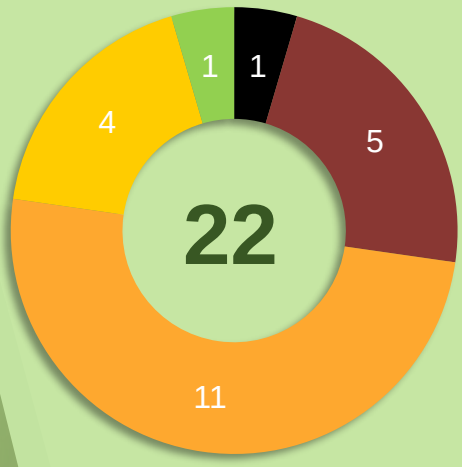
EXECUTIVE SUMMARY

This document reports on implementation of the Multi-species Action Plan for Grasslands National Park of Canada between 2016 and 2021. 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 Addressed[3]

The action plan addressed a total of 21 SARA-listed species and one species of conservation concern.

Recovery actions and population and distribution objectives were focused on 10 species for which Grasslands NP could have the largest impact on species recovery: Black-Footed Ferret, Black-tailed Prairie Dog, Burrowing Owl, Chestnut-collared Longspur, Eastern Yellow-bellied Racer, Greater Sage-grouse, Greater Short-horned Lizard, Little Brown Myotis, Plains Bison and Sprague's Pipit.



SARA-listed species

- Extirpated
- Endangered
- Threatened
- Special Concern

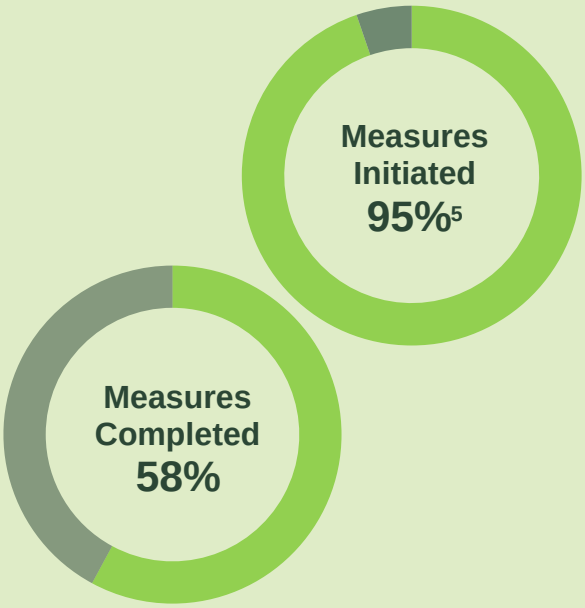
Non SARA-listed species[4]

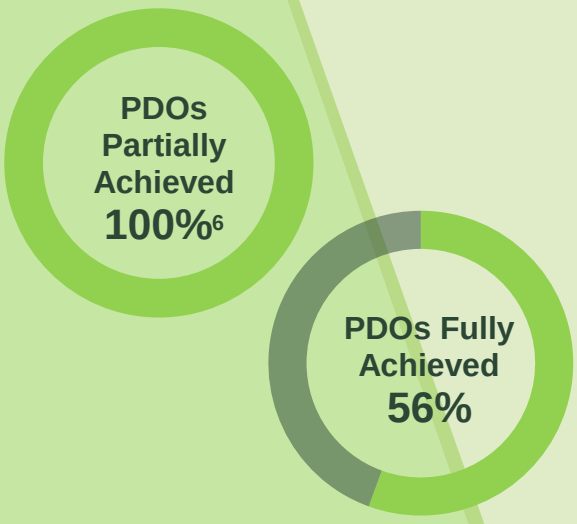
- Species of Conservation Concern

[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

19 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 outlined in Section 2 of this report. During the five-year period, 18 of 19 measures were initiated[5] and 11 were completed. As resources and/or partnerships became available to support the work, an additional 8 measures identified in the action plan were implemented (of which 2 completed).



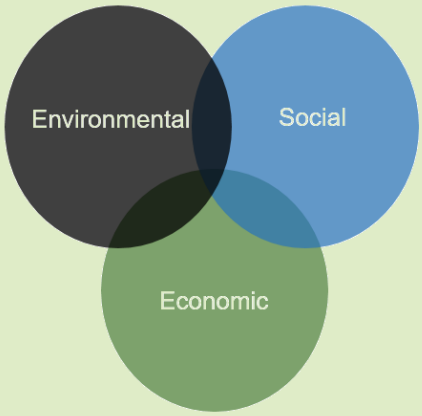


Ecological Impacts

9 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 3. Progress was made on all objectives[6] including 5 that were fully achieved.

Socio-Economic Impacts

Direct costs of implementing this action plan were borne by Parks Canada. Other impacts were created by minor restrictions on visitor activities and conflicts with local communities related to recovery actions for specific species at risk. Benefits included improved park ecological integrity and species at risk habitat, greater species awareness and enhanced engagement of visitors and other Canadians.



[5] Includes measures that are 100% completed
[6] Includes PDOs that are fully achieved

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1. CONTEXT

This document reports on implementation of the Multi-species Action Plan for Grasslands National Park of Canada[7] between 2016-2021 on lands and waters in Grasslands National Park of Canada, assesses the progress towards meeting its population and distribution objectives, and evaluates its ecological and socio-economic impacts. It addresses 22 species, including one Extirpated, five Endangered, and eleven Threatened species (which legally require SARA action plans once a recovery strategy is finalized) and four Special Concern SARA-listed species[8]. It also includes one species of conservation concern with no SARA status that was assessed as Threatened by COSEWIC (Plains Bison).

Recovery actions and population and distribution objectives were focused on 10 species for which Grasslands NP could have the largest impact on species recovery: Black-Footed Ferret, Black-tailed Prairie Dog, Burrowing Owl, Chestnut-collared Longspur, Eastern Yellow-bellied Racer, Greater Sage-grouse, Greater Short-horned Lizard, Little Brown Myotis, Plains Bison and Sprague's Pipit.

2. IMPLEMENTATION OF THE ACTION PLAN

Implementation of the Multi-species Action Plan for Grasslands National Park of Canada is assessed by measuring progress towards completing the recovery measures identified in the action plan (Table 1). See original action plan for threats and recovery measures addressed by each measure. A more detailed description of the implementation of the measures is outlined in Appendix 1.

In 2020 there were several restrictions put in place at Grasslands National Park to combat the spread of COVID-19, including temporary restriction of Resource Conservation monitoring programs and management activities. This has impacted the ability of the park to complete the implementation of some parts of the action plan.

[7] https://species-registry.canada.ca/index-en.html#/consultations/2913
[8] At the time this Multi-Species Action Plan was posted in 2016, there were 1 Extirpated, 5 Endangered, 8 Threatened, and 5 Special Concern SARA-listed species. The plan also included 3 non-SARA listed species of conservation concern at the time it was posted.

Table 1. Progress towards completing recovery measures committed to by Grasslands National Park. A more detailed description of progress made towards completing recovery actions is outlined in Appendix 1.

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Black-tailed Prairie Dog **BTPD 1** *Led by GNP and partner* Habitat Mapping and Decision Support Tool Development: conduct habitat inventory and mapping activities to determine the most suitable areas for optimal prairie dog and sage-grouse habitat. This information will be used to support future habitat restoration activities.	To develop a detailed habitat map for multiple species at risk to provide support for decision making when identifying potential restoration areas.	The habitat mapping and decision support tool was developed comparing current and potential distribution of suitable habitat (assessed using soil, vegetation and terrain variables). Since 2017, this model has been used as a tool to inform and prioritize enhancement of sage-grouse and prairie dog habitat in GNP.	100%
Black-tailed Prairie Dog **BTPD 2** *Led by GNP* Plague Mitigation: implement the sylvatic plague mitigation plan.	To adaptively manage the risk of plague, and ensure at least a 90% probability of persistence of BTPD.	Plague surveillance (i.e., burrow swabbing, opportunistic collection and post-mortem examination of host carcasses) and management (i.e., burrow dusting, distribution of sylvatic plague vaccine baits) have been implemented annually in 2016-2021 (i.e., 6/6 years = 100%). A revised Plague Management Plan has been developed to reflect results of research and active management conducted by Parks Canada and partners.	100%
Black-tailed Prairie Dog **BTPD 3** *Led by Partner* Individual Level Research: support research partnerships to provide fine resolution information at an individual level to better understand demographic factors (reproductive success, recruitment and mortality) contributing to the decline[9] of prairie dogs in Grasslands NP (focused research on one or more colonies in the park).	Within 5 years have an interim data set that will support the development of life tables for this population.	In 2015-2019, with support from Parks Canada, Lane's Lab (University of Saskatchewan) conducted individual-level research on the Walker BTPD colony within GNP. This program assessed demographic rates and investigated factors affecting them (e.g., climatic variation, chronic stress, body condition, sylvatic plague).	100%

[9] The decline the Action Plan referred to had been observed mainly between 2009 and 2013.

