Caribou Conservation Breeding and Augmentation Project in Jasper National Park

Detailed Impact Assessment

J19-018

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EXECUTIVE SUMMARY

Parks Canada proposes a 10 to 20-year caribou conservation breeding and augmentation project (the project) in Jasper National Park (JNP). The intent of the project is to recover caribou in their natural ranges in JNP. The project will occur in six (6) main phases, including:

1. Build - Breeding facility design, construction & operations: Breeding facility design, construction, and operation will consider the project setting and prioritize animal welfare. Facilities include an animal treatment facility and laboratory, handling barn, site office, short-term accommodations space, vehicle/equipment storage spaces, and a temporary work camp/equipment lay down yard. The site furnishing will include construction of several fenced pens, animal feeders, waterers, and animal handling equipment and associated utilities.

2. Capture - Securing source caribou: Securing source caribou will involve capturing wild caribou and transporting them to the breeding facility. The goal is to obtain a small number of caribou from source populations with the closest genetic and behavioural match to the wild populations where the animals will be released while not affecting the source populations' long-term viability. Following expert guidance and standard caribou capture techniques, capture of source animals would occur between December and February (First capture in 2025; second capture in 2026)

3. Breed - Animal husbandry and care: By managing risks, captive breeding has the potential to supply enough caribou to reach self-sustaining population sizes in wild populations in the Jasper/Banff Local Population Unit (LPU). The project aims to produce 14-18 female yearlings annually, with most (11-15 yearlings) available for release. Actual number of annual female yearlings will depend on reproductive rates, first-year mortality, and adult mortality in captivity, which are a function of good husbandry, facility management, captive conditions, and appropriate expertise. Managing caribou health is essential to the project and should be based on preventive medicine rather than medical intervention. First caribou born in captivity is expected in June 2025.

4. Release - Augmentation of recipient populations: Selecting the right recipient populations, supporting the best ecological conditions in those recipient populations, and timing the release of captive-bred animals is crucial to achieving the project's objectives and minimizing mortality after release. The Tonquin population, which is part of the Jasper/Banff LPU, is prioritized because the current size of the remaining herd gives the best chance of success. In order to prioritize animal welfare and minimize mortality, a soft release approach will be utilized. This approach provides captive raised caribou an opportunity to acclimatize to the release location and potentially bond with the wild population prior to release. First male and female augmentation are anticipated in March and September (or October) 2026 respectively.

5. Adapt - Research, monitoring, and adaptive management: The project will be guided by Open Standards for the Practice of Conservation, which provides a framework to define and achieve conservation outcomes. The project will also be guided by provincial and federal government partners, local Indigenous partners and various experts in conservation from around the world. Research scientists will also independently be engaged to test hypotheses and assumptions, gather data and knowledge, and learn from

and integrate results throughout the project's implementation. Research, monitoring, and adaptive management are ongoing.

6. End - Decommissioning and restoration: At the end of the project, the breeding facility will be decommissioned. Initial assessment indicates that it is feasible to reclaim the proposed site. The project will include a vegetation management strategy to minimize impacts of the breeding facility and release sites. Exact timing for decommissioning and restoration of breeding facility and associated infrastructure is to be confirmed (10 to 20-year project) and is anticipated in 2040/45. Parks Canada will monitor the success of the project on an ongoing basis. If objectives of the project are not realized in the manner anticipated, the project may be ended earlier than anticipated. Animal care and health considerations will be central to phasing out the project.

The *Parks Canada Directive on Impact Assessment, 2019* (the Directive) outlines the legislative and policy framework and accountabilities relevant to environmental and cultural impact analysis of proposed projects within Parks Canada-protected heritage places. Under the Directive, "Projects likely to result in significant interest or controversy among members of the public, stakeholder or Indigenous peoples related to potential adverse effects on natural or cultural resources, or components of the environment critical to key visitor experience objectives," are subject to a Detailed Impact Assessment (DIA).

The project is the subject of a DIA, in order to eliminate, reduce or control potential adverse effects. This DIA describes baseline conditions (existing environment), environmental impacts, mitigations, residual impacts and cumulative effects for ten (10) valued components (VCs) in the context of the most appropriate phases of the project. The 10 VCs are:

1. Brazeau caribou population;
2. À la Pêche caribou population;
3. Tonquin caribou population;
4. Vegetation and soils;
5. Surface and groundwater quality and subsurface drainage;
6. Heritage sites and cultural resources;
7. Wildlife and predator habitat security;
8. Species at Risk under Schedule 1 of SARA;
9. Indigenous values and connection to caribou; and
10. Wilderness character and visitor experience opportunities.

The basis for assessing impacts to the À la Pêche and Tonquin caribou population VCs will rely on previously accomplished population modelling. The Brazeau caribou population is too small to use statistical modelling and will be depopulated and brought into the facility, in order to preserve the individuals and their genetics. Additional source population modelling will be undertaken in collaboration with provincial partners and Environment and Climate Change Canada (ECCC) to expand upon the initial models Parks Canada developed.

