

Detailed Environmental Impact Analysis

Plains Bison Reintroduction in Banff National Park Pilot Project 2017-2022

Executive Summary



Introduction

Parks Canada is proposing to reintroduce a small herd of plains bison to Banff National Park (BNP) in 2017. The intent of this pilot project is to assess the feasibility of longer-term bison restoration in the area. Reversible and adaptive, this project provides a focal point for Parks Canada to work collaboratively with Canadians and Indigenous People, while beginning to restore the roles of bison in the ecosystem.

Background

According to early explorer accounts and archaeological evidence, bison were abundant in the Banff area prior to being extirpated by overhunting in the 1850s. Currently, plains bison occur in only five isolated wild subpopulations and occupy less than 0.5% of their original range in Canada. As a world leader in conservation, Parks Canada is committed to restoring native ecosystems and to the conservation of threatened species like the plains bison.

Reintroducing plains bison also contributes to Parks Canada's mandate to "protect and present nationally significant examples of Canada's natural and cultural heritage."

Purpose of the Detailed Environmental Impact Analysis

Given the complexity of reintroducing a keystone species that has been absent from this area for over 140 years, Parks Canada has determined that a detailed environmental impact analysis (DEIA) is required to evaluate the project. The DEIA process ensures that Parks Canada has a clear understanding of the potential project impacts; positive, neutral and negative, and is prepared to address any risks or adverse impacts. A final Determination of Impacts will be made after reviewing and considering feedback from the public review of this analysis. This Determination of Impacts, along with public comments received throughout the project, and any other relevant information, will be considered by the Superintendent in making a final decision about whether and how the project may proceed.

Scope of the Detailed Environmental Impact Analysis

Parks Canada evaluated the following valued components as part of the DEIA: soil, vegetation and fire; wildlife resources; aquatic resources; cultural resources; species at risk; visitor experience; and the socio-economic dynamics of surrounding human communities. No impacts on air quality or climate are expected.

The timeframe of the analysis was the 5-year-pilot project, beginning in January 2017. This period was expanded for the cumulative effects assessment to consider future projects. The geographic scope varied with the valued component. For soil, vegetation, wildlife, aquatic, visitor experience and cultural components, the analysis was conducted at the scale of the reintroduction zone. The socioeconomic component was evaluated at a regional scale to capture potential impacts to the agriculture industry.

Overview of Pilot Project to Reintroduce Bison

For the proposed pilot project, a small herd of bison would roam a reintroduction zone spanning 1,189 km² of the eastern slopes of Banff National Park. Like many reintroduction projects, the success of the Banff reintroduction would require a phased and hands-on approach. In early 2017, a small herd of healthy bison from Elk Island National Park would be transferred to an enclosed pasture system within the heart of the reintroduction zone where they would remain for approx. 16 months. Called a "soft-release", this approach is a common practice for reintroduction programs to help the animals bond to their new home. After 16 months, the new herd will be free to explore the full reintroduction zone. Fifteen short sections of wildlife-friendly fencing will complement the natural containment provided by rock ridges and cliffs to encourage the bison to remain within the reintroduction zone. After five years, Parks Canada would conduct a detailed evaluation to assess the feasibility of maintaining the project, expanding the vision, or withdrawing from the initiative.

The project would be implemented in five phases:

1) Bison Translocation (February 2017)

Translocate 16 bison (12 pregnant two-year-old females and 4 two-year-old bulls) from Elk Island National Park's herd to an 18-ha, enclosed soft-release pasture in the reintroduction zone. This is the recommended herd composition, as younger bison are more adaptable and likely to bond to new environments and would be easier to handle during the initial years of the project.

2) Soft Release Pasture (February 2017-June 2018)

Hold the animals in the fenced soft-release pasture for 16 months where they would be provided with water and supplementary feed. This approach would help the herd develop a strong bond to their new home. It is anticipated the cows would calve twice during this time, increasing the size of the herd to approximately 30 animals.

3) Fencing Construction (Summer 2017)

Install approximately 8 km of adjustable wildlife friendly fencing in 15 locations to discourage bison from leaving the reintroduction zone.

4) Free Roaming (July 2018-February 2022)

Release the herd from the soft-release pasture into the 1,892 km² reintroduction zone. Closely monitor the animals via GPS and radio collars. As necessary, Parks Canada would herd, haze, or bait the bison to help steer their movements to encourage the bison to develop an affinity for their new home range.

5) Assessment of Pilot Project

Evaluate 5-year pilot against project targets to determine if the bison reintroduction program should continue or if the pilot project needs to be reversed and animals and fences removed.

Project Location

The availability of sufficient, high quality bison habitat is key for successful reintroduction. An extensive, peer-reviewed habitat and carrying capacity assessment for BNP analysed bison habitat quality throughout the Park to determine which areas, if any, would provide suitable habitat for bison. The remote, grassy valleys of the eastern slopes of BNP were found to represent suitable habitat for the proposed reintroduction and could theoretically support hundreds of bison year-round.

The 1,189 km² reintroduction zone would be divided into three Bison Management Zones as per BNP's Bison Excursion Prevention and Response Plan (Figure 2). The goal is for bison to stay within the 354 km² Core Reintroduction Zone for the first 1-2 years so that they bond to their new home range, before gradually venturing into a further 329 km² of habitat in the Expansion Zones to the north and south. Should bison venture into the surrounding 506 km² Hazing Zone they will be actively herded, baited and/or hazed back into the Core and Expansion zones, primarily by staff on horseback using low-stress stockmanship techniques.

The entire reintroduction zone is declared as Wilderness under the Canada National Parks Act. This zoning ensures that the wilderness character of the area is maintained, with only non-motorized access permitted on the trails.

The reintroduction zone is also entirely surrounded by national park lands and is abutted by other national parks to the west, provincial protected areas to the southeast and northwest, and a Public Land Use Zone prohibiting motorized activity that extends for 15 km from the eastern BNP boundary to the Forestry Trunk Road (Figure 1). The nearest grazing allotments and active forestry areas outside of BNP occur approximately 20 km to the east of the reintroduction zone and the nearest private land begins 50 km east. The closest town (Banff, Alberta) and major highway (TransCanada) is approximately 20 km south of the reintroduction zone while the town of Sundre is located 90 km east (Figure 1).