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Black-tailed Prairie Dog **BTPD 4** *Led by Partner* Population Level Research: support research partnerships to better understand the population level factors that may be contributing to the current decline of prairie dogs and the long-term viability of this population.	To better understand the prairie dog population long term viability in the park.	Population-level research was conducted by the Calgary Zoo's Centre for Conservation Research in 2016-2021, and helped identify drought as a major limiting factor to BTPD survival and reproduction. Data collected were used within a Population Viability Analysis to inform the species' Recovery Strategy and Action Plan. The recovery action was implemented in 6 of 6 years (achievement=100%).	100%
Greater Sage-grouse **SAGR 1** *Led by GNP* Sage-grouse Friendly Fencing: employ methods such as fence marking, fence removal and/or sage-grouse friendly fencing in priority habitats to improve sage-grouse survival in Grasslands NP.	To reduce risk of sage-grouse mortality related to fence infrastructure in the park.	In 2016-2021, a total of 88.8 km of fences were marked (100% achievement) and an additional 81.9 km were removed (90% achievement) within SAGR critical habitat and priority areas. These two measures were averaged to assess the overall implementation of the recovery action (95% achievement).	95%
Greater Sage-grouse **SAGR 2** *Led by Partner* Habitat Assessment, Mapping and Decision Support Tool: conduct habitat assessment and mapping activities to determine the most suitable areas for optimal nesting and brood rearing sage-grouse habitat. This information will be used as an indicator of sage-grouse habitat health and support future habitat restoration activities.	A detailed habitat map and decision support tool for multiple species at risk to inform key priority sites for restoration.	See recovery action BTPD1	100%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Greater Sage-grouse **SAGR 3** *Led by Partner* Habitat Restoration: implement habitat restoration activities at sites identified as priority areas by the Decision Support Tool, which have the potential to be optimal nesting and/or brood rearing habitat for sage-grouse, which are in the vicinity of existing high quality sage-grouse habitat.	To increase the amount of nesting and brood rearing habitat in the vicinity of lekking areas at identified priority sites.	In 2016-2018, a total of 93.7 ha of priority SAGR habitat (selected also with the help of the Habitat Mapping Tool; see SAGR 2) were enhanced through sagebrush seeding and plug planting at an average density of 0.2 plant/seed per m^2. In 2019, a restoration project was commenced to determine the feasibility of converting hayfields into native sagebrush communities; this first phase entailed program development and site preparation for eventual restoration to native vegetation. Achievement was assessed against a target of 125 ha restored or enhanced (25ha/year over 5 years, see Population & Distribution objective 1b).	74%
Greater Sage-grouse **SAGR 4** *Led by GNP* Best Management Practices: implement best management practices/processes to mitigate, minimize and/or avoid potential impacts of activities on sage-grouse and identified critical habitat (as per the Emergency Protection Order and Recovery Strategy).	To minimize potential adverse effects of activities on sage-grouse and their habitat.	Since 2013, Parks Canada operations and programs have complied with the Emergency Protection Order (SOR/2013-202) and Recovery Strategy for SAGR. A Pre-approved Routine Impact Assessment (PRIA) for prescribed fire in SAGR critical habitat (and other SAR) was completed and approved in 2020; a PRIA for installing signs was also approved in 2020. Overall, the action was implemented in 5/6 years.	83%
Greater Sage-grouse **SAGR 5** *Led by GNP* Beneficial Grazing Practices: Implement beneficial grazing practices/prescriptions to optimize sage-grouse habitat attributes in nesting and brood rearing critical habitat areas.	To make the habitat attributes in priority nesting and brood rearing critical habitat areas optimal for sage-grouse.	In 2016-2021, GNP implemented grazing practices to optimize vegetation attributes in priority SAGR nesting and brood-rearing habitat (i.e., areas within 10 km of active leks). Practices implemented included timed grazing and reduced stocking rates in priority sagebrush areas. Achievement was measured annually based on the implementation of grazing practices (10% value), expansion of grazing management areas or partnerships (5%), and implementation of prescribed fire with specific objectives for improving grazing in sage-grouse habitat (5%).	70%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Plains Bison **PB 1** *Led by GNP* Maintain Conservation Herd Status: maintain the population in conservation herd status through implementation of bison management plans and practices (disease free, genetically pure, 50% sex ratio, IUCN guidelines).	A bison population within a target range of 300 to 350 animals within the reintroduction area that are utilizing the full extent of this area.	Achievement of conservation herd status has been measured according to the following principles: i) implementation of a bison management plan that follows IUCN guidelines; ii) the herd is genetically pure (i.e., no cattle gene introgression); iii) the herd is free of diseases of conservation concern. The conservation herd status was obtained and maintained in 2017- 2021 (5 of 6 years=83%).	83%
Plains Bison **PB 2** *Led by GNP* Investigate Bison Habitat Use: develop fine scale habitat maps using the results from telemetry bison collars to better understand the habitat use of the bison population and their extent of occurrence in the bison reintroduction area, within the context of multi-species at risk management.	A bison population within a target range of 300 to 350 animals within the reintroduction area that are utilizing the full extent of this area.	GNP worked with the University of Saskatchewan to integrate remote sensing and Resource Selection Functions, identify variables that influence bison spatial use, and revise estimates of bison carrying capacity. In combination with data on sustainable stocking rates, this model helped refine the population target (approx. 580 bison) but also identified the potential to for it to be increased to over 1,000 individuals if forage utilization across a greater area of the park was promoted. Moving forward, GNP will test tools to shape bison grazing and increase use outside of the current core range while managing critical habitat for multiple species at risk, such as prescribed fire.	100%
Sprague's Pipit, Chestnut-collared Longspur **SPPI 1/CCLO 1** *Led by GNP* Implement Prescribed Fire/Grazing Management Strategies: Implement prescribed burning/grazing management strategies in a manner that maintains and/or enhances songbird and avian species habitat.	To maximize optimal habitats for Upland Grassland songbirds (Sprague's Pipits and Chestnut-collared Longspur).	Since 2016, GNP implemented a combination of beneficial grazing practices and prescribed fire to optimize habitat for upland grasslands songbirds. To measure the completion of this recovery action, each season was given a maximum of 16.7 % of the total value, with 8.3% each for implementation of targeted grazing practices and prescribed fire in SPPI/CCLO habitat. A 66% achievement was obtained through annual targeted grazing and a total of two prescribed fires.	66%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Eastern Yellow-bellied Racer **EYBR 1** *Led by GNP* Traffic Management Strategy: develop and implement a traffic management strategy for the Ecotour Road to reduce road mortality.	To reduce the road mortality of important SAR species in GNP.	A traffic management strategy was developed to minimize the risk of road mortality for EYBR and other species at risk. Speed signs were deployed in areas identified as wildlife mortality hotspots, based on data recorded in 1995-2016. A standardized monitoring program was initiated and conducted to further improve data collection and inform decision making. While an apparent positive effect of speed signs in mortality hotspot was detected, continuous monitoring efforts will help identify the need for additional or different mitigation options in response to park visitation. Overall, the recovery action was implemented annually in 2016-2021 (6/6 years = 100%).	100%
Black-footed Ferret **BFF 1** *Led by GNP* Continue to evaluate the persistence of ferrets in the park and maintain the potential for future ferret reintroductions.	Maintain the potential for future ferret reintroductions.	Motion sensor cameras were maintained year-round on up to 14 BTPD colonies and used to assess the presence of BFF in GNP. Recovery actions and Population & Distribution Objectives identified for BTPD are intended as stepping stones towards future ferret reintroductions, once adequate BTPD occupied habitat is achieved.	100%
Greater Short-horned Lizard **GSHL 1** *Led by Partner* Investigate GSHL genetic relationships: Explore the genetics between AB and SK lizards and at a finer scale between GNP East and West blocks. (Threat: assumption that populations are all the same genetically and could lose rare genetic diversity if they are not the same).	Understanding of the amount of genetic diversity of GSHL between the East and West Blocks of GNP.	Progress towards completion was measured by assigning a maximum of 50% to each of the two project components: genetic relationships within Canada (i.e., AB *vs*. SK) and within GNP. A total of 87 and 51 lizards sampled during 2009-2018 in AB (12 locations) and SK (3 locations), respectively, were successfully genotyped at eight microsatellite loci. Analysis of genetic structure revealed that GNP populations form three distinct genetic clusters (West Block northwest, West Block southeast and East Block) with little gene flow among them (Paszkowski et al., *in prep*). Further research is required to understand whether this relative isolation is the result of a geographic barrier (i.e., habitat fragmentation).	100%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Greater Short-horned Lizard **GSHL 2** *Led by Partner* Identify new populations in previously unsurveyed areas in the East Block and newly acquired lands in the West Block.	Comprehensive identification of populations and critical habitat in GNP.	Occupancy of GSHL habitat in GNP has been monitored through a 5 year-rotation panel (see Table 3). No GSHL occupancy was opportunistically detected in previously unsurveyed areas. Due to limited operational resources, no additional surveys have taken place in previously unsurveyed areas.	0%
Mormon Metalmark **MOMO 1** *Led by Partner* Ground truth the MOMO predictive critical habitat model: 1) Use ground-truthed data from summers 2013 and 2014 to refine the predictive MOMO habitat model; 2) Determine differences between occupied and unoccupied MOMO habitat which will assist in the creation of a more robust habitat model so that unoccupied habitat is not considered critical habitat.	Refined critical habitat model for Mormon Metalmark.	Ground-truthing and validation of the predicted critical habitat model was conducted in 2013-2014. Over 400 new geo-referenced observations of the species were collected, bringing the total extent of predicted habitat within GNP to 4214 ha. On-the-ground surveys seem the most efficient means of further expanding known MOMO habitat and should continue, along with efforts to improve the predictive model.	100%
Little Brown Myotis **LBMY 1** *Led by GNP* Investigate site use: Identify structures in the park being used by LBMY and ensure their continued occupancy. If buildings being used by bats are to be decommissioned, alternate structures (i.e. bat houses) will be provided if necessary. If bat houses are mounted on poles, then anti-perch mechanisms will have to be installed on top as well. If bat boxes are not used by any bat populations, then they will be removed in a reasonable time frame.	To maintain occupancy of LBMY in GNP and ensure suitable roosting and maternity sites are available.	National Best Management Practices for Management of Bat Maternity Roosts in Built Assets have been developed and followed since 2016. Where applicable, removal of buildings followed surveys conducted to confirm the absence of a maternal roosts and during the appropriate window (after September 1st). Overall, the measure was implemented in 6/6 years (total completion=100%).	100%
ALL 1 *Led by GNP* Invasive Species Management: prevent expansion or reduce the current distribution of invasive species that impair the quality of species at risk habitat.	To reduce the risk that invasive species have on key species at risk habitats.	A management program for non-native plant species was conducted annually in 2016-2021. An Invasive Plant Management Plan was developed and approved in 2020, and will guide Invasive Alien Plant surveillance and management for the next 5 years.	100%

Additional measures were identified in the action plan that would be completed should resources become available within the five-year timeframe. Table 2 describes the actions that Grasslands National Park was able to initiate during 2016-2021. Measures from the action plan that were not completed or initiated will be carried forward for consideration in a revised 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). A more detailed description of progress made towards completing recovery actions is outlined in Appendix 2.