During early dialogue and consultation activities, Parks Canada heard from Indigenous partners about the importance of their participation and collaboration in the project, the importance of Indigenous knowledge, language, spirituality and ceremony to inform the project, a desire for economic opportunities associated with the project, and concerns about raising caribou to be wild. Extensive research and consultation with Indigenous partners, stakeholders and the public was undertaken over the period of April to September 2022. Ongoing consultation and

engagement efforts with Indigenous partners will aim to include Indigenous knowledge and perspectives into all aspects of the project in a meaningful way.

Taking into account the implementation of mitigations outlined in this DIA, Parks Canada is of the view that significant adverse impacts on identified VCs from the project are unlikely to occur.

Acronyms and Abbreviations

ACIMS – Alberta Conservation Information Management System
Action Plan – Multi-Species Action Plan for Jasper National Park of Canada
AIA – Archaeological Impact Assessment
CABIN – Canadian Aquatic Biomonitoring Network
COSEWIC – Committee on the Status of Endangered Wildlife in Canada
CWD – Chronic Wasting Disease
DIA – Detailed Impact Assessment
Directive – Parks Canada Directive on Impact Assessment, 2019
ECCC – Environment and Climate Change Canada
EIMP – Ecological Integrity Monitoring Program
EMS – Environmental Management System
ELC – Ecological Land Classification
GCDWQ – Guidelines for Canadian Drinking Water Quality
GWUDI – Groundwater Under the Direct Influence of Surface Water
HOA – Historical Overview Assessment
IAA – Impact Assessment Act
IPM – Integrated Population Model
IUCN – International Union for Conservation of Nature
JNP – Jasper National Park
LPU – Local Population Unit
MO/DERs – Management Objectives and Desired End Results
MBCA – Migratory Birds Convention Act
Parks Canada – Parks Canada Agency
Project – Caribou Conservation Breeding and Augmentation Project
Recovery Strategy – *Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada*
RFP – Request for Proposal
SARA – Species at Risk Act
UNESCO – United Nations Educational, Scientific and Cultural Organization
UNDRIP – United Nations Declaration on the Rights of Indigenous Peoples
VC – Valued Component
Willmore – Willmore Wilderness Park

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1. Introduction

Parks Canada Agency (Parks Canada) is proposing a 10- to 20-year caribou conservation breeding and augmentation project (the project) in Jasper National Park (JNP). The intent of the project is to recover caribou in their natural ranges in JNP. Southern mountain caribou is identified by the Government of Canada as a priority species for conservation action, based on their ecological, social and cultural value to Canadians and are listed as Threatened on Schedule 1 of the *Species at Risk Act (SARA)*. Caribou recovery is a priority for Parks Canada in the fulfillment of its mandate to maintain and restore the ecological integrity of JNP, and its commitment to recover species at risk. Extensive research and consultation with Indigenous partners, stakeholders and the public has been and will continue to be undertaken for the project.

Parks Canada's legal accountability under the *Impact Assessment Act, 2019 (*IAA, Parks Canada Agency 2019*)* is to ensure that projects and activities undertaken on the lands it manages do not result in significant adverse environmental effects (IAA, Parks Canada Agency 2019, s. 84). Developed in response to IAA 2019 legal requirements for federal lands, *Parks Canada Directive on Impact Assessment, 2019* (the Directive) outlines the legislative and policy framework and accountabilities relevant to environmental and cultural impact analysis of proposed projects within Parks Canada-protected heritage places. Under the Directive, "Projects likely to result in significant interest or controversy among members of the public, stakeholder or Indigenous peoples related to potential adverse effects on natural or cultural resources, or components of the environment critical to key visitor experience objectives," are subject to a Detailed Impact Assessment (DIA). The project is, therefore, the subject of a DIA, in order to eliminate, reduce or control potential adverse effects.

The purpose of this DIA is to identify potential adverse impacts associated with the project, explain the proposed mitigations to minimize them, identify any residual impacts and cumulative effects, describe follow-up monitoring to address knowledge gaps, and determine whether significant adverse environmental and cultural impacts are likely to occur.

Several changes have been made to the DIA following feedback from consultation with Indigenous partners, stakeholders and the public. Section 7 summarizes the consultation process, the feedback received and how this feedback shaped the final version of the DIA. Additional details are provided in Appendix A.

2. Scope of the project

2.1 Current situation/background

Caribou populations in the Jasper/Banff LPU are at risk.
Research and monitoring of woodland caribou (*Rangifer tarandus caribou)* in JNP show that, over many years, caribou populations have significantly declined to populations that currently have too few animals to sustain themselves. While declines have stabilized, maintaining the status quo will result in the extirpation (extinction within a specific area) of all caribou populations within the southern region of JNP (referred to as Jasper/Banff Local Population Unit [Jasper/Banff LPU]). The Jasper/Banff LPU is comprised of the Banff, Maligne, Brazeau, and Tonquin populations.

The project described here is the proposed approach for preventing the extirpation of southern mountain caribou in the Jasper/Banff LPU, and for rebuilding populations that can persist on their own. It is the product of years of information gathering, observation and scientific research and knowledge-sharing with Indigenous partners. Currently, threats to caribou in JNP have been abated, and conditions are favourable to support caribou recovery. Rebuilding the dwindling populations of caribou in JNP will help to ensure the continued existence of some of the world's southernmost caribou.

Only two populations remain within the Jasper/Banff LPU and they are facing imminent extirpation.