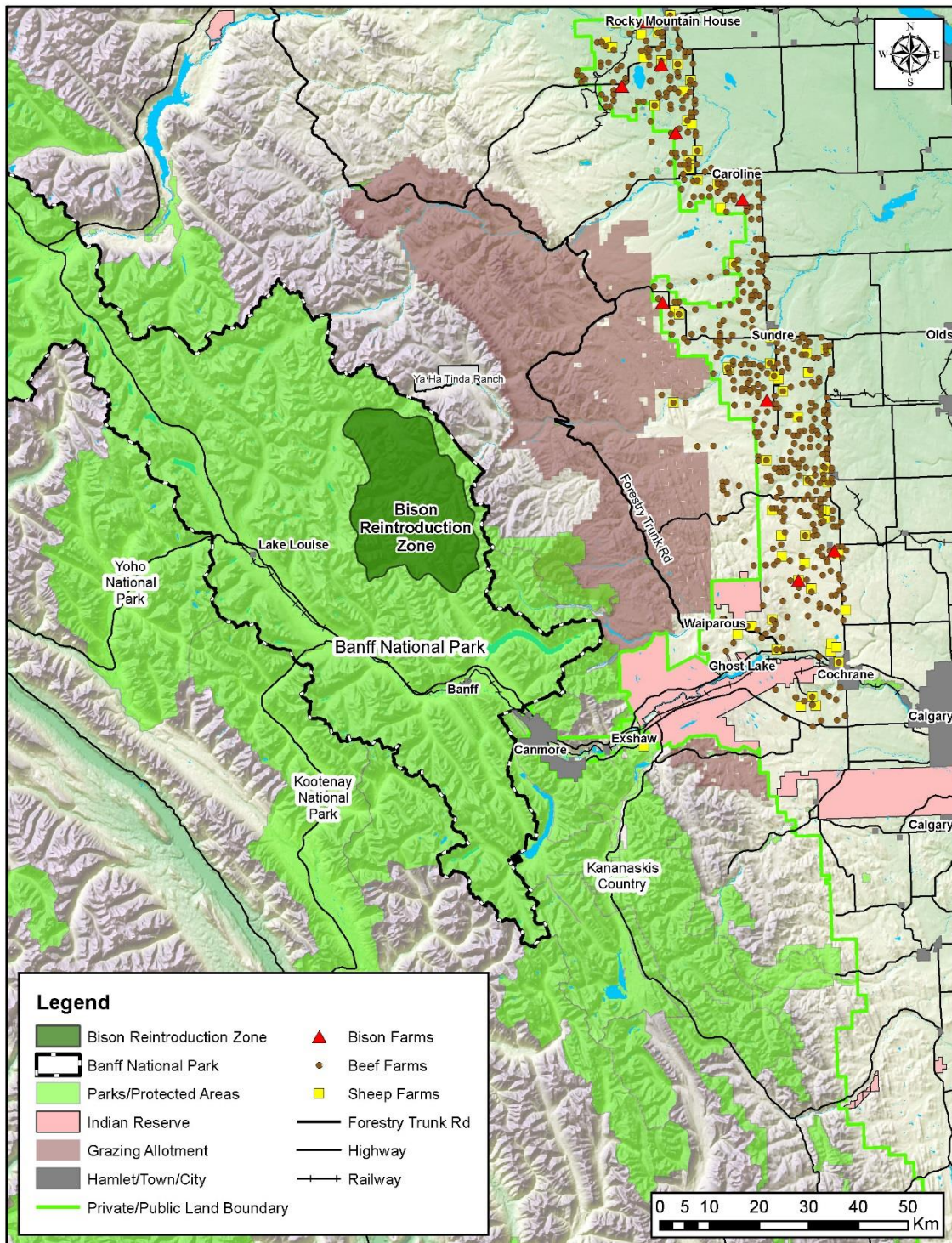


Figure 1: Location of the Banff National Park Bison Reintroduction Pilot Project (nearest farms and ranches to the east of the reintroduction zone are indicated).

Considerations

While BNP contains relatively large areas of wilderness with high quality bison habitat, certain parts of the Park, such as the Bow Valley corridor, experience high levels of human use. Further, the Park's eastern border is bounded by provincial lands used and managed for recreational and tourism purposes with more intensive industrial and agricultural uses occurring further east. Parks Canada recognises and respects that neighbouring land managers and organizations may have different priorities and mandates. Accordingly, given that bison roam in search of high quality habitat, special planning and actions have been built into the project to dissuade reintroduced bison from wandering into these areas and to manage any negative impacts should this happen during the course of the pilot project.

Key Concerns, Assumptions and Performance Objectives

Reintroducing a large mammal that has been absent for over 140 years comes with uncertainties, concerns and new opportunities, some of which have been expressed by stakeholders, Indigenous People and the public in two previous public comment periods. These comments have been carefully considered by Parks Canada in the development of the reintroduction plan. Appendix 1 summarises these concerns as well as others identified in this DEIA, along with the assumptions Parks Canada has made and the associated performance objectives it will use to evaluate those assumptions at the end of the 5-year pilot project.

Review of Detailed Environmental Impact Analysis

Potential impacts on identified valued components were considered for **supporting infrastructure** (i.e. wire fences) and **reintroduction activities** (i.e. capture and translocation of bison). An overview of each of these is described below, followed by a brief discussion of the major impacts, mitigations, and magnitude of impacts after mitigations.

Supporting Infrastructure

Overview

Approximately 8 km of wire fencing will be constructed in 15 sections ranging in length from 38 m long to 2.5 km long (Figure 2). Collectively these will help retain bison in the reintroduction area and supplement the natural containment provided by cliffs and rocky ridges. The use of minimal, strategic fencing will support other tools to help the animals develop an affinity to the reintroduction zone, including a 16-month soft-release holding period, meadow burning to maintain and enhance attractive habitat, and herding and hazing the bison on horseback while the herd is initially free-roaming.