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Black-tailed Prairie Dog BTPD 6 Habitat Restoration: facilitate the establishment of new colonies and the expansion of existing prairie dog colonies once the prairie dog population reaches its long-term average (using range of methods such as: fire/grazing/ revegetation/ translocation). Use habitat mapping and decision tool to prioritise areas for restoration.	Expand prairie dog occupancy at existing occupied prairie dog colonies by 10% through Measure # BTPD 5, and an additional 20% increase through BTPD 6 in new areas through the establishment of new colonies of suitable habitat within 15 years.	Progress towards completion was measured by looking at the number of management actions and habitat mapping/assessment projects completed to promote the expansion of existing BTPD colonies or identify priority areas for their creation. In 2015-2021, 85 ha of previously cultivated land between two BTPD colonies had a variety of management actions applied to make progress towards restoring native vegetation (e.g., mowing, spraying, prescribed fire, native seeding). In 2020, a Habitat Suitability Index and field protocols were developed to rank the habitat suitability for expansion and creation of BTPD colony within GNP. A second habitat management project was not completed. Total measure completion was 2/3 (66%).	66%
Black-tailed Prairie Dog BTPD 7 Population Genetic Assessment: to determine the genetic makeup of prairie dog populations in the geographic region (including Canada and Northern Montana) and assess the potential for founder populations that could be genetically compatible to Grasslands.	To have collected information on which populations in the geographic region may be genetically compatible to the Grasslands population.	Preliminary results using hair samples collected from eight colonies indicated that the Canadian BTPD population is amongst the most genetically depauperate across the species range. Furthermore, data on population genetic structure and inbreeding levels are suggestive of high genetic isolation from populations in the USA. Further research using higher resolution data is required to assess the need of genetic rescue of the population, and if applicable, the genetic compatibility with other populations.	100%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Greater Sage-grouse SAGR 6 Collaborate with Partners to Increase/Stabilize the Sage-grouse Population: Collaborate with partners such as the Calgary Zoo to support methods (i.e., captive breeding or rearing, egg collection, augmentation and translocation efforts) to stabilize/increase the population of sage-grouse in GNP over the next 5 years.	To establish a captive bred population that can be used to augment and stabilize/increase the GNP population over the next 5 years.	In 2016-2017, Grasslands National Park joined a program led by the Calgary Zoological Society and helped establish a captive-breeding population of SAGR to be used for future augmentation programs aimed to stabilize and increase the SAGR population in Canada. A total of 32, 39, 5 and 12 captive-reared birds were released in 2018, 2019, 2020 and 2021, respectively. As of fall 2021, total measure progress is 75% (50% for establishment of captive population, and 25% for release of at least 24 birds in 2018 and 2019 releases), although more birds are expected to be released in spring 2022.	75%
Greater Sage-grouse SAGR 7 Investigate the role predators play in the decline of sage-grouse.	To better understand the factors contributing to the predation of sage-grouse and implement actions to reduce predation, where feasible.	Progress was assessed based on two key components, each weighed 50% of total measure completion: 1) Understand the impact of predators on SAGR. Progress was quantified to reflect the number of SAGR life stages (i.e., nest, brood, adults) for which the role of predation has been assessed, with each life stage contributing to 1/3rd (33%) of the value. This was achieved through a field study assessing predation rates on artificial SAGR nests (2016-2017) and adult captive-reared SAGR released in 2018-2020 (contribution of this program component= 50% x 2/3 =33%). 2) Develop and implement evidence-based program(s) to reduce the risk of predation on SAGR. This was fully achieved through a perch deterrent program, framed within the principles of effectiveness monitoring and within an adaptive management framework. Total progress toward measure completion was 83%.	83%
Greater Sage-grouse SAGR 8 Shelterbelt/Outbuilding Decommissioning/modification: Decommission old shelterbelts and unused outbuildings, as opportunities arise, that may	To increase habitat suitability and reduce the mortality of sage-grouse from predation related to roosting and cover areas.	In 2020, GNP began a three-year program to improve the quality of otherwise suitable SAGR critical habitat and help reverse landscape changes caused by human activities. In Fall 2020, Parks Canada rerouted and removed nearly 11 km of overhead power lines running through the West Block, among the tallest vertical features present in the park. Along with removal of	99%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
provide artificial predator roosts, attract other non-native species (raccoons, Ring-necked pheasants, etc.) near critical habitat areas, or cause habitat avoidance by sage-grouse.		other vertical features and deployment of perch deterrents on selected road signs, an estimated 633 ha of previously impacted SAGR critical habitat in the park's West Block were restored (99% achievement over a 635 ha target). In the amended Species at Risk Action Plan, this target may be revised to reflect feasibility within a longer-term (e.g., 10-year target).	
Plains Bison **PB 3** Feasibility of Herd Expansion: investigate the potential to expand the area that bison occupy in the park (Dixon/Walkers and East Block).	Determine the feasibility of expanding the bison range and increasing the total bison population in the park. (Goal of establishing a population of 1000 bison as per IUCN guidelines).	Current bison population target was assessed accounting for local vegetation biomass productivity and energetic requirements for GNP bison. Numbers obtained were validated integrating remote sensing and bison resource selection function. A developing partnership with WWF Northern Great Plains will help re-assess vegetation productivity in the current bison enclosure and the adjacent land (expected year of completion: 2023). Starting in 2019, GNP has designed a program to test the use of fire as a tool to shape bison grazing patterns and inform management decisions with respect to herd expansion. Based on four project components, total measure progress is 1/4 (25%).	25%
Burrowing Owl **BUOW 1** Improve Burrowing Owl Survival and Reproductive Success: Seek partnerships to investigate the feasibility of implementing practical approaches to improve the reproductive performance, survival, and site fidelity of Burrowing Owls in GNP. Also implement mitigations to minimize visitor or researcher disturbance of nesting owls, and conduct supplemental feeding when necessary.	To improve BUOW reproduction, survival, and site fidelity.	In 2016-2021 (progress toward completion: 100%), GNP implemented a supplemental feeding program for BUOW in the park. Data collected indicated that on average, nests supplementally fed produced a higher number of fledglings than those that were not (5.94±1.58 *vs.* 4.65 ± 1.63), and that overall nesting success during supplemental feeding years was also higher than that recorded before the feeding program was implemented (93.2% *vs.* 72.4%). Supplemental feeding has a positive impact on BUOW reproductive success and recruitment on breeding grounds, potentially contributing to at least slowing down the local population decline, if not also to the population rebound observed in 2020-2021. This active management program will be continued as long as operational resources allow, or until new data suggest otherwise.	100%

Species and measure	Desired outcome	Progress towards outcome	Progress (% complete)
Greater Short-horned Lizard GSHL 3 Determine Wintering Site Requirements: Identify wintering site requirements to assist in evaluating potential effects of climate change (inclement or extreme weather conditions are a threat to GSHL in the current Recovery Strategy).	Understanding of the vulnerability of GSHL during the winter hibernation period. This life stage (overwintering) is thought to contribute to high GSHL mortality.	A research project on microclimate selection in overwintering GSHL commenced in 2021 (GRA-2021-39539), in coordination with GNP. Using visual surveys, temperature data loggers, snow depth measurements and a Digital Elevation Model, the project aims to understand the risks climate change to species survival. Progress toward completion was quantified by attributing 25% for study design and 75% for data collection (25% for each year over a 3 year period).	25%

3. 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 these species is outlined in Appendix 3.

Table 3. Progress towards achieving site-based population and distribution objectives for species at risk in Grasslands National Park of Canada. "N/A" stands for not applicable.