Of the four original caribou populations in the Jasper/Banff LPU, which once contained hundreds of caribou, only two populations are left—the Tonquin population and the Brazeau population. The Banff population was extirpated in 2009, and the Maligne population was determined to be extirpated in March 2020. The Brazeau population has only approximately 3 adult females, and the Tonquin population has approximately 9 adult females. At current population levels, the Brazeau and Tonquin populations are not large enough to be self-sustaining (Hebblewhite 2018; Johnson 2017; Schmiegelow 2017). A caribou population with 10 or fewer reproductive females is considered functionally extinct, even though a few of the animals may persist in the population's range for a prolonged period (Environment Canada 2011).

Parks Canada has acted to mitigate many of the influences on caribou decline.

Caribou in JNP have been listed as Threatened on Schedule 1 of the *Species at Risk Act* since 2003. Over the past fifteen years, Parks Canada has undertaken a suite of conservation measures including closing public access to important winter habitat, implementing helicopter guidelines to minimize disturbance, improved roadkill management to reduce supplementing caribou's main predator (wolves), prohibition of ski-lift development in the Tres Hombres and Outer Limits areas of Marmot Basin, and has implemented science-supported change to park management to support natural recovery of caribou populations in JNP. These measures reduced the severity of threats but were insufficient to recover these small populations while wolf density remained high until recently (above three wolves per 1,000 km^2). Wolf density is now low, estimated currently at 1.2 wolves/1,000 km^2, corroborated by aerial wolf surveys annually. Conditions for caribou survival are much improved, but populations are now too small to recover on their own. Furthermore, as caribou populations decline, they become disproportionately affected by natural processes like predation, disease and avalanches.

In January 2021, Parks Canada hosted a virtual workshop to review the scientific evidence that Parks Canada has developed towards conservation breeding in Jasper National Park, facilitated by Foundations of Success. A group of nearly 50 specialists in caribou ecology and conservation breeding came together from academia, environmental non-governmental organizations, research institutes, international conservation organizations, zoos, and federal and provincial governments and Aseniwuche Winewak Nation. The scientific review confirmed support for the following:

- Without intervention, the Tonquin and Brazeau populations will disappear and caribou will not return to the historic Maligne Range.
- Other strategies to increase the population size of caribou populations in Jasper National Park are not likely to be effective.
- The threats that originally caused the decline of caribou populations in Jasper National Park have been reduced as a result of Parks Canada's conservation actions and long-term changes to elk and wolf populations in the park.
- Current conditions in Jasper National Park support rebuilding caribou populations.

The scientific review (Foundations of Success, 2021) determined that the proposed conservation breeding program is feasible, as long as:

- Parks Canada can secure suitable sources of wild caribou;
- predators and long-term climate changes are monitored and mitigated;
- Parks Canada continues to review conservation actions to support caribou recovery, including mitigations for winter activities in the Tonquin Valley; and
- the program is adapted based on what is learned along the way.

2.2 Need and purpose

The Government of Canada has identified six species, including southern mountain caribou, as a priority for conservation based on their ecological, social and cultural value to Canadians (Environment Canada 2014). Caribou recovery can have significant benefits for other species at risk and biodiversity within the ecosystems they inhabit.

Through this project, Parks Canada will:

- capture wild caribou, using sources that maximize genetic diversity and minimize demographic impacts on the source populations;
- breed these animals in a temporary facility protected from predators and other health risks;
- release young animals born in the facility into existing wild populations to augment and strengthen those populations to a self-sustaining level that will preserve ecological integrity and a priority species at risk;
- regularly assess outcomes and adapt management based on research and monitoring; and
- reintroduce caribou in areas of JNP where wild populations have been extirpated.

As a first step, the proposed goal for the project is a minimum stable population of at least 200 animals in the Tonquin population within 5-10 years after the first caribou are released. If this first goal is achieved, then the possibility of reintroducing caribou in the Brazeau and Maligne populations will be explored, with a goal to reach populations of 300–400 caribou across the Jasper/Banff LPU.

A breeding and augmentation project is the best option.
Parks Canada has explored in detail several options to support caribou recovery (see Section 2.3 Alternatives/options considered). Based on this body of research, Parks Canada has concluded that, in the JNP context:

- The project is the only viable option to reverse caribou decline, prevent the extirpation of caribou, and meet the goals and objectives of the *Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada* (Recovery Strategy) (Environment Canada 2014).
- The project has a high chance of success, building on research and practices from breeding and augmentation of caribou and other ungulates carried out successfully around the world on a smaller scale, as well as similar programs for other species at risk.

- The main threats and drivers of the caribou decline in JNP have been identified and sufficiently mitigated.
- A national park is unique, protected space, where caribou populations have the best chance of recovery and long-term survival. Caribou in JNP are not affected by industrial and development pressures. With sufficient habitat and favourable ecological conditions for reintroducing caribou bred in captivity, JNP could be an optimal location for strengthening caribou populations.
- Chances of success are better while wild caribou remain in JNP and their natural behaviours and characteristics can be preserved.

2.3 Alternatives/options considered

Several alternatives to this project have been examined, including:

2.3.1 Status quo (no intervention)

The status quo is ineffective in the Jasper context. Jasper/Banff LPU populations, with currently less than 10 reproductive females each, have been determined to be too small to recover without intervention. These smalls populations may persist for a long time but are unlikely to recover.