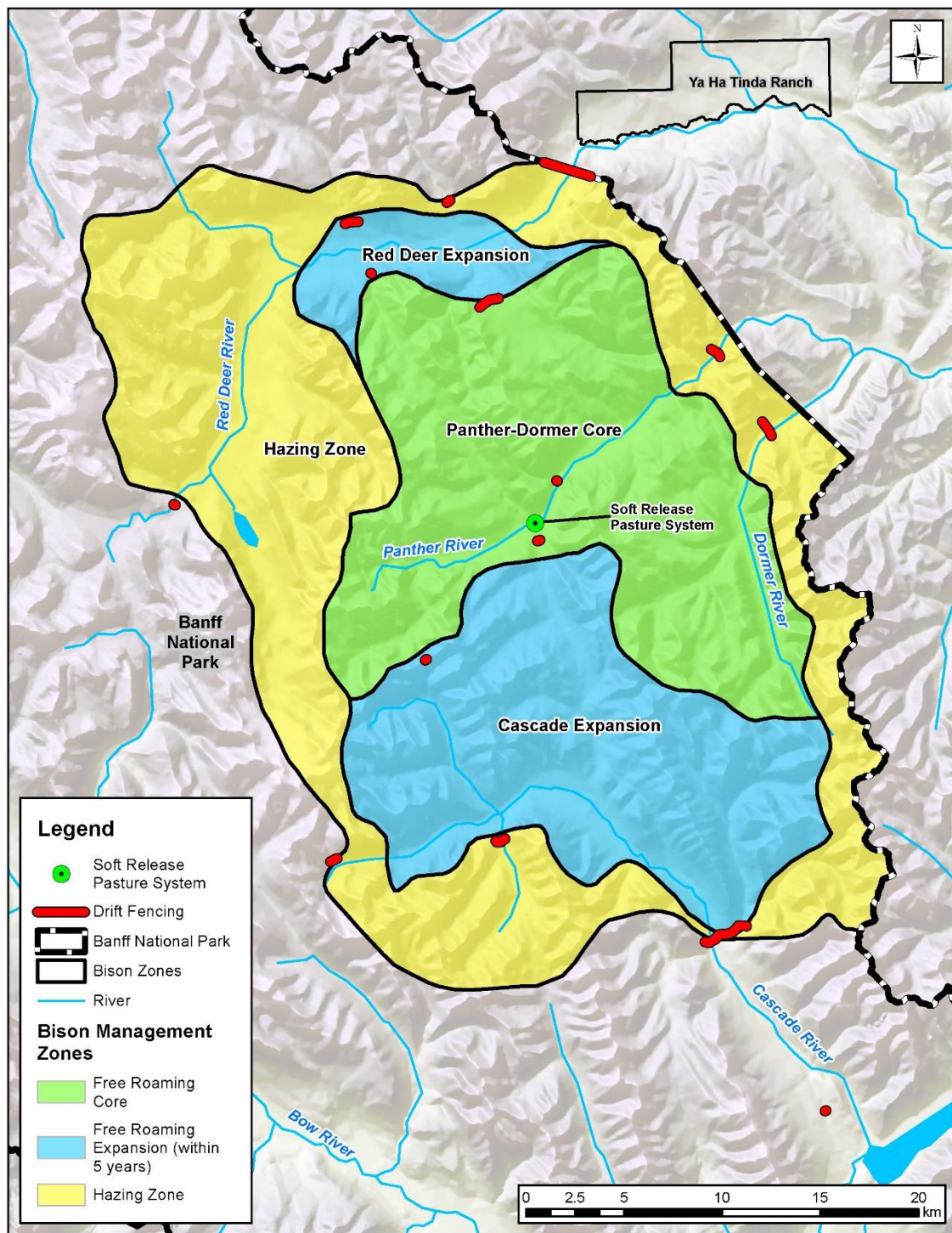


Figure 2: Wire fence locations and Bison Management Zones in BNP bison reintroduction area.

An adjustable fence design with two modes will be used to meet the dual needs of holding back bison, when required, while allowing for free passage of other wildlife at all other times. The proposed wire drift fence design has been informed by rigorous field testing in and adjacent to the reintroduction zone over the last 1.5 years.

The wildlife-permeable mode will be the default setting for fences (Figure 3). It consists of two groupings of double-stranded smooth wire at approximately 107 cm above ground (good for elk, white-tail deer and moose to jump over) and 76 cm above ground (good for bighorn sheep and mule deer to slide under). This design exceeds the latest standards for wildlife fence permeability in western North America.

Bison-holding mode will be the fence setting whenever bison are within 2 to 5km of a given fence. It consists of 5 strands of double-stranded smooth wire strung at approximately 150 cm, 130 cm, 105 cm, 80 cm, and 50 cm above ground (Figure 4).

The 80 cm wire will also be augmented with an electrified wire that can be enabled where habitat modelling suggests bison pressure could be greatest in winter.

Fence deployment between the two modes will be performed by staff, volunteers, and partners stationed at nearby patrol cabins and outfitter camps. Based on the quality of nearby habitat, the fences are collectively expected to be in bison-holding mode <5% of the time (fewer than 18 days per year, predominately in winter)

Where fences cross rivers or creeks, curtains of plastic chain or lightweight boards will be suspended over the watercourse to create a strong visual barrier that will discourage bison from moving through the area while still allowing for the free passage of water, fish, waterfowl, flood debris and watercraft (Figure 5). This is the type of design that is used successfully to contain bison at a river crossing in Grasslands National Park.

Gates will be installed at all park trails intersected by wire fences and will be closed when in bison-holding mode. Signs will be posted along the trail at each site explaining how the fences work and their necessity for bison restoration.



Figure 3: Remote camera image of cow elk going over Panther test fence in wildlife-permeable mode (Parks Canada).