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population & distribution objectives	Progress (% achieved)
Black-footed Ferret (BFF)	1. Increase the amount of ferret/prairie dog habitat to 900 ha by 2019 and 1200 ha by 2025.	1. Map colony perimeters every 2 years.	1. Extent of Black-tailed Prairie Dog colonies in the park was monitored through perimeter mapping every 2 years. The 5-year moving average of the measure value was 972.2 ha (100% achievement of 2019 target).	100%
	2. Reintroduce ferrets when there are a minimum of 10 prairie dogs per hectare of colony (in addition to meeting objective 1 above) to meet the breeding requirements of ferrets.	2. After future reintroductions have a 2 week spotlighting/live trapping survey every summer-fall.	2. BFF reintroduction is not feasible at this time. Furthermore, thresholds previously identified have been revisited based on new knowledge and will be incorporated in the amended plan.	n/a

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population & distribution objectives	Progress (% achieved)
Black-tailed Prairie Dog (BTPD)	1. Average area of colony = 900 ha by 2019 and 1200 ha by 2025.	1. Map colony perimeters every 2 years.	1. Extent of BTPD colonies in the park was monitored through perimeter mapping every 2 years. The 6-year moving average of the measure value was 1046.3 ha (100% achievement).	100%
	2. Average density in unadjusted visual counts of greater than or equal to 10 animals/ha.	2. Estimate density with visual counts on sample plots every year.	2. BTPD density was estimated through visual counts conducted annually on 4 hectares-plots distributed across 8-14 colonies. The 2016-2021 density averaged 18.8 animals/ha (100% achievement).	100%
Burrowing Owl (BUOW)	Maintain the number of nesting pairs in the range of 20 to 40 pairs on prairie dog towns.	Record the number of nesting pairs observed initiating a nest during May, as well as the number of young successfully fledged in July.	Number of breeding pairs was monitored annually on 13 Black-tailed Prairie Dog colonies. The 2016-2021 moving average of the measure value was 21.8 nests (100% achievement)	100%
Chestnut-collared Longspur (CCLO)	Maintain >47 Chestnut-collared Longspurs per 100 ha.	Conduct point counts at least once every 2 years in critical habitat managed for optimal habitat conditions.	In-person point counts were conducted in 2018-2019 in sites managed with targeted grazing. Adjusted density of CCLO (i.e., correcting for probability of detection) was equal or above the target density in eight of 22 reference plots, thus resulting in a 36% achievement. Moving forward, a new monitoring program will be developed to include both in-person counts and Autonomous Recording Unit data collected in critical habitat managed through prescribed fire and beneficial grazing.	36%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population & distribution objectives	Progress (% achieved)
Eastern Yellow-bellied Racer (EYBR)	Maintain occupancy at known hibernacula and any newly-discovered hibernacula.	Opportunistically record sightings (including road kill) and confirm continued occupancy of over-wintering hibernacula at least once every 5 years.	Baseline data for EYBR occupancy were acquired through trail camera and in-person surveys at all previously known and newly identified dens (monitoring achievement=100%). Occupancy rate of EYBR at surveyed dens was 52.3%. Moving forward, an occupancy rate target (e.g., >80%) of known occupied hibernacula may be identified as the new Population and Distribution Objective.	100%
Greater Sage-grouse (SAGR)	1. (a) Immediate objective (next 5 years) to prevent the extirpation of sage-grouse from GNP; (b) restoration of 25 ha/yr of sage-grouse habitat.	Annual spring lek counts on active leks and revisit inactive leks opportunistically.	1. (a). Maximum number of SAGR males attending active leks in GNP (both East and West blocks) was monitored on an annual basis (April 1-30) according to a standardized protocol. Site occupancy was continuous during 2016-2021 (100% achievement). *For 1 (b), see recovery action SAGR 3 on Table 1 (page 4).*	100%
	2. Short term (6-10+ years): demonstrate increasing trend in the number of lekking males.		2. Measure value was scored as 0% (decline), 50% (no trend), and 100% (increase). No statistically significant trend in number of males was recorded in 2016-2021 (therefore, measure value=50%).	50%
	3. Long term (20+ years): Increase the numbers of mating areas to 6 - 8 leks and the total population to 300 to 400 individual birds (100 to 133 males).		3. Progress was assessed by proportionally re-scaling the long-term target to 2021 (reporting cycle), resulting in 66.6% (component a: number of leks) and 47.7% (component b: number of males), respectively, for a total (average) achievement of 57%.	57%

Species	Site-based population & distribution objectives	Population monitoring	Progress towards site-based population & distribution objectives	Progress (% achieved)
Greater Short-horned Lizard (GSHL)	Maintain occupancy on known occupied habitat and any newly discovered occupied habitat.	Confirm continued occupancy and assess habitat quality by annually visiting a minimum of 5-10 occupied patches spatially distributed across the park. Rotate between all known occupied locations. Assess habitat and remove invasive species when possible.	GSHL population surveys within representative critical habitat were completed in 20/25 (80%) habitat units identified in the monitoring program. Within sampled areas, habitat occupancy rate was 95%. Moving forward, an occupancy target (e.g., >80%) of known occupied habitat units may be identified as the new Population and Distribution Objective.	80%
Little Brown Myotis (LBMY)	Maintain occupancy in the park.	Conduct ultrasonic surveys using bat detectors, and survey known roosting sites in the park for bats once a year.	Building inspections, acoustic monitoring and mist-netting captures were conducted in 2018-2019 at a total of 16, 8 and 8 sites, respectively. One maternal roost of LBMY was identified in 2018, and confirmed occupied through annual monitoring in 2019-2021 (100% achievement).	100%
Sprague's Pipit (SPPI)	Maintain >45 Sprague's Pipits per 100 ha.	Conduct point counts at least once every 2 years in critical habitat managed for optimal habitat conditions.	In-person point counts were conducted in 2018-2019 in sites managed with targeted grazing. Adjusted density of SPPI (i.e., correcting for probability of detection) was equal or above the target density in nine of 18 reference plots, thus resulting in a 50% achievement. Moving forward, a new monitoring program will be developed to include both in-person counts and Autonomous Recording Unit data collected in critical habitat managed through prescribed fire and beneficial grazing.	50%

4. 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 MSAP for GNP, described as costs and benefits, are outlined below.

Costs

The total cost to implement the action plan was borne by Parks Canada out of applicable appropriations. This includes measures outlined in the action plan in Appendices B (i.e., conservation and recovery measures that will be conducted by GNP and/or partners) and C (i.e., other conservation and recovery measures that will be encouraged through partnerships or when additional resources became available). Many of the proposed measures were integrated into the operational management of Grasslands National Park. These costs to the government were covered by prioritization of appropriate funds at the site and thereby did not result in additional costs to society. Internally, a significant

proportion of salaries and operational costs associated with Species at Risk monitoring and recovery actions was sought and obtained through various funding streams through competitive processes within Parks Canada, since it could not be covered within the regular funding available for operations.

Additional resources or partnerships were sought to support the measures outlined in Appendix 2 within this report; in-kind contribution was provided by the Calgary Zoo, the University of Saskatchewan, the University of Alberta, the Saskatchewan Ministry of Environment, the Canadian Wildlife Health Cooperative, the Public Health Agency of Canada, and the U.S. Fish and Wildlife Service.

The action plan applies only to lands and waters in GNP and the national historic sites (Fort Walsh and Cypress Hills Massacre), and did not bring any restrictions to land use outside the site. However, restrictions were placed on visitor activities on park lands and waters to protect and recover species at risk, such as temporary area closures for Greater Sage-grouse and Burrowing Owl, or temporary speed reduction zones for Eastern Yellow-bellied Racer and Black-tailed Prairie Dogs. Area closures were also put in place to ensure public safety during operations required by active management, such as prescribed fire, herbicide (invasive alien plant species) or insecticide (sylvatic plague management) application. In addition, while not a direct result of its implementation, this action plan promoted compliance with the Emergency Order for the Protection of the Greater Sage-grouse, which identifies seasonal and year-round restrictions, including but not limited to vehicular traffic, operation of equipment or infrastructure development.

While direct costs of actions in the plan were incurred by Parks Canada, plan activities resulted in local social-economic impacts related to conflict with species at risk management, and in particular of Black-tailed Prairie Dogs. Municipal governments and ranchers dispute the necessity of expanding the active range of the species, the accuracy of supporting data, the impacts the species has on their economic activities, and have not been therefore supportive of management actions for its recovery. Parks Canada has committed to continue to work with local communities towards reducing conflicts related to Black-tailed Prairie Dogs and other species.

Benefits

Measures presented in the action plan for GNP contributed to meeting recovery strategy objectives for Threatened and Endangered species, and also contributed to meeting management objectives for species of Special Concern. The measures sought a balanced approach to species recovery,

and included active management to reduce or eliminate threats to populations or habitat (e.g., control of invasive species, removal or mitigation of sources of mortality or injury, restrictions of human activities within areas occupied by the species), research and monitoring to inform species or habitat management, potential species re-establishment, and increasing public awareness and stewardship (e.g., signage, visitor programs, and highlights in communication media).

Working with partners and volunteers, staff enhanced over 90 hectares of Greater Sage-grouse habitat, and minimized the risk of Greater Sage-grouse mortality by removing or marking more than 150 km of fences. A sylvatic plague management program was developed and implemented to increase the probability of persistence of the only wild Canadian population of Black-tailed Prairie Dog, which provides resources for many other species at risk (e.g., Ferruginous Hawk, American Badger, Burrowing Owl, Mountain Plover, Tiger Salamander, Prairie Rattlesnake, Swift Fox).

By applying prescribed fires over 400 hectares, implementing a beneficial cattle grazing program, and controlling invasive alien plant species, quality of species at risk habitat was improved and optimized. Park staff also successfully established and implemented a scientifically sound program for the management of a disease-free, genetically pure, Plains Bison conservation herd.

These and other measures had an overall positive impact on ecological integrity, and may have resulted in broader benefits to Canadians, such as positive impacts on the value individuals place on preserving biodiversity and contributed to efforts to increase visitor and public awareness.