2.3.2 Wolf control

In the Jasper National Park context, wolf control is a tool that, on its own, is unlikely to help recover populations in the long term and is insufficient to recover populations that are already too small. In addition, wolf control in a protected area and without reducing prey density (for example, elk or deer) would likely lead to an increase in all ungulates, and an eventual rebound in the wolf population after control is stopped. This increase in wolf density would create high pressure on endangered caribou populations and would recreate the situation of management-induced apparent competition when wolf control was in place from 1900-1959 (Bradley and Neufeld 2012). Wolf density in JNP, currently assessed at 1.2 per 1,000 km^2 is now sufficiently low to support self-sustaining caribou populations (Hebblewhite2007; Wilson 2009; Serrouya 2021). Parks Canada continues to monitor wolf density and habitat use as well as wolf prey populations (elk, deer, moose). While park-wide wolf control is not being considered, short term, targeted and localized predator management (e.g. relocation, removal) may be used to support the augmentation of caribou within the Tonquin population range. A predator management strategy, with clearly defined thresholds and conditions will be developed for the project.

2.3.3 Maternity penning

Maternity penning is a species-recovery technique to increase the survival rate of calves by capturing pregnant females before they give birth. Pregnant females are temporarily held in a fenced area for four to eight weeks during which calves are born and experience their first weeks of life protected from predators. The goal of maternity penning is to increase calf survival and recruitment.

Maternity penning would not be effective for the Jasper/Banff LPU because:

- Calf mortality is not the cause for declining numbers in the Jasper/Banff LPU. Jasper has high calf-to-cow ratios, relative to other caribou populations.
- There is an insufficient number of breeding females in the Jasper/Banff LPU (Johnson 2017); therefore, preventing deaths of the small number of calves that are born would be insufficient for changing the trajectory towards extirpation. In other words, it would add too little too late.
- There is a small number of females available to pen, and there could be health risks from multiple recaptures of those wild females (Hebblewhite 2018; Johnson 2017).

2.3.4 Direct caribou translocation

Direct caribou translocation involves moving wild caribou from one population to another. Translocation of woodland caribou has been used since the 1930s for several boreal and mountain populations in Canada with variable success (Cichowski *et al.* 2014; Hayek *et al.* 2016). Most recently, this approach was used unsuccessfully in 2012 in the Purcell Mountains in British Columbia to augment specific, high-priority populations (Cichowski *et al.* 2014; SaRCO 2007). Estimates suggest translocation of at least 120 animals would be required to meet the goals of the Recovery Strategy for the Maligne and Brazeau populations alone.

Direct translocation is not considered workable in the Jasper context because:

- Sufficient source caribou are not available.
- Support from other jurisdictions, Indigenous groups and the public may be lacking (Hebblewhite 2018).

2.4 Detailed project description

2.4.1 Build: breeding facility design and construction

Design and construction of the breeding facility will need to consider the project's environmental setting and prioritize animal welfare. Parks Canada will engage an external engineering consultant, and partner with specialists experienced in the planning and construction of similar facilities dedicated to the handling and husbandry of caribou and other ungulate species to develop the detailed plans and designs for the facility. Construction will consist of several stages, including, at a minimum:

- selective vegetation removal and removal of trees affected by mountain pine beetle within the site;
- site preparation, including topsoil harvesting, utility construction, earthworks, grade preparation and road construction;
- establishment of a work camp and equipment storage/laydown yard at the Kerkeslin Borrow Pit in JNP or another suitable location;
- upgrades to the lower portion of the Geraldine Fire Road;
- construction of facilities, including an animal treatment facility and laboratory, handling barn, site office, short-term accommodation space, and vehicle/equipment storage spaces;
- site furnishing, including construction of site perimeter fence and animal pens, animal feeders, and waterers; and
- construction restoration and reclamation.

At all times throughout the design and construction processes, the welfare of captive caribou will remain the highest priority for engineers, planners and decision-makers.

Breeding facility design is research-based to maximize caribou health.
This facility will house more than 100 animals at peak production times—specifically, early summer. Therefore, the facility design needs to accommodate caribou at a higher density than found in nature. The facility will consist of fenced pens, which will support population management, protect against predation, allow for handling and provision of basic health care. The facility will be built to be easily decommissioned at the end of the project's lifecycle. Parks Canada has engaged experts with over 25 years of experience managing caribou in captivity (Blake and Rowell 2017), or who are involved in caribou health care (Slater 2017), to create husbandry and health care protocols to guide the facility's operations.

The breeding facility requires approximately 65 hectares of land to allow for population management and to accommodate separating animals at various life stages and times of year, as well as for health care and quarantine areas. The conceptual breeding facility layout proposed by Blake and Rowell (2017) will limit negative interactions among animals and provide reasonable overall density. The breeding facility will include various pens (Figure 1). Limiting use and density of the calving pens will be critical to minimizing calf mortality, therefore, calving pens will hold cows and their calves for roughly 10 days after birth.