Figure 4: Bison-holding mode, Red Deer test fence, BNP bison reintroduction zone, as per specifications recommended for Alberta grazing leases with bison.



Figure 5: Fence design for watercourses: plastic chain curtain on Panther River test fence in BNP.

Summary of Potential Impacts on Valued Components

Soil, Vegetation and Fire

Construction of the fences will be done by hand in summer 2017. Very few trees will be cut as they will be incorporated as fence posts and will be protected from fencing wire and staples by 1.5 m-long lengths of lumber affixed to their trunks. Where trees aren't available metal posts will be hammered directly into the ground, thereby minimizing disturbance of soil and ground vegetation.

Wildlife

The greatest potential impact of wire fencing after mitigations will be on regional wildlife movement when fences are in bison-holding mode. The intermittent nature of the disturbance and its expected short duration renders it low in magnitude.

Delivery of fencing materials and work crews to the various fence sites will require approximately 15.5 hours of helicopter time. Flight elevations of 500 m above ground level will be maintained except when landing to minimize disturbance to wildlife.

Species at Risk

Only 100 m of wire fencing occurs in the area previously used by the extirpated woodland caribou (southern mountain population), a SARA listed threatened species. Were woodland caribou to be reintroduced in the future it could impede their movements when in bison-holding mode. However, bison habitat modelling suggests this will occur infrequently due to the lack of nearby high quality bison habitat (1% of the time in summer and <2% of the time in winter for this particular fence). The magnitude of the impact on woodland caribou is therefore rated as negligible. No other SARA species are expected to be affected by supporting infrastructure for this project.

Cultural Resources

An Archaeological Overview Assessment was completed for the 5-year pilot bison reintroduction project based on previous archaeological surveys of the Red Deer, Panther, Dormer and Cascade river valleys. There are 155 known archaeological sites in the proposed bison release area but none are expected to be impacted by the proposed fences.

Conclusion

The magnitude of potential impacts of fencing to soils, vegetation, aquatics, visitor experience and socioeconomics were considered to be negligible. The overall adverse impact of fencing on all ecosystem components is therefore expected to be **insignificant**.

Reintroduction Activities

Capture and Translocation of Bison (February 2017)

Overview

Herd selection

Parks Canada proposes to select 16 healthy plains bison from Elk Island National Park (EINP) in January 2017. Twelve pregnant 2-year-old cows and four 2-year-old bulls will be taken from the larger herd via EINP's existing corral and chute system. Five of these animals will be fitted with GPS radio collars.

Quarantine and Transfer

The entire group will be held in EINP's quarantine pasture for 2 weeks. In addition to satisfying initial disease surveillance requirements, this 14-day period will permit the animals to adjust to new social hierarchies, adapt to the kind of hay and pellet feed they will receive in BNP's soft-release pasture, and begin to habituate to daily contact with humans and horses.

Once the two-week period is over the animals will be administered a veterinarian-approved calming agent (e.g. Halopurinal) and loaded into stock trailers and hauled overnight to Parks Canada's Ya Ha Tinda Ranch near the eastern boundary of BNP. Once at the ranch, the animals will be airlifted 25 km to the soft-release pasture while still in the stock trailers using a heavy-lift helicopter. Upon arrival, bison will be released into a 22 m-diameter catch pen to ensure they recover from the flight and do not require further attention before being released into the larger pasture system.

Bison will be handled throughout this process as per guidelines and principles set by Parks Canada's Animal Care Task Force. A qualified wildlife veterinarian will be on site for all capture and translocation procedures.

Summary of Potential Impacts on Valued Components

Soil, Vegetation and Aquatic Resources

All capture and translocation activities will occur outside of BNP on hardened ground at existing bison handling facilities in EINP and at the working corrals at the Ya Ha Tinda Ranch, none of which are close to water. No adverse impacts to soil, vegetation or aquatic resources are expected.

Wildlife

The largest impact of this phase of the project is likely to be stress on the bison themselves. This will be mitigated through the use of low-stress stockmanship techniques at EINP's handling facility, through the use of specially outfitted stock trailers that will reduce the chances of injury during ground and air transport, and through the use of a calming agent during all translocation activities. The services of a heavy-lift helicopter that can sling a stock trailer with bison inside will eliminate the need for another stressful transfer into individual crates or bags at the Ya Ha Tinda Ranch.

Bighorn sheep are the only wildlife expected to be along the flight path in winter (goat surveys show they are not present in the area). The potential impacts on sheep will be mitigated by ensuring it maintains minimum above-ground flight elevations of 500 m.

The magnitude of negative impacts on bison and sheep once these mitigations are in place is considered to be negligible given the short duration of the disturbance (approximately 12 hours of transport for the bison; total of 4-round-trip flights that may periodically fly over sheep).

No potential impacts are expected on species at risk, cultural resources, visitor experience (no visitors in this area in February) and socioeconomic dynamics.

Conclusion

The overall adverse impact of capturing and translocating bison is therefore expected to be **insignificant**.

Holding, Feeding and Conditioning Bison in Soft Release Pasture (February 2017 to June 2018)

Overview

Pasture System

The translocated bison will initially be held and rotationally grazed for 16 months in an existing 18-ha system of two soft-release pastures located in the Panther River Valley (Figure 2). Construction of this pasture system was assessed in a separate environmental analysis process. The primary of the two pastures (5.8 ha enclosed with 2.4 m-high page wire) will be used to hold and supplementally feed the bison during two winters and two spring calving seasons (2017/18). Natural forage will be supplemented with weed-free hay and minerals transported by helicopter and by horseback from the Ya Ha Tinda. An 11.9 ha subsidiary pasture (Pasture 2) will be fenced with the same adjustable 5-wire design described above. The native grasses within the larger subsidiary pasture will be grazed in summer and fall.

Feed

Hay will be delivered in square bales so as to easily be moved by hand. A quad and snowmobile will be used to help haul feed between pastures but will be restricted to the immediate vicinity of the Windy patrol cabin, tack shed, corral and Pasture 1. Where water is not accessible (Pasture 1) it will be pumped from the Panther River via portable fire pump and hose into a temporary trough every few days.