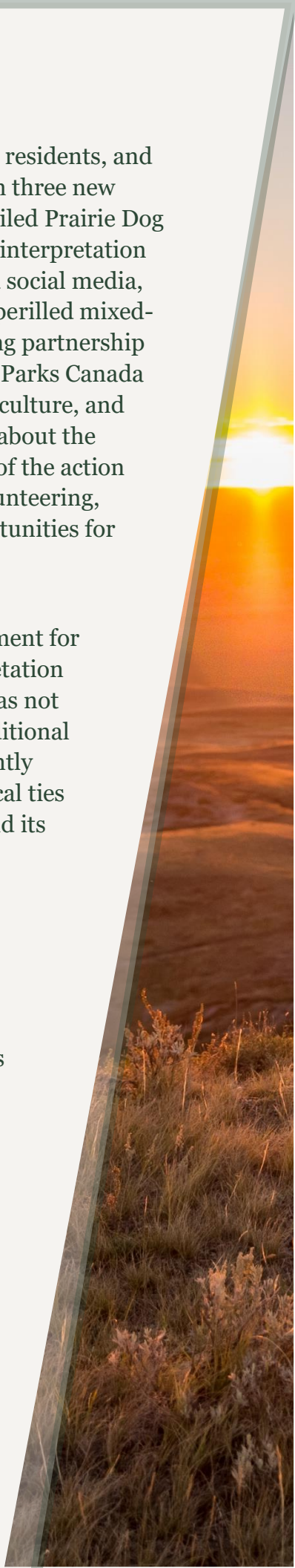
Potential economic benefits of the recovery of the species at risk found in GNP cannot be easily quantified, as many of the values derived from wildlife are non-market commodities that are difficult to appraise in financial terms. Wildlife, in all its forms, has value in and of itself, and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons. The conservation of wildlife 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.

Implementing this action plan had positive benefits for park visitors, local residents, and Indigenous groups. By combining conservation actions on the ground with three new volunteer programs (sagebrush plug planting and fence marking, Black-tailed Prairie Dog ecosystem research, Greater Short-horned Lizard Monitoring), delivering interpretation programs, and disseminating conservation stories through traditional and social media, the implementation of this plan fostered a greater appreciation for the imperilled mixed-grass prairie ecosystem and its multiple species at risk. Through developing partnership and the transfer of Plains Bison from GNP to Wanuskewin Heritage Park, Parks Canada also continued its efforts for renewing connections to Indigenous Peoples culture, and created new opportunities for visitors, neighbours and the public to learn about the ecological and cultural importance of this iconic species. In the new cycle of the action plan, GNP will consider setting communication (e.g., public outreach, volunteering, social media) and visitor experience-related targets, so to maximize opportunities for integrated delivery and enhance tracking progress in those areas.

Local knowledge was taken into consideration and incorporated in the implementation of this plan, in particular with respect to habitat management for species at risk (including both beneficial grazing and prescribed fire), vegetation restoration and bison management. While consensus with stakeholders was not always achieved, GNP is committed to improving its ability to include traditional knowledge into future species at risk management. Parks Canada is currently working to identify Indigenous groups who have both cultural and historical ties to the Park and its ecosystem and interest in engagement with the Park and its programs.

Summary

The measures proposed in the action plan placed no restrictions on lands outside the boundary of the national park, but generated local conflicts, which Parks Canada will continue to work with local communities towards improving. Direct costs of implementing this action plan were borne by Parks Canada. Benefits included positive impacts on park ecological integrity, greater awareness of species and enhanced opportunities for engagement of visitors, local communities and Indigenous groups.



Appendix 1: Technical Compendium – Recovery Measures (committed)

Black-tailed Prairie Dog (BTPD)

BTPD 1 and SAGR 1 – Habitat Mapping and Decision Support Tool

Habitat suitability for Black-tailed Prairie Dog (BTPD) was analyzed by comparison of soil and terrain variables between used areas (i.e., current colonies) and unused areas. The resulting model was used to rank habitats based on their physical suitability for BTPD colonies.
Habitat suitability for Greater Sage-grouse (SAGR) habitat was assessed through detailed mapping of vegetation cover-types (i.e., amount and distribution of sagebrush cover, distribution of meadows and bare soil) in valley-bottoms throughout the park. Agricultural land conversion, roads, and vertical structures were also mapped, to identify areas in which use of the natural habitat may be impaired by anthropogenic impacts. The current distribution of sagebrush stands was compared to their potential distribution based on soil suitability. This analysis highlighted areas that could support dense sagebrush stands but currently lack them, typically because of former agricultural land conversion.
We identified areas that ranked high for BTPD but low for SAGR, and others that ranked high for SAGR but low for BTPD. Conflict between management objectives can be minimized by setting habitat targets reflecting the higher-ranked species in each selected area. A Geographic Information System-based Decision Support Tool was developed to help identify sites for habitat enhancement and restoration projects.
Since 2017, this document has been used as a tool to inform decisions regarding SAGR and BTPD habitat management in GNP.

BTPD 2 – Plague Mitigation

Plague surveillance (i.e., burrow swabbing, opportunistic collection and post-mortem examination of Black-tailed Prairie Dog (BTPD) and Richardson's Ground Squirrel carcasses) and management (i.e., burrow dusting, distribution of sylvatic plague vaccine baits) have been implemented annually in 2016-2021 (i.e., 6/6 years = 100%). A revised Plague Management Plan has been developed to take into account data collected in 2013-2017 by Parks Canada and partners on BTPD population dynamics, plague surveillance and management[10,11]. Our analyses suggested that sylvatic plague in GNP is maintained at an enzootic level (i.e., chronic presence affecting a low proportion of individuals) with no evidence of widespread mortality, at least partially due to reduced flea activity after spring, low prevalence of *Yersinia pestis* in flea samples, and relatively low BTPD densities. Nonetheless, reducing flea prevalence through insecticide application had a positive effect on BTPD abundance, suggesting that enzootic plague may be causing chronic mortality. In interaction with small population size and climate change, sylvatic plague therefore poses a sufficiently substantial long-term threat, which requires continued monitoring and an adaptive approach to plague mitigation measures. Moving forward, the strategic combination of a rotational plan for burrow dusting with distribution of sylvatic plague vaccine baits will help prevent plague outbreaks, minimize the risk of zoonotic transmission, unwanted impacts on the invertebrate community and the risk of flea populations developing insecticide resistance.

[10] Peer-reviewed paper on Ecosphere: https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.3138.
[11] Photogallery: https://esajournals.onlinelibrary.wiley.com/doi/10.1002/bes2.1741


Figure 1. Sylvatic plague surveillance and management in Grasslands National Park. Parks Canada staff conducting burrow swabbing to assess and monitor temporal variation in flea abundance, as well as prevalence and circulation of *Y. pestis* in the Canadian black-tailed prairie dog ecosystem (A) Photo credit: H. Kirk/Parks Canada. Sylvatic Plague Vaccine (SPV) baits ready for distribution in the field (B). Photo credit: S. Liccioli/Parks Canada

BTPD 4 – Population level research

Population-level research was conducted by the Calgary Zoo's Centre for Conservation Research in 2016-2019, in partnership with Parks Canada. This work helped understand that drought is a major driver of Black-tailed Prairie Dog survival and reproduction, and confirmed climate change as a threat that can severely impact the long-term persistence of the Canadian population. Data collected were used within a Population Viability Analysis to inform species recovery planning and management (i.e., species' Recovery Strategy and Action Plan). In 2020, research on Black-tailed Prairie Dog population dynamics at the park scale was suspended due to COVID-19. However, mitigation translocation of dispersing individuals to the edge of an existing colony allowed us to continue to collect data on individual survival and reproduction, and further our understanding of the species' ecology. Mark-recapture work resumed in 2021. The recovery action was implemented in 6 of 6 years (achievement=100%).

SAGR 1 – Sage-grouse friendly fencing

Throughout 2016-2021, GNP implemented three strategies for reducing Greater sage-grouse (SAGR) collisions and mortality including permanent fence removal, temporary fence removal (i.e., laying down fence wires during breeding season), and increasing visibility of fence wires through fence marking (installing 3" strips of vinyl siding to the top 2 wires). Specific targets were identified for permanent fence marking and fence removal.
A total of 41.2 km of fences were marked in 2015-2018 (average 2015-2018=10.31 km/year), fulfilling targets identified by a concurrent CoRe project. Starting in 2019, a new target was established to continue improving SAGR habitat. The target was set by applying the 2015-2018 average over the 2019-2021 period, and aiming to mark>66% of the annual average (i.e., 0.66 x (10.31 x 3) = 20.41 km; total 61.6 km). An additional 29.1 km and 18.5 km of fences were marked in 2019 and 2020, respectively, for a total achievement of 88.8 km (100% achievement). The fence marking program largely relied on the efforts and contribution of GNP's friends and volunteers.
Similarly to fence marking, a previous CoRe target for fence removal was fully achieved by decommissioning a total of 60.9 km of fences (average=15.2 km/year). Starting in 2019, a new

target was established to continue improving SAGR habitat; applying the 2015-2018 average over the 2019-2021 period, the new target was set at 91 km. 2.2, 4.8 km and 14 km of fences were removed in 2019, 2020, and 2021 respectively, for a total of 81.9 km (90% achievement). These two measures were averaged to assess the overall implementation of the recovery action, which resulted in a total 95% achievement.

Figure 2. A volunteer installing 3" strips of vinyl siding to the top two barbed wires of a fence within Greater Sage-grouse critical habitat in Grasslands National Park, summer 2018. Photo credit: L. Gardiner/Parks Canada

SAGR 3 – Habitat Restoration

A habitat enhancement and restoration program was developed and implemented to increase quality and amount of Greater Sage-grouse (SAGR) nesting and brood-rearing habitat. A target of 125 ha (25 ha/year over 5 years) was set to reflect Population and Distribution Objectives identified for the species (see PDO 1b in Section 3).
For habitat enhancement, sites were selected with the help of the Habitat Mapping Tool (see recovery action SAGR 2) and based on a variety of factors including known use by SAGR, proximity to leks, access and the highest potential for establishment of dense sagebrush stands. In 2016-2018, a total of 93.7 ha of SAGR habitat was enhanced through sagebrush seeding and plug planting at an average density of 0.2 (+/- 0.15) plant/seed per m^2.
In 2019, a restoration project was commenced to determine the feasibility of converting formerly cultivated land (i.e., hayfields) into native sagebrush communities. This first phase entailed program development and site preparation, but not active seeding of native vegetation.
Combining both habitat enhancement and restoration components, the overall completion of this recovery action was 74%.
In the long term, the hayfield restoration program will include invasive plant control and seeding or planting of native seeds/plugs, with goals of increasing the amount of suitable SAGR habitat in the vicinity of lekking sites, and helping to inform land-use planning and multi-Species at Risk habitat management within GNP.