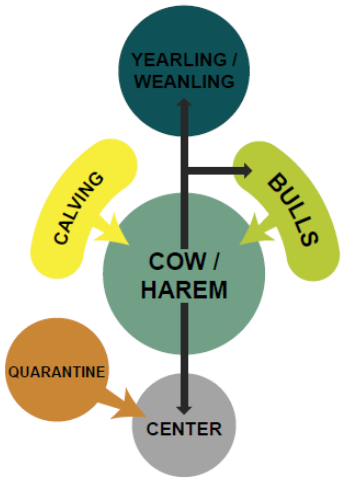

Figure 1: Breeding facility concept diagram

The breeding facility concept diagram (Figure 1) outlines the general guiding principles for the placement of the various pens:

- The pens will be connected to a central raceway to simplify daily operations and streamline caribou movements.
- Cows will move the most around the facility, therefore, placing the cow pens in the centre of the layout would ease movement.
- The calving and bull pens can be used as a buffer between the cows and yearling/weanling pens.
- The yearling and weanling pens will be farthest from the centre and associated disturbance.

Based on site conditions, the location of the yearling/weanling pens take priority over the location of other pen types. They are located furthest from the central building complex and away from other pens to minimize disturbance and habituation of the yearlings. Figure 2 illustrates the design layout of the facility.

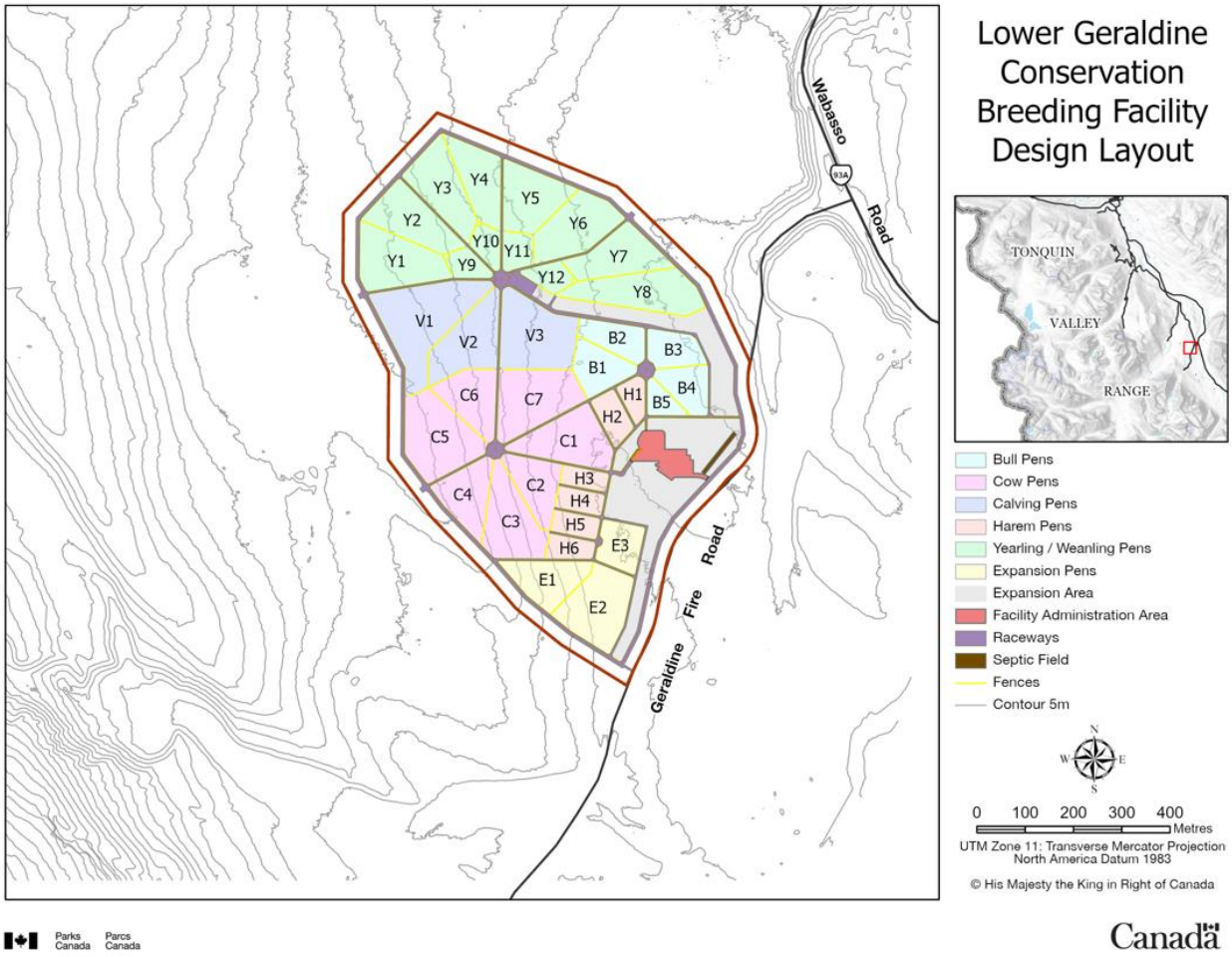

Figure 2: Conservation breeding facility design layout

The yearling/weanling pens are arranged into four units that meet at a point on the southern end where a handling system is located for animal sorting, veterinary care, and release activities. From the yearling/weanling handling centre is a road that leads to a staging area located outside of the perimeter fence. Around the pen yearling/weanling complex and down the centre are raceways for staff to move and care for the caribou.