Monitoring and Care

Rotating shifts consisting of two Parks Canada staff and/or contractors and volunteers will stay on site at the Windy patrol cabin to feed, monitor and condition the animals for the 16-month soft-release pasture phase of the project. No upgrades are necessary to the cabin. Human waste will be contained in an existing outhouse pit located 100 m from the nearest open water (Wigmore Creek).

Conditioning

Staff will condition the bison to several stimuli while they are contained over the course of their 16-month stay in the soft-release pasture system. Such conditioning has been effective in reducing stress in captive bison elsewhere and will improve the effectiveness of herding techniques that will be used during the free-roaming phase of the project. The goal is to establish attraction and avoidance behaviours in the bison to help improve their manageability and prevent the risk of excursions from the reintroduction zone once they are free-roaming. This will be a short term, transitional strategy to encourage the initial group of animals to develop an affinity for their new home range and will help set the pattern of future herd movements. Subsequent generations are not expected to be subject to such conditioning.

Transportation

The remote location of the soft-release pasture requires that helicopters be used to support this phase of the project. Approximately 21 flights will be necessary to transport hay (flights of 20 minutes each) and 45 flights for weekly shift changes in winter (40 minutes each) for an estimated total of 37 hours of flight time. Parks Canada personnel will access the site on horseback and on foot in spring, summer and fall to minimize helicopter use and will periodically ski in and out in winter to help reduce reliance on helicopters.

Summary of Potential Impacts on Valued Components

Soil and Vegetation

The soft-release pasture system will be the centre of bison activity for 16 months of the pilot project and is likely to be where impacts of the project to soils and vegetation are greatest. The animals will be held at a much higher density (e.g. 190 animals/km²) within the pasture system than during the free-roaming phase (e.g. 0.04 animals/km² in the larger reintroduction zone) and are likely to trample, horn and overgraze the willow and birch shrubs that are the predominant vegetation type in Pasture 1. Potential impacts to the soils and vegetation of Pasture 2 will be less intense as it is twice as big as Pasture 1 and will hold the animals for a quarter of the time. Riparian areas in Pasture 2 were scoured of most vegetation during the 2013 flood and now consist primarily of rock and gravel and are unlikely to be used much by the bison.

Long- term studies in other areas where bison occur show moderate grazing leads to substantial increases in forage productivity and quality not just for bison but for other animals. Bison's tendency to selectively feed on grasses over leafy plants, and preferentially feed on some areas, also leads to greater plant and habitat diversity. Such benefits may occur in Pasture 2.

Bison are also important vectors for seed dispersal via their fur and in their feces. This could be a positive impact in Pasture 2 where only native plants exist but could be negative in Pasture 1 where there is a small pre-existing infestation of non-native buttercup plants. This will be addressed through aggressive removal of buttercup flower heads prior to bison reintroduction and through targeted spraying after the soft-release pasture phase is over. Further introduction of non-native plants will be avoided through the use of second-cut weed-free hay (no viable seeds) that is sourced from the same supplier that Parks Canada has used without issue for several years.

Wildlife

Potential impacts to wildlife during the soft-release phase of the project could occur from: fencing; the unlikely event that bison introduce disease; increased human presence in the area; and increased helicopter activity.

The adjustable, wildlife-permeable fencing will be used for Pasture 2 and will enable free-passage of wildlife for 12 of the 16 months. Page wire fencing will exclude wildlife from Pasture 1 for the full 16 months but the impact is expected to be negligible due to its temporary nature, small extent (5.8 ha), and the number of alternative routes for wildlife to travel around the pasture.

A disease risk assessment was completed by the Canadian Wildlife Health Cooperative and estimated the risk of brucellosis or tuberculosis being introduced with bison into BNP to be low, given the animals would come from Elk Island National Park (certified brucellosis and tuberculosis-free by the Canadian Food Inspection Agency). Nonetheless, Parks Canada has committed to extensive disease monitoring for the project and will depopulate the herd in the unlikely event brucellosis or tuberculosis are detected. Protocols are also in place for several other unlikely diseases.

The majority of helicopter use will occur in winter when bears are hibernating and elk have migrated outside of the park. Minimum flight elevations of 500 m above ground level will be maintained to minimize disturbance to bighorn sheep. Goats are not common along planned flight routes.

Full-time staff presence is likely to have a localized and temporary (16-month) negative impact on shy and wary animals like grizzly bears and wolves. A number of well-used wildlife trails provide a variety of alternative routes for them to travel around the area. The extent of displacement is expected to be very localized (i.e. 2 km²) within home ranges that often exceed 1,000 km².

Staff access to and from the site by foot and horseback in spring, summer and fall could also disturb these species. Given the low levels of existing human use on these trails, however, such access is not expected to approach any thresholds whereby these animals may abandon the area. The overall impact to large carnivore habitat security is therefore expected to be negligible.

Aquatics

Increased sediment and nutrient loads to the Panther River are possible during the 4-month period bison have access to the river within Pasture 2. Sedimentation of the water can occur when bison create trails into the river, however in other areas where this has happened, the impacts have been found to be localized. Bare ground from bison wallowing and horning behaviour can also have a negative impact but, due to the extent of scouring from the 2013 flood, very little soil is available to be mobilized in the riparian area of Pasture 2. Manure build up in the riparian area and a resultant flush of nutrients into the river are also unlikely given the unattractiveness of the scoured riparian zone to bison. Nonetheless, weekly surveys of the riparian zone will be conducted while the bison are in Pasture 2 and all manure in excess of 1 pile/2 m² in riparian areas will be moved to higher ground by staff.

Cultural Resources

One historical campsite falls outside of the Pasture 2 fence. No other cultural sites are known to exist in the area.

Visitor Experience

In summer 2017, a bypass trail will allow the few horse riders and backpackers using the area to continue to access all trails. On-site staff caring for the bison would explain any temporary losses to wilderness experience within the context of long-term species restoration.