SAGR 5 – Beneficial Grazing Practices

Since 2016, GNP implemented beneficial grazing practices to optimize vegetation attributes in priority Greater Sage-grouse (SAGR) nesting and brood-rearing habitat (i.e., areas within 10 km of active leks). Practices implemented included timed grazing and reduced stocking rates in priority sagebrush areas. Overall achievement was measured by weighing the integration of grazing practices, expansion of grazing management areas or partnerships, and implementation of prescribed fire with specific objectives for improving grazing in SAGR habitat. The degree of completion of this recovery action was measured by assigning to each year of implementation a maximum value of 20%, partitioned as follows: 10% for conducting beneficial grazing; 5% for increasing the area in which beneficial grazing is being conducted (e.g., through enhanced grazing partnerships, prescribed fire, etc.), and 5% for conducting a prescribed fire that supported or promoted beneficial grazing in SAGR habitat. Beneficial grazing practices were implemented annually, while expanded agreements and prescribed fire were implemented in 2016, 2017 and 2019, for a total achievement of 70%. Moving forward, GNP will try to quantify areas targeted by different management tools (e.g., number of ha) and refine the measure so that degree of achievement can be quantitatively expressed.

Figure 3. Parks Canada staff and local ranchers on horseback moving cattle used to help optimize vegetation attributes in priority Greater Sage-grouse nesting and brood-rearing habitat. Photo credit: C. Reed/Parks Canada

PB 1 – Maintain Conservation Herd Status

Plains Bison were reintroduced to GNP in 2005, with the main objective of restoring grazing as an ecological process. Since 2016, monitoring of population size, sex and age structure, diseases and parasitism, genetic variation and space use were framed into an adaptive management program aimed to maintain a disease-free, genetically pure and diverse bison conservation herd. This status has been reached and maintained in 2017-2021 (5 of 6 years=83%), according to the following principles: i) implementation of a bison management plan that follows guidelines set by the International Union for Conservation of Nature (IUCN); ii) the herd is determined to be genetically pure (i.e., no cattle gene introgression); iii) the bison herd is determined to be free of diseases of conservation concern. Specifically, in 2017 GNP approved a Management Plan to

adhere to IUCN principles for population surplus and management, and included routine slaughter disease testing to confirm and monitor disease-free status. As of 2019, no Brucellosis, bovine Tuberculosis or *Mycoplasma bovis* have been reported in the GNP herd. Analysis on 252 hair samples conducted in 2017-2019 confirmed no cattle genetic introgression, and allowed us to estimate a heterozygosity of ~ 0.62, among the highest recorded for bison herds across North America.

Figure 4. Bison on the calving grounds within Grasslands National Park, summer 2021. Photo credit: S. Liccioli/Parks Canada

PB 2 – Investigate Bison Habitat Use

Although bison space use was taken into account when determining the 2017-2019 population management target, it was not used to identify strategies for multi-species habitat management. In 2020, GNP worked with the University of Saskatchewan to integrate remote sensing, Geographic Information System (GIS), and Resource Selection Functions (RSFs), examine variables that were predicted to be related to bison spatial use, and return a more comprehensive estimate of bison carrying capacity. Factors of relevance to the RSFs included vegetation landscape units, slope, distance to water, fence and roads. In particular, bison selected for upland and sloped grasslands (probability of use=0.61 and 0.57, respectively), which were characterized by the highest forage biomass (3,200 and 3,153 kg/ha, respectively), and avoided roads and fences during the growing season. While this model overall identified a carrying capacity estimate in line with sustainable stocking rates applicable for GNP ecological sites (approx. 580 bison), it also identified the potential for it to be increased to over 1,000 individuals if space use and forage utilization across a greater area of the park were promoted. Moving forward, GNP will test tools to shape bison grazing and increase use outside of the current core range while managing critical habitat for multiple species at risk (e.g., prescribed fire) and continuing to refine RSF models within an adaptive management framework.

EYBR 1 – Traffic Management Strategy

A traffic management strategy was developed in 2016 to minimize the risk of road mortality for Eastern Yellow-bellied Racer (EYBR) and other species at risk (e.g., Black-tailed Prairie Dog, Burrowing Owl, Prairie Rattlesnake). In 2017, speed signs were deployed in areas identified as wildlife mortality hotspots, based on kernel analysis of all road mortalities recorded in GNP in 1995-2016. A standardized monitoring program was initiated to further improve data collection and inform decision making with respect to mitigation of road mortality. When comparing years with similar visitation rates (i.e., 2016 and 2018), we documented a -66% *vs*. +25% change in road mortalities in hotspots with and without speed signs, respectively, suggesting that signs were effective in reducing road mortalities. Furthermore, despite an increase of road mortality throughout the park in 2017 – likely linked to a 36% increase in visitation during Canada 150 year - the rate of increase in road mortality was much higher for sites where signs were not installed (300% *vs*. 77%).
While a positive effect of speed signs in mortality hotspots is apparent, mortalities in these zones have continued to occur throughout the reference period, thus suggesting some improvements may be necessary to further mitigate the impact of traffic on sensitive wildlife. Continuous monitoring efforts will help identify the need for additional or different mitigation options and assess changes in the number of road mortalities in response to park visitation. A citizen science and education program was launched in 2021 to increase data available (e.g., snake crossings) and help further reduce snake mortalities on roads. Overall, the recovery action has been implemented annually in 2016-2021 (6/6 years = 100%).

Figure 5. A speed reduction sign installed by a wildlife road mortality hotspot identified on Ecotour road within Grasslands National Park's West Block. Photo credit: J. Crowe/Parks Canada.

MOMO 1 – Ground truth the predictive critical habitat model

Ground-truthing of the predicted Mormon Metalmark (MOMO) critical habitat model was conducted over two summers (2013 and 2014), and final report finished in 2015. The predictive model developed by Wick (2013) was first validated, particularly with regards to its accuracy in previously unsurveyed regions in the West Block of GNP. Second, over 400 new geo-referenced observations of the species were collected (of which 235 in the newly acquired lands) and added to the model. Using a 222 m buffer radius, this nearly doubled known occupied MOMO habitat in West Block, bringing the total to 4214 ha (12% of all badlands habitat) across all areas of GNP.

Overall, the predictive model appeared to be somewhat successful at identifying the poorest habitat, but still not very effective in pinpointing higher probability locations. Given limited time and resources, and considering the inconsistent performance of the predictive model as currently parameterized, on-the-ground surveys seem the most efficient means of further expanding known MOMO habitat in the short term. However, the exercise helped refine one of the tools available for species protection and conservation. Thus, while on-the-ground surveys should continue, so too should efforts to improve the predictive model.

Figure 6. Mormon Metalmark ovipositing at the base of an *E. pauciflorum* plant. Eggs (inset) may be laid on any solid object near or on the base of a host plant: lichen, rocks, well-coagulated soil, or the roots, branches or old leaves of the plant itself. Photo credit: K. Illerbrun.

Appendix 2: Technical Compendium – Other Recovery Measures

BTPD 6 – Habitat Restoration

Progress toward completion was measured by looking at the number of management actions (e.g., fire, mowing, grazing) and habitat mapping/assessment projects completed to i) promote the expansion of currently occupied Black-tailed Prairie Dog (BTPD) colonies; or ii) identify priority areas for BTPD colony restoration/creation. For the calculation of the score, actions on the ground contributed a maximum 2 of 3 points and habitat mapping/quality assessment projects a maximum 1 of 3 points.
In 2015-2021, 85 ha of previously cultivated land between the BTPD colonies of Monument A and B were targeted by a habitat management program and treated with a combination of spraying, mowing, prescribed fire and seeding of native species. Starting in 2020, following-up on the predictive Habitat Mapping Tool (HMT; recovery action BTPD 1), a Habitat Suitability Index (HSI) and field protocols have been developed to rank the habitat suitability of sites identified by the HMT for BTPD colony expansion and creation within Grasslands National Park. Three colonies were assessed in 2020 (Monument, Sage and Snake Pit). Information obtained was used to identify a release site for mitigation translocation of BTPD that colonized the Frenchman Valley Campground of GNP in summer 2020. Measure score, as of 2021: Habitat management projects: 1/2; Habitat quality index = 1/1; Total measure completion = 2/3 (66%). Overall, this work was a stepping stone toward understanding whether and where expansion of BTPD habitat can be accomplished, in support of Population and Distribution Objectives that have been identified within the BTPD Recovery Strategy and Action Plan.

Figure 7. Applying prescribed fire in between the Black-tailed Prairie Dog colonies of Monument A and B to support a habitat restoration program and help maintain favorable conditions for natural Black-tailed Prairie Dog colony expansion in Grasslands National Park, October 2016. Photo credit: S. Liccioli/Parks Canada.

SAGR 6 – Increase/Stabilize the Sage-grouse Population

Progress for this measure was quantified based on two components: i) 50% for contributing to the establishment of a captive-reared population; ii) the remaining 50%, to be measured based on the percentage of years during 2018-2021 during which at least 24 captive-reared Greater Sage-grouse (SAGR) have been released to augment the breeding population and/or promote the re-activation of historic leks in Grasslands National Park (i.e., 12.5% for each year in which at least 24 SAGR were released).