The calving pens are located on a moderate slope for good drainage. The pens are oriented perpendicularly to the slope to minimize runoff from other pens into the calving pens. The location of the calving pens also creates a buffer between the cow pens and the yearling/weanling pens which will aid in the weaning process.

Adjacent to the calving pens are the cow pens. The proximity of the cow pens to the calving pens allows for direct transfer of the pregnant cows to the calving pens. The cow pens and adjacent raceways are mostly oriented perpendicularly to the slope to reduce the cross slope in the raceways and ease caribou movement and vehicular circulation. The cow pens are interconnected to allow for pasture rotation and flexibility in population management. They are connected through a central hub for ease of sorting and moving caribou around.

The bull pens are located in the eastern portion of the site. The bull pens are connected through a central hub to the raceways to gather and move bulls to other pens.

The harem pens are located near the handling barn, close to the cow pens, the bull pens and the main raceway. This configuration ease harem formation and dissolution. Between the harem pens are raceways that separate the pens and prevents rutting bulls from have direct contact with each other at the fence line.

The building centre, which includes the handling barn, administration building, vehicle storage and food storage, is located near the existing road for easy access. It acts as a check point as it is the first structure staff and visitors encounter when they enter the facility. The centre is located on the flattest area of the facility.

Because the breeding facility will handle caribou at a higher density than found in nature, facility personnel will minimize the associated risks of disease transmission using strict handling, population management, health care and biosecurity protocols (Blake and Rowell 2017; Slater 2017).

A breeding facility located in JNP maximizes chances for success.
JNP is the best location for the project's success, based on a list of criteria that was applied to a variety of proposed sites (Wilson 2018).

The Geraldine site, 30 kilometres south of the Jasper townsite, is considered the preferred location for the caribou conservation breeding facility.

The Geraldine site is:

- relatively quiet, with low human disturbance;
- close to typical caribou habitat;
- able to supply environmental conditions like those found in the caribou's natural spring habitat (temperature, vegetation and water sources), although the site does not include alpine habitat;
- away from large concentrations of other wild ungulates;
- entirely separate from domestic livestock;
- relatively close to source sites for wild caribou and release of captive-reared caribou;
- relatively close to utilities and services required to run the facility; and
- accessible to Parks Canada staff and specialists from the Jasper townsite.

Ambient conditions at the Geraldine site, such as temperature and vegetation, are most like those of planned release sites. A site in JNP benefits from its proximity to both capture and release sites, which minimizes transportation and reduces acclimatization stresses, although sites located too close to release sites could encourage caribou to return to the facility. It also offers adequate drainage, as well as protection against predators.

The facility will be situated in a forested area with shade available. The fence lines and shade requirements will be designed to preserve as many trees as possible (Blake and Rowell 2017). Additionally, the facility will include sufficient heat protection, such as open-side shade shelters and cooling stations with water sprinklers, to protect the caribou on hot days. Shelters and sprinklers have been used successfully in other breeding operations (Blake and Rowell 2017).

Cool air temperature was one of the key criteria for determining acceptable locations for the facility.

Preliminary site reconnaissance of the Geraldine site has included verifying a clean and reliable water source by drilling and testing an underground well, collecting high resolution topographic data of the area, and determining the incidence of rare plants within the estimated project footprint that will require environmental mitigations to protect. An archeological assessment has also been completed and several Indigenous partners took part in a site visit in September 2019. Additional site visits with Indigenous partners took place in June of 2022. Feedback from early dialogue and consultation with Indigenous partners is summarized in Section 7.1.

Relative proximity to the Jasper townsite is important for fast and ongoing access for professionals working at the site. Distance to veterinary care is a factor, as any delay in identifying and responding to health problems or issues with birthing may reduce successful outcomes (Macbeth 2015). Blake and Rowell (2017) suggest that a lead veterinarian need not be on-site full time, and that the position could be filled by someone working remotely, if a local animal veterinary practitioner was nearby to address minor health issues and to supply basic obstetric assistance. Proximity to Jasper would facilitate having these professionals accessible.

Proximity to Jasper will also facilitate collaboration with academic partners, increase staff retention compared with a more remote location, increase productivity by reducing travel time, improve access to reliable water, power sources and communication options, and simplify operation of the facility by reducing shipping time and delays for maintenance work.

Other sites were considered and rejected, primarily because of disease risk. Several potential breeding facility locations outside of JNP were considered, based on an extensive criteria list, including Elk Island National Park, Ya Ha Tinda Ranch, and public land in the Hinton, Valemount and Calgary areas. All were rejected as sub-optimal (Bisaillon and Neufeld 2017; Blake and Rowell 2017; Macbeth 2015; Slater 2017; Whittington *et al.* 2011; Wilson 2018).

One key reason that these sites did not meet the criteria for a breeding facility was exposure to disease. Disease risk is a major deciding factor for success in all conservation breeding programs (Ballou 1993; IUCN/SSC 2013; Snyder *et al.* 1996). The risk of chronic wasting disease (one of the most serious health concerns for ungulates) increases significantly east or south of JNP (S. Cotterill, personal communication, 2019; Macbeth 2015; H. Schwantje, personal communication, 2017). Potential sites inside JNP do not have a history of agricultural use nor any known history of significant endemic wildlife diseases (Macbeth 2015; Slater 2017 and 2018; Wilson 2018). However, as chronic wasting disease is progressing westward, strict biosecurity measures will be implemented.