No impacts to socio-economic dynamics are expected.

Conclusion

Given the above mitigations, the overall adverse impact of the operation of the soft-release pasture is expected to be **insignificant**.

Free-Roaming (June 2018-2022)

Overview

After two calving seasons in the soft-release pasture the original herd of 16 translocated bison will grow to approximately 30-35 animals, half of which would have been born on site. They would be accustomed to being herded by Park Canada staff by this time; would have learned to respect the wire fencing that they may encounter in key areas; and would be accustomed to crossing rivers and feeding on natural forage.

Prior to being released into the larger 1,189 km² reintroduction zone in June 2018, approximately ten bison would be chemically immobilized and fitted with GPS and radio collars to ensure at least one-third of the herd can be monitored from a distance. The gates to the soft-release pasture will then be opened.

Management Actions as Required

Given the availability of good quality year-round habitat and the management efforts identified to retain bison in the reintroduction zone, it is assumed the bison will remain within the Core and Expansion areas and use the habitat in proportion to its estimated suitability. In the event that bison move outside of the reintroduction zone, management actions, as well as their urgency, will increase appropriately as per the BNP Bison Excursion Prevention and Response Plan. In extreme cases, and when all other options have failed, bison may need to be put down.

Summary of Potential Impacts on Valued Components

Soil, Vegetation and Aquatic Resources

The extremely low density at which bison will occur in the reintroduction zone during the 3.5-year free-roaming phase of the project (0.04 animals/km²) is expected to result in negligible impacts on soil, vegetation, and aquatic components of the ecosystem. The exception to this would be if the animals concentrate their movements and activities to very few localized riparian areas, which is unlikely given the scoured nature of the riparian area.

Wildlife

Impacts to wildlife and regional socioeconomic dynamics would occur if bison introduced disease to wild or domestic animals but such impacts are highly unlikely given 40+ years of good health assessments of the source herd in Elk Island National Park. Nonetheless, the bison selected for reintroduction will be tested, quarantined and monitored for disease and health issues for 16.5 months prior to becoming free-roaming. Their health will also be assessed during the free-roaming phase of the project by way of twice-yearly ground surveys. All bison mortalities will also be investigated. In the unlikely event that brucellosis or tuberculosis are detected, the entire herd will be depopulated.

Helicopter use is expected to decrease dramatically once the bison are free-roaming (average of 0.5 hours/month) and will be limited to emergency flights to locate bison or to investigate mortalities. As with other phases of the project, minimum flight elevations of 500 m above ground will be maintained to minimize disturbance on sheep and other wildlife.

Cultural Resources

Three high-vulnerability archaeological sites will be proactively fenced in the Red Deer River Valley to prevent damage by free-roaming bison. Other moderately vulnerable archaeological sites will be monitored every two years to assess for possible newly exposed artefacts.

Visitor Experience

The risk of reintroduced bison injuring visitors is similar to the current risk posed by elk, bears or other species or natural hazards already in BNP. Like other wild species, individual bison can be aggressive in the rare occasion when they are surprised, when they feel trapped or cornered, when males are in rut, and when females are defending their young. Very few such encounters prove serious in other sites with bison like Elk Island and Prince Albert national parks. Despite tens of thousands of visitors interacting with bison in the frontcountry and backcountry areas of these parks, there have been fewer than half a dozen incidents involving human injury in the last 15 years. On the rare occasion when there is a conflict, it tends to involve bicyclists surprising bison on trails. None of the trails in the Banff bison reintroduction zone currently allow bicycles and all but one see fewer than 200 hikers/horseback riders per year. As part of this reintroduction, Parks Canada will conduct extensive education programs before and during all years of the reintroduction to help prepare visitors for a safe visitor experience in bison country.

As with BNP's elk and bear management programs, bison management may sometimes be required. Actions may range from proactive education and posting area warnings/closures to hazing or even removing bison from a conflict situation.

Socioeconomic Dynamics

Bison could damage fences and other private property if they leave the reintroduction zone and travel 20-50 km to the east but this is unlikely given the combined effect of the described reintroduction techniques, GPS-enabled radio collars and protocols in place to respond to any excursions that do occur.

Similarly, there are concerns that bison could introduce disease to livestock that is 20-50 km east of the reintroduction zone but this, too, is unlikely given the source herd in Elk Island National Park has been used, without incident, for dozens of bison reintroductions elsewhere in the world and the health monitoring protocols that will be in place.

Conclusion

Given the above mitigations, the overall adverse impact of free-roaming bison on all valued components during the course of the 5-year pilot project is expected to be **insignificant**.

Cumulative Impacts

Cumulative impacts are changes to the biophysical, social, economic, and cultural environments caused by the combination of past, present and foreseeable future actions.

Long-term Bison Restoration

The magnitude for most potential impacts of free-roaming bison for the 5-year pilot project are considered to be negligible, largely because of the low densities of bison. Should longer-term bison restoration proceed beyond the pilot project, those densities could increase to levels where the cumulative positive and negative impacts become more pronounced and potentially more significant. For example, based on bison population dynamics elsewhere, the 16 bison reintroduced to BNP in 2017 could grow to 200 animals within 10 years.

Examples of positive impacts from higher bison densities include:

- Increased plant diversity and productivity due to the grazing effects of bison;
- Maintenance and expansion of meadow habitat for other species due to the horning and rubbing behaviours of bison;
- Increased insect diversity and biomass supported by bison for consumption by insectivorous birds and bats;
- Additional food source for predators and scavengers;
- Additional amphibian habitat due to ephemeral ponds created by bison wallows; and
- Improved nestling survival due to the availability of bison fur for nesting birds.

Negative cumulative impacts could include:

- An increase in predators that results in increased predation on endangered caribou, should they be reintroduced into the park, or other ungulates;
- Damage to riparian vegetation and stream habitat due to the trampling, wallowing and grazing impacts of higher densities of bison if they favour such habitats; and
- Competition between bison and other ungulate species should food and space become limited.