In 2016-2017, Grasslands National Park joined a program led by the Calgary Zoological Society and helped establish a captive-breeding population of SAGR to be used for future augmentation programs aimed to stabilize and increase the SAGR population in Canada.

In 2018, due to the successful breeding of captive birds, as well as the concurrent decline of the wild population, Calgary Zoo, Grasslands National Park, and Saskatchewan Ministry of Environment started developing and implementing an augmentation strategy for SAGR in the West Block of Grasslands National Park. The program relied on soft release pens, which allow juvenile birds to acclimate, learn about their new surroundings, recover from the stress of transportation prior to release and reduce post-release movements and predation risk, thus maximizing their chances of survival.

A total of 32 and 39 captive-reared birds were released in 2018 and 2019, respectively. Due to a late summer outbreak of avian malaria in the source captive population in Calgary, only 5 hens were released in 2020. Additional 6 males were released on a lek site in spring 2020, after being over-wintered in captivity; 6 more females were released in fall 2021. As of fall 2021, total measure progress is 75% (50% for establishment of captive population, and 25% for 2018 and 2019 releases), although more males and females are expected to be released by lek sites in spring 2022.

Figure 8. Captive-reared Greater Sage-grouse in the acclimation pen prior to release into the wild in the West Block of Grasslands National Park, October 2019. Photo credit: L. Gardiner/Parks Canada.

SAGR 7 – Investigate the role predators play in the decline of Sage-grouse

This recovery action was designed and implemented based on two key components (objectives), each weighed 50% of total measure completion:
1. Understand the impact of predators on Greater Sage-grouse (SAGR). Progress was quantified to reflect the number of SAGR life stages (i.e., nest, brood, adults) for which the role of predation has been assessed through specific research, with each life stage contributing to 1/3rd (33%) of the value.
2. Develop and implement evidence-based program(s) to reduce the risk of predation on SAGR.

An experimental study using artificial SAGR nests was conducted in GNP in 2016-2017 to i) estimate rates of predation on SAGR nests; and ii) identify the species most likely to prey upon SAGR nests, and therefore reduce its nesting success.
Of a total of 80 artificial nests, 35 (43.75%) were preyed upon. Predation rates in the West Block were significantly higher than in the East Block (65.0% *vs*. 22.5%). The majority of predations were attributed to corvids (i.e., American Crow or Black-milled Magpie), which is consistent with numerous studies that identified Common Raven (*Corvus corax*) as a key nest predator of both artificial and natural SAGR nests across the species' range (Coates et al. 2008, Coates and Delehanty 2010, Lockyer et al. 2013, Conover and Roberts 2017, Dinkins et al. 2016). Considering the ecological similarities among species within the taxon, this work suggests that habitat suitability for Corvidae in the area surrounding both active and historic leks may be an important factor for SAGR nest success in GNP. Management actions aimed to control corvid populations should be considered and implemented, with indirect methods such as attractant removal (i.e., garbage pits or spilled grain; Trost 1999, Verbeek and Caffrey 2002) as the preferred choice. Removing unused anthropogenic structures can also further reduce perching opportunities available to other avian predators.
The impact of predators on adult SAGR was estimated using survival data obtained from captive-reared SAGR that were released in GNP in 2018-2020 (see recovery action SAGR 6). Of a total of 33 confirmed mortalities for which cause of death could be confirmed as predation and predator species identified, 11 (33.3%) were attributed to Owls (i.e., Great-horned or Snowy), one (3%) to Golden Eagle, 10 (30.3%) to unknown raptors (which could include any of the species listed above), seven (21.2%) to Canids and four (12.1%) to unknown mammals. Predation rates on SAGR broods were not estimated. Contribution of this program component toward total measure completion was (50%*2/3)=33%.

Starting in 2017, GNP developed and implemented a perch deterrent program, framed within the principles of effectiveness monitoring and within an adaptive management framework. Specifically, the effectiveness of perch deterrents was tested by monitoring the number of perching events recorded in response to the presence and type of deterrent on a sample of 20 signs. Selected signs were distributed evenly across upland and lowland habitats as well as front and backcountry areas of GNP, and monitored through motion sensor cameras during May-September in 2018 (no perch deterrents installed) and 2019 (perch deterrents installed on 14 signs). A total of 299 perch events by SAGR avian predators were recorded over the two-year study period. Although relatively infrequent, avian predators of SAGR were recorded to perch with an average of 6.3 - 9.5 occurrences per sign (both with and without deterrents). In general, the majority (~75%) of perch events recorded was of relatively short duration. Although overall encouraging, these numbers must be interpreted with caution, since even only few successful perching events (i.e., leading to predation) have the potential to negatively impact the local SAGR population, given its extremely low numbers.
Overall, we detected a positive effect of perch deterrents, with the average number of perching events per sign decreasing for treatment signs after installation of perch deterrents (2018:

mean=10.5, 2019: mean=5.07). However, such an effect appeared to be significant only for smaller, nest predators (i.e., corvids), while no significant effect of perch deterrents was detected for larger predators like owls and diurnal raptors. Owls, in particular, likely due to their larger size, seemed to be particularly capable of utilizing signs despite the presence of deterrents. Such information is relevant given the demonstrated role of owls as predators of adult SAGR.
In 2020, an experimental study in a captivity setting allowed to develop and test other types of perch deterrents, and led to the identification of a prototype (metal pyramid with metal rod) that was effective in deterring perching by great horned owl. Such a prototype has been adopted as a standard mitigation tool for road signs within GNP. This program component was fully achieved and contributed 50% toward measure completion, for a total measure value of 83%.

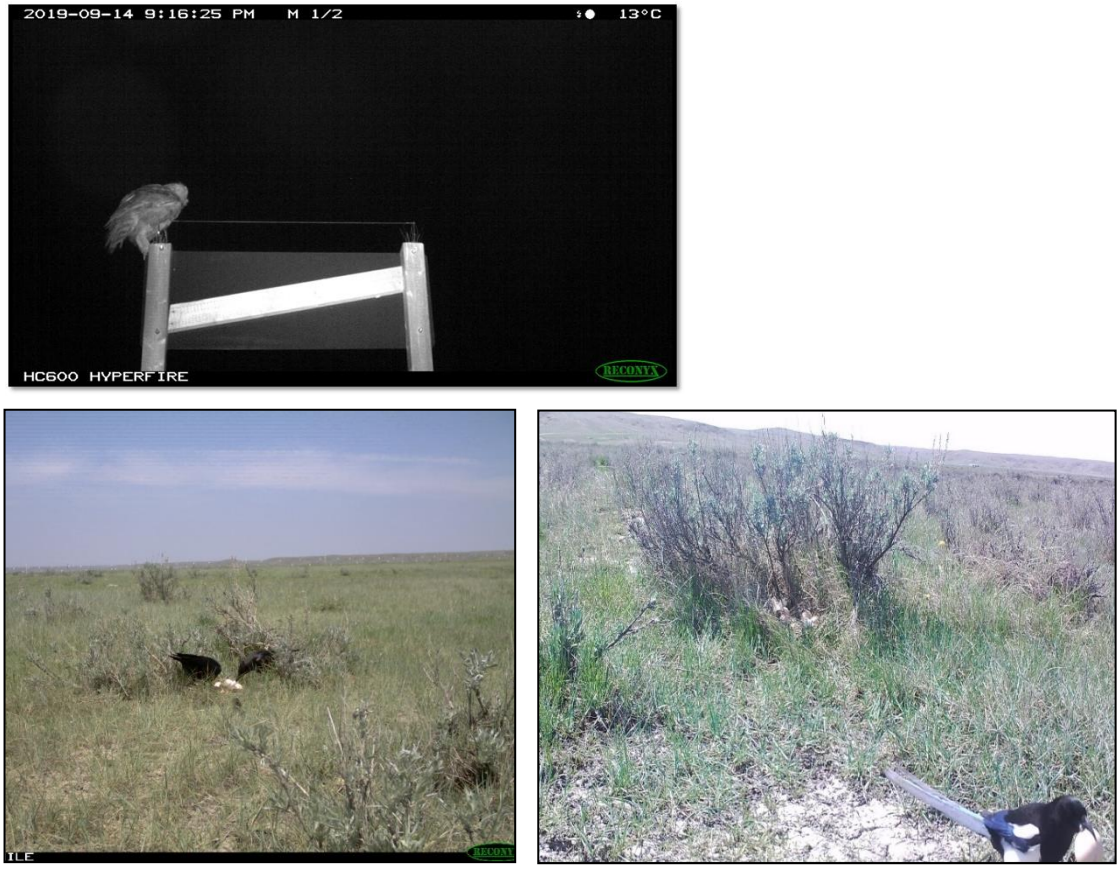


Figure 9: Assessing the role of predators on Greater Sage-grouse in Grasslands National Park. Top: Effectiveness monitoring of perch deterrent through trail cameras, documenting a Great Horned Owl perched on a Multi-spike deterrent. Below: Two of the main predators of artificial Greater Sage-grouse nests detected in 2016-2017, American Crow (left), and Black-billed Magpie (right).

SAGR 8 – Shelterbelt/Outbuilding Decommissioning/modification

The relative importance of this recovery action was underestimated when the action plan was first written, but it was later identified as a high priority activity that could have a large impact on long-term recovery of Greater Sage-grouse (SAGR). Field studies conducted in Grasslands National Park over the past five years (see recovery action SAGR 7) have indicated that man-made structures (e.g., outbuildings, overhead power lines, fences, etc.) are a local threat to the

recovery of SAGR populations. By providing predators perching opportunities and nesting/denning habitats, these structures indirectly impact SAGR survival rates, and their removal has improved SAGR population trends elsewhere (Coates and Delehanty 2004, Coates et al. 2016, Conover and Roberts 2017).