Distance from urban centres is an advantage for success but has associated costs. It should be noted that a facility in JNP is estimated to have a higher cost than other locations to construct and decommission, as well as for rehabilitating habitat at the end of the project (Wilson 2018). However, while sites near urban centres benefit from lower building costs, they increase stress on caribou and risk of disease (Wilson 2018).

2.4.2 Capture: securing source caribou

Securing source caribou will involve capturing wild caribou and transporting them to the conservation breeding facility. The goal is to obtain caribou from source populations with the

closest genetic and behavioural match to the wild populations where the animals will be released. Following expert guidance and protocols from partners who have used such techniques before, capture of source animals will occur between December and February. Risks associated with capture, handling, and transport will be mitigated by employing the best practices that have been established in other caribou capture, captive-rearing and translocation programs (Slater 2017). Recent projects to move pregnant caribou to maternity pens (e.g. Klinse-Za, Columbia North, Central Selkirk populations) and the capture and relocation of the remaining South Selkirk and South Purcell caribou in British Columbia have illustrated that caribou can be captured and moved safely and effectively.

Source population options are limited, given the precarious state of most populations. Genetic and behavioural differences between populations must be considered.

Details on how many caribou will be captured, and from which populations, are not yet confirmed. The decision will be based on the best available information about genetic and behavioural suitability, the impacts of removing animals from source populations, and based on discussions with provincial, federal and Indigenous partners. Initial population modelling to identify impacts to source populations (Neufeld and Calvert 2019) will be further developed in conjunction with the governments of Alberta and British Columbia, federal partners, local Indigenous partners and other external expects in the following months.

It is recommended that founding source animals be captured over a period of 5 years depending on source populations availability, anticipated impacts, and discussion with provincial, federal and Indigenous partners. While it is possible to capture all the breeding females in the first year, this could have several negative outcomes. Capturing all animals in the first year would require a more aggressive capture and transport schedule, and would be a greater risk to caribou with only one breeding group, as disease or other problems could affect this one group catastrophically. Capturing females over two or more years maximizes the conservation of genetic material and animal rescue while minimizing risks (for example, cost, transport, animal health and welfare) and potentially reducing the impact on source populations. A multi-year process also allows Parks Canada to learn from the first capture year to verify success, and apply the learning to the second and following years. It also allows for proof of program effectiveness for Indigenous partners, stakeholders and the public, and more time to communicate about the process as it unfolds.

Parks Canada is cognizant of and respects the agreements that the Governments of Alberta (Alberta) and Government of British Columbia (British Columbia) have with the Government of Canada for the protection and recovery of caribou, know as Section 11 agreements. Parks Canada's priority is to avoid impacting Alberta and British Columbia's commitments to the Section 11 agreements, as well as to avoid imperilling the long-term recovery of potential regional source populations. Parks Canada will work with partners to develop the necessary inter-jurisdictional agreements in support of this project. Parks Canada will only capture caribou on provincial lands or from a shared population (i.e. À la Pêche population) under a Parks Canada-provincial agreement.

To promote inter-jurisdictional collaboration, Parks Canada intends to establish a governance structure (such as an external advisory committee, Indigenous Working Group and joint technical committees) to support ongoing collaboration on topics such as appropriate source populations and numbers that could be provided for the conservation breeding project. Parks Canada will also seek third party and independent expertise to assist in the refinement of model inputs and development of source population strategies. Parks Canada is recognized as a

separate competent authority under the *Species at Risk Act* for all individuals occurring on federal lands managed by Parks Canada, and as such, has the legal responsibility and authority to recover the Jasper/Banff LPU.

Genetic diversity of the breeding population is a critical consideration.
Parks Canada aims to maximize genetic diversity by capturing females from disparate groups and then assessing and adjusting genetic relatedness in the founding population (Blake and Rowell 2017; Cavedon and Musiani 2020). This strategy will theoretically allow capture of between 95%–98.75% of wild genetic diversity (McShea *et al.* 2018). Genetic variety will also be optimized by tracking and controlling the number of offspring each male breeder produces. Adding new wild males and females to the breeding population periodically will counteract random loss of genetic variation and reduce inbreeding (Traylor-Holzer 2015).

To maximize genetic diversity in the captive population, Parks Canada will:

- gather as large a breeding population as required, while ensuring long-term viability of source populations;
- minimize genetic relatedness among wild-caught animals (that is, capture from several source populations, sample spatially, temporally, or both within a single large-source population);
- identify and address problems in the founding population through ongoing genetic review and individual caribou management;
- replace older breeding males that are less consistently virile with new wild-caught males when feasible, rather than captive-born males;
- retain captive-born males that are the fewest generations removed from the wild source caribou to minimize risks of inbreeding;
- place breeding males with a different group than the one into which they were born;
- manage breeding group size; and
- limit time that males breed to balance number of offspring produced by each male.