A goal of the pilot project is to assess the response of various ecosystem components to the reintroduction of very few bison in order to determine long-term population targets should further bison restoration proceed (see Monitoring section below).

Prescribed Fire

Several prescribed fires over the last 30 years have resulted in approximately 11% of the reintroduction zone (126 km²) being burned since 1980. This is high compared to the rest of the park and is approaching the historic fire regime. This has resulted in less fuel, more open areas, and higher habitat heterogeneity than adjacent valleys, making the area better for bison and other grazers.

The continued application of prescribed fire, particularly meadow burning, is an integral component of the pilot bison reintroduction project to enhance habitat and help attract and hold the bison within the reintroduction zone. A separate environmental analysis was completed for meadow burning throughout the park and 865 ha of meadow burning was completed in 2015 in the reintroduction zone in anticipation of bison arriving. A further 635 ha of meadow burning is planned in and around the soft-release pasture over the course of the next three years.

There are several anticipated cumulative impacts from bison and prescribed fire, especially if long-term bison restoration proceeds and bison densities increase. **Examples of positive cumulative impacts from these two activities include:**

- The prevention of bison excursions from the reintroduction zone through the creation of more attractive habitat;
- Increased habitat heterogeneity and biodiversity;
- Increased forage quality, quantity and palatability for not only bison but other native grazers like elk and bighorn sheep.

Negative impacts may include:

- Prescribed fire applied outside of the reintroduction zone could attract bison out of the area;
- The combined impacts of bison trampling, wallowing and grazing in riparian areas, along with temporary removal of vegetation by fire, could lead to bank erosion, sedimentation of streams and rivers, and decreased fish habitat quality.

The risk of bison being attracted outside of the reintroduction zone due to fire can be mitigated by coordinating prescribed fire activities with neighbouring land jurisdictions. Long-term bison population targets, to be determined at the end of the 5-year pilot project, will mitigate damage to riparian and aquatic ecosystem components.

Monitoring and Assessment

A suite of project targets and monitoring measures is presented in Appendix 1. All monitoring measures were created in response to stakeholder concerns and knowledge gaps. These will be used to evaluate the 5-year pilot reintroduction project when it ends and to determine if it should be reversed or longer-term bison restoration should continue. If the decision is to reverse the project, all bison and fences will be removed. If the decision is to continue with longer-term bison restoration, then a comprehensive bison management plan, complete with population targets, will set the parameters for how it proceeds.

Conclusions

In considering bison re-introduction, Parks Canada has the opportunity to assess the feasibility of restoring one of only two missing species of a relatively undisturbed and intact mountain ecosystem. In doing so, it could make an important contribution to the natural integrity of ecosystems of Banff National Park and global conservation of plains bison.

There are challenges and constraints that make the endeavour complex, not the least of which is undertaking the pilot project in a remote, backcountry setting, and the need to limit the movements of the largest land mammal in North America. Doing so results in possible disturbance to other wildlife. As the detailed environmental impact analysis demonstrates, the extent of these and other impacts are considered insignificant after mitigations.

The cumulative impact analysis considers the potential adverse impacts of this 5-year pilot project in the context of potential future ecological gains if longer-term bison restoration proves feasible. Expected benefits include improved grazing for other ungulates due to the fertilized grasses bison leave in their wake, more forest openings for meadow-loving birds and small mammals, more amphibian habitat due to bison wallowing, and more conversion of grass into protein when bison die and are consumed by scavengers and predators like wolverines and grizzly bears. Persistence of these benefits over time relies on the long-term management of population numbers. During the proposed 5-year pilot project, extensive herd monitoring will help establish population targets for the future if longer-term bison restoration proves feasible and proceeds.

Appendix ES-1: Key concerns, assumptions, supporting evidence, monitoring measures and project targets for BNP's 5-year pilot bison reintroduction.

Key Concerns	Primary Assumption	Secondary Assumptions & Supporting Evidence	Section of DEIA	5-year Monitoring	Performance Objectives
Bison may roam onto provincial lands.	Bison will remain within the reintroduction zone.	<ul style="list-style-type: none"> ➤ 16 months and calving in soft-release pasture will result in strong bonding to new home. ➤ Meadow burning will help to attract/hold bison. ➤ Bison will respond to herding/hazing once free-roaming. ➤ Fences will work when in bison-holding mode and will be deployed in a timely manner as bison approach. ➤ A subset of the bison will be marked with GPS radio collars to enable close monitoring of their movements. ➤ There is suitable habitat to support bison within the park in both summer and winter. ➤ An Excursion Prevention and Response Plan is in place in the unlikely event excursions occur (Appendix 1). 	App. 1	<ul style="list-style-type: none"> ➤ Home range movements and habitat selection. ➤ Number and duration of excursions outside reintroduction zone. ➤ Hectares of meadows burned. ➤ Bison selection of recently burned meadows. ➤ Number of times bison move past fences. 	<ul style="list-style-type: none"> ➤ No bison excursions outside of the reintroduction zone. ➤ 1,500 ha of meadows burned. ➤ Bison do not move past fences.
Bison may be infected with tuberculosis or brucellosis.	Bison brought from Elk Island National Park (EINP) will be free of brucellosis and tuberculosis.	<ul style="list-style-type: none"> ➤ EINP bison herd certified brucellosis and tuberculosis-free by Canadian Food Inspection Agency since the 1970s. ➤ Dozens of other reintroduction projects have used EINP plains bison without issue. ➤ The probability of bison being infected with these diseases is low. ➤ Parks Canada will conduct intensive surveillance of bison health, with response protocols in the unlikely event disease is detected. 	App. 2	<ul style="list-style-type: none"> ➤ Bison health and disease surveillance as per BNP Bison Health and Disease Monitoring Plan. 	<ul style="list-style-type: none"> ➤ No brucellosis or tuberculosis introduced by bison or detected in any species.
Bison may create safety hazards for people travelling by horseback, foot or ski.	Risks to visitors will be similar to other large mammals – e.g. elk and bears – in the Park	<ul style="list-style-type: none"> ➤ BNP is a world leader in human-wildlife coexistence and will prepare visitors for bison with appropriate education, warning signs, etc. ➤ Very low visitation in BNP reintroduction zone (~200 people/year); users tend to be experienced backcountry travellers. ➤ Bison and visitors coexist in several other sites with higher visitation (e.g. Elk Island National Park). 	Section 4.6	<ul style="list-style-type: none"> ➤ Number and type of bison-human conflicts. 	<ul style="list-style-type: none"> ➤ Education, outreach and management actions result in very few bison-human conflicts; none result in serious injury.
Fences for bison may affect the movements of other wildlife, especially elk and sheep.	Fences will have 2 modes: wildlife-permeable and bison-holding. They will be deployed in bison-holding mode <5% of the time.	<ul style="list-style-type: none"> ➤ Wire height and spacing for the 2-wire, wildlife-permeable mode exceed the latest North American standards for wildlife-friendly fencing and have been tested in BNP for their permeability to other species in 2016. 	Sections 3.3 and 4.2	<ul style="list-style-type: none"> ➤ % time fences in bison-holding vs wildlife-permeable mode. ➤ Safe passage by other wildlife. 	<ul style="list-style-type: none"> ➤ Fences will collectively be in bison-holding mode <5% of the time. ➤ No wildlife are seriously injured by bison fence.