Figure 10: Representative images of critical habitat for Greater Sage-grouse and other species at risk within Grasslands National Park before and after rerouting and removing approximately 11 km of power lines. Photo credits: A. Heathcote and K. Cairns/Parks Canada.

For this action, progress toward completion was measured as percentage of the total improvement in high quality SAGR critical habitat (i.e., not impacted by infrastructures) identified for 2023 (end of funding secured in support of this program; 635 hectares) that has been achieved. This target is a stepping stone toward the medium-term (i.e., 2030) goal of 89% high quality critical habitat at the park scale (West Block).
In Fall 2020, Parks Canada partnered with SaskPower to reroute nearly 11 km of service lines in GNP to reduce the amount of overhead line running through SAGR critical habitat, while maintaining power service to the ranches and stakeholders that are still operational in the park; this work was fully completed in November 2020. Along with removal of other vertical features and deployment of perch deterrents on selected road signs, an estimated 633 hectares of previously impacted SAGR critical habitat in the park's West Block were restored (99% achievement).
Moving forward, GNP will continue its efforts to remove man-made structures while still providing a quality visitor experience and respecting cultural resources. The measure will be revised and included in the amended Species at Risk Action Plan, and will be integrated within park management plan cycle targets for SAGR critical habitat.

PB 3 – Feasibility of Herd Expansion

Progress toward completion was quantified based on four project components, each one representing up to 25% of the total measure value:
1) Assess bison carrying capacity on the current confinement area;
2) Assess bison carrying capacity in potential expansion land;
3) Assess the role of prescribed fire in shaping bison grazing patterns and support habitat management for multiple species at risk;
4) Assess operational requirements and feasibility for managing a larger herd (on an equal or larger confinement area).

Bison carrying capacity was first assessed by using average vegetation biomass production obtained from sites ungrazed by cattle for 10-12 years (McCanny et al. 1996, McCanny et al. 1997, Peat 1997, Bai et al. 1998), adjusted to reflect grazing prescriptions (i.e., 50% of the land grazed and 35-45% of the aboveground biomass removed annually) and energetic requirements for Plains Bison (adjusted for bison weights and age structure in Grasslands National Park). Such carrying capacity estimate helped inform the population target identified for GNP for the period 2017-2019 (397-511 bison). Starting in 2019, a collaboration with University of Saskatchewan has helped GNP refine bison carrying capacity by integrating vegetation biomass data, bison resource selection function and remote sensing techniques (revised carrying capacity: approx. 580 bison; see action PB2). As of 2020, a partnership with WWF Northern Great Plains Program is being developed to re-assess vegetation productivity in the current bison enclosure and the adjacent land (expected year of completion: 2023). Starting in 2019, GNP has designed a program to test the use of fire as a tool to shape bison grazing patterns; however, in 2020-2021 no prescribed fire has been implemented for these purposes in the bison containment area, yet. Together, these research programs will inform management decisions with respect to herd expansion. Total measure progress is ¼ (25%).

BUOW 1 – Improve Burrowing Owl Survival and Reproductive Success

Since 2016, GNP implemented a supplemental feeding program to increase Burrowing Owl (BUOW) reproductive success on breeding grounds within the park. Data collected in 2016-2021 indicated that nests supplementally fed produced a significantly higher number of fledglings than the control nests (mean ± SD = 5.94±1.58 *vs*. 4.65 ± 1.63). The success rate of nests during supplemental feeding years was also significantly higher than that recorded in 1998-2015, before the feeding program was implemented (93.2% *vs*. 72.4%). Combined with the apparent lack of any population increase reported in other sites across the species' range (Canada or U.S.), these data suggest that supplemental feeding has been having a positive impact on BUOW recruitment, potentially contributing to at least slowing down the local population decline, if not also to the population rebound observed in 2020-2021. Based on an average of 21.8 nests/year (2016-2021 data), supplemental feeding has the potential to result in approx. 28 additional fledglings/year. Moving forward, this active management program will be continued as long as operational resources allow, or until new data will suggest otherwise. Furthermore, the following actions have been taken: i) mitigation measures to compensate the risk of disruption of owl feeding behavior caused by the presence of researchers/Park staff on prairie dog colonies; ii) use of signs and colony closure to prevent disturbance of nesting owls by Park visitors. Total measure progress completion was 6/6 years (100%).

Figure 11. Brood of nine Burrowing Owl chicks at a nest included in the supplemental feeding program in Grasslands National Park, summer 2016.

Appendix 3: Technical Compendium - Population and Distribution Objectives

While previously established, ongoing monitoring activities helped fulfill a portion of the population monitoring requirements identified by this action plan, three new monitoring programs were designed and implemented in 2016-2021 and are here below described in more detail.

Eastern Yellow-bellied Racer (EYBR)

A monitoring program was designed and commenced in 2018 to monitor Eastern Yellow-bellied Racer (EYBR) occupancy at 15 known hibernacula. Since a large portion of historic data had not been confirmed recently (with two dens last monitored in 1990 and 1995), the first 5 years of the program aimed to establish baseline data and confirm the number of known occupied hibernacula according to a standardized approach. As the first objective, we aimed to determine baseline data for at least 80% of known hibernacula. Between 2016 and 2021, all 21 previously known or newly discovered hibernacula were surveyed (100% monitoring effort achieved), 11 of which (52%) were occupied by EYBR. Moving forward, an occupancy rate target (e.g., >80%) of known occupied hibernacula may be identified as the new Population and Distribution Objective. Furthermore, the program may be extended to monitor the occupancy and distribution of other snake species at risk, such as Bullsnake and Prairie Rattlesnake.

Figure 12. Evidence of Eastern Yellow-bellied Racer occupancy of known dens in Grasslands National Park collected through motion-sensor camera (left) and in-person foot surveys (right) in 2018-2021. In both cases, the survey indicated that the species co-occupied the site with Prairie Rattlesnake (*Crotalus viridis*), another species of conservation interest. Photo credits: Parks Canada and L. Gardiner/Parks Canada.

Greater Short-horned Lizard (GSHL)

A monitoring program was designed and implemented starting in 2018 to confirm continued occupancy of known, occupied habitat patches in the Park. Greater Short-horned Lizard (GSHL)

critical habitat within GNP's West Block (Environment Canada 2015, Parks Canada Agency 2016) was used as a first level of site selection. As habitat polygons were less complete in the Dixon, Walker and Gillespie lands, polygons were expanded to include bearpaw shale habitat identified on satellite imagery in ArcGIS. Considering the limited amount of critical habitat identified on gazetted land within the East Block's proposed boundary (~1% as opposed to ~ 99% in West Block), as well as the more difficult access and limited resources, no areas of the East Block were selected for monitoring at this stage.
A 1 km x 1 km grid was then placed over the habitat polygons, and any grid cells containing <50% GSHL habitat were excluded. One fifth of the remaining squares, corresponding to approximately 20% of total GSHL habitat in the park, were randomly selected and surveyed through a 5 year-rotation panel. The species was monitored using targeted random meander search method (Fink 2014), with 5-7 observers surveying good quality habitat.
As of 2021, 20/25 habitat (80%) units identified in the monitoring program were surveyed. Preliminary data indicate a critical habitat occupancy rate of approximately 95% (19/20 sampling units). Moving forward, an occupancy target (e.g., >80%) of known occupied habitat units may be identified as the new Population and Distribution Objective.

Figure 13. Coordinated meander survey of Greater Short-horned lizard (*Phrynosoma hernandesi*) in a selected habitat patch within Grasslands National Park (A). Adult Greater Short-horned Lizard detected during annual monitoring efforts in Grasslands National Park in 2020 (B). Photo credits: S. Liccioli/Parks Canada.

Little Brown Myotis (LBMY)

A monitoring program was commenced in 2018 to identify maternal roosts within GNP and confirm their continuous occupancy in subsequent years. In 2018-2019, the program integrated inspections at a total of 16 buildings with acoustic monitoring and mist-netting at a total of 8 sites. One maternal roost of Little Brown Myotis (LBMY) was detected at one site in 2018, with a population of at least 42 individuals. Two replicates of exit count surveys were then conducted annually and confirmed the roost was occupied in 2019 (average count=44 bats), 2020 (average count =66 bats) and 2021 (average count =114 bats).
Concurrently, an inventory of the bat community was conducted in GNP in 2018-2019, using a combination of live capture (mist-netting) and acoustic detection. These surveys indicated the presence of at least six bat species other than LBMY in Grasslands National Park: Long-eared Myotis, Big Brown Bat, Western Small-footed Myotis, Silver-haired Bat, Eastern Red Bat, and Hoary Bat. Of these, three species were confirmed breeding in GNP: Big Brown Bat, Hoary Bat,

and Long-eared Myotis. Although breeding activity by Western Small-footed Myotis could not be confirmed, the frequency of captures suggests the species is a common occupant of GNP.
A relatively large number of migratory bat detections, especially of Eastern Red Bats and Hoary Bats, suggested the park may be along a potential migratory route for these species, possibly providing corridors to the Milk and Missouri Rivers.
High acoustic activity at the Snake Pit snake hibernaculum, where bats were previously observed roosting, suggests bats may be roosting in the area during winter months. Most acoustic activity at the Snake Pit is suspected to be from Western Small-footed Myotis and Long-eared Myotis, which is consistent with trail camera evidence collected in 2018.

Figure 14. Little Brown Myotis (left) and Hoary bat (right) handled during bat monitoring and community inventory efforts conducted in Grasslands National Park in 2019. Photo credits: C. Olson.

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