Key Concerns	Primary Assumption	Secondary Assumptions & Supporting Evidence	Section of DEIA	5-year Monitoring	Performance Objectives
Bison may compete with other ungulates, especially elk and sheep.	Bison provide benefits for other ungulates.	<ul style="list-style-type: none"> ➤ Bison grazing increases plant productivity and palatability for other grazers (e.g. elk and sheep). ➤ Bison prevent encroachment of trees and shrubs into meadows, thereby increasing grazing habitat for other grazers like elk and sheep. ➤ Meadow burning will promote attractive forage for all large herbivores. ➤ Competition is unlikely due to the small number of reintroduced bison and low elk and sheep numbers. 	Section 4.2	<ul style="list-style-type: none"> ➤ None as changes will not be evident in 5-year span of pilot project. 	<ul style="list-style-type: none"> ➤ N/A
Bison may introduce and spread non-native weeds	Bison will not introduce/spread non-native weeds except in soft-release pasture where aggressive treatment of existing tall buttercup will occur.	<ul style="list-style-type: none"> ➤ Parks Canada has identified 10 small existing non-native plant infestations in the 1,189 km² reintroduction zone (9 consisting of tall buttercup and one of Canada thistle). ➤ They are located in high quality bison habitat but their extent is so small, and the number of bison so few (0.04 animals/km²) as to render further spread by bison unlikely. ➤ The one exception is the soft release pasture. Weed-free hay will be used and aggressive treatment of existing buttercup will occur before bison arrive followed by aggressive rehabilitation of soil/vegetation afterwards. 	Section 4.3	<ul style="list-style-type: none"> ➤ Number and area of non-native vegetation infestations assessed biannually. ➤ Bison home ranges and habitat selection. 	<ul style="list-style-type: none"> ➤ No net increase in number and extent of infestations attributable to bison.
Bison may prefer and potentially damage riparian habitats	Bison will not preferentially spend time in riparian habitat	<ul style="list-style-type: none"> ➤ Research from elsewhere shows that bison do not preferentially use riparian habitats. 	Section 4.3	<ul style="list-style-type: none"> ➤ Bison habitat selection 	<ul style="list-style-type: none"> ➤ Bison will not preferentially select and unduly damage riparian habitat.
Bison re-introduction may negatively affect water quality	Water quality will not diminish due to bison reintroduction or meadow burning.	<ul style="list-style-type: none"> ➤ Bison do not tend to linger around water or in riparian areas. ➤ Negative impacts of prescribed fire on water quality are minimal and short-lived. 	Section 4.4	<ul style="list-style-type: none"> ➤ Benthic macroinvertebrate sampling as per the Canadian Aquatic Biomonitoring Network. ➤ Water chemistry sampling in bison reintroduction zone and other valleys for comparison. 	<ul style="list-style-type: none"> ➤ Maintenance of benthic macroinvertebrate communities indicative of good water quality. ➤ No net increase in sedimentation.
The reintroduction of bison may lead to higher numbers of wolves which will affect other prey species.	No numeric response of wolves to bison reintroduction.	<ul style="list-style-type: none"> ➤ Experience elsewhere shows wolves often take years to adapt to a new prey source. ➤ The number of bison will be small during the 5-year pilot reintroduction. ➤ Bison are extremely robust to predation and often inflict injuries on wolves. 	Sections 4.2 and 4.5	<ul style="list-style-type: none"> ➤ Investigate all bison mortalities. ➤ Continue monitoring wolves with radio collars and remote cameras. 	<ul style="list-style-type: none"> ➤ Assess response of predators to bison during 5-year pilot. ➤ Set bison population target if restoration proceeds.

Key Concerns	Primary Assumption	Secondary Assumptions & Supporting Evidence	Section of DEIA	5-year Monitoring	Performance Objectives
Increased helicopter use for bison management, as well as greater human presence, will lead to reduced grizzly bear habitat security and sense of wilderness.	After an initial increase, helicopter and staff presence in reintroduction zone will decrease annually as bison settle into their new home.	<ul style="list-style-type: none">➤ Translocation and soft-release pasture phases will be the most staff and helicopter intensive parts of the project.➤ Significant increase in public use of the area is unlikely due to remoteness of reintroduction zone.	Sections 4.2 and 4.7	<ul style="list-style-type: none">➤ Helicopter hours in the eastern slopes of BNP.➤ Staff presence in Wilderness Zone.➤ Number of people on trails in reintroduction zone.	<ul style="list-style-type: none">➤ Reduction in helicopter use (<2.5 hrs/month) and staff presence (<2 wks/month) in Wilderness once bison are free-roaming.➤ Backcountry visitation remains <100 events/month on all trails that are currently below that threshold.