The near-extinct Brazeau population and animals from regional populations are proposed to form the founding breeding population.
The Brazeau population has been below the quasi-extinction threshold since approximately 2004. Parks Canada will capture this population first and relocate all of the animals, estimated to be 10-15 animals, to the conservation breeding facility (Hebblewhite 2018; McShea *et al.* 2018; Slater 2017). In addition, the project proposes capturing a few males and potentially a few females from the Tonquin population. This approach will preserve regional genetics within the captive population that would otherwise disappear.

Parks Canada is proposing to initially capture some female caribou from the Jasper/Banff LPU, and, in subsequent years, to capture additional caribou from several regional populations from Alberta and British Columbia. The goal is the creation of a breeding herd of, ideally, 35-40 female caribou made up of a combination of captured and facility-bred animals. Caribou from these source populations would be primarily females, plus dependent calves, and a few males, biasing toward younger animals (Hebblewhite 2018; Neufeld 2020). Obtaining small numbers of caribou from several wild or captive sources would increase genetic diversity and decrease the impact on any one population. Parks Canada is committed to ensuring that the long-term viability of source populations is not impacted by the project. There has been no final decision on source populations and additional work with Indigenous partners, the provinces of British Columbia and Alberta and federal partners through a joint technical committee is needed to ensure that the best regional approach is used and supported.

2.4.3 Breeding: animal husbandry and care

By managing risks, captive rearing has the potential to supply enough caribou to meet or exceed the goals of the Recovery Strategy for the populations of the Jasper/Banff LPU, including the South Jasper populations (Hebblewhite 2018; Johnson 2017; Schmiegelow 2017). The project aims to produce 14–18 female yearlings annually, with most (11–15) available for release (Neufeld 2019). Actual number of annual female yearlings will depend on reproductive rates, first-year mortality, and adult mortality in captivity, which are a function of good husbandry, facility management, captive conditions and expertise (Blake and Rowell 2017; Traylor-Holzer 2015; Whittington 2014). To meet the objectives of the project, Parks Canada must minimize mortality at all stages.

Adult female survival in captivity is the most influential factor in producing calves for release, based on population viability analysis (Neufeld 2020; Whittington 2014). Without high adult female survival in the breeding facility, more calves would need to be kept in facility to continue breeding. Maintaining a high annual survival rate is important to produce the maximum number of yearlings for release. This high-productivity scenario is likely possible if strict health and husbandry protocols are implemented and closely monitored (Blake and Rowell 2017). Maintaining diversity will require a clear breeding plan, pedigree tracking software, and metrics to monitor overall diversity (Blake and Rowell 2017). Additional work will be undertaken to detail these protocols through a Science and Monitoring Plan, which is currently in development by Parks Canada.

The Science and Monitoring Plan will be implemented within an adaptive management framework, ensuring that research results feed directly into changes in the program. Technical committees will be established to review, advise and inform the Science and Monitoring Plan. In parallel, an Indigenous Working Group will be established to provide advice and direction on the interpretation and weaving of Indigenous knowledge into the project.

Managing health and disease risks will maximize the project's productivity.
Managing caribou health is essential to the project and to achieving recovery objectives. Proper husbandry will be extremely important and managing animal health should be based on preventive medicine rather than medical intervention.

Breeding females should be habituated to humans to:

- reduce overall stress levels;
- enable handling to monitor their health;
- reduce likelihood of trauma events from stressed animals; and
- draw on successful practices and technologies from the commercial ungulate (reindeer) industry.

Calves and yearlings require a more hands-off approach to prepare them for release into the wild. Cows with calves will be handled with minimum intervention, and calves may be raised separately from cows after weaning (Blake and Rowell 2017). Indigenous partners have identified the importance—and challenges—of raising caribou to be wild. Their connection to caribou and experience with animals will be beneficial in adapting approaches to breeding and augmentation. Ongoing consultation and engagement efforts with Indigenous partners will aim to include Indigenous Knowledge and perspectives into all aspects of the project in a meaningful way.

The captive population will have between 30 – 40 adult breeding females and 8–10 adult males from a mix of wild populations and from captive bred animals. The project can control density in the facility (which is important both for cost and animal management reasons) based on timing release of the yearlings.

Managing facility security
To mitigate the risk of wildfire to the project, vegetation will be removed along the perimeter fence, creating a large buffer around the facility. In addition, all dead standing trees, primarily dead pine, will be removed within the facility and deadfall will also be reduced, partially to reduce wildfire risk and also to decrease injury risk to caribou. The buildings will have metal sidings and roofing material and sprinklers will be installed to protect the buildings as well. Additional vegetation will be removed around the buildings following FireSmart guidelines. The perimeter fence has multiple egress route to allow for rapid evacuation if needed. The facility would be protected as a value at risk Jasper National Park's Fire Management Plan and a dedicated Fire Management and Evacuation Plan will be developed.

Predation is a large risk that the project will need to manage. A large perimeter fence with controlled gates will help manage access to the site. The above ground portion of the fence will be 2 metres high, comprised of high tensile game wire to provide a physical barrier, a multiple-strand electric fence to provide additional deterrent and geotextile material to provide a visual barrier. The fence will also have an underground skirt to prevent animals from accessing the facility from under the fence. The integrity of the fence will be inspected every day, the electric fence will have redundancy systems and will also be electronically monitored to ensure uninterrupted power.

The fence design should act as deterrent for unauthorized human access as well. Education about the project will be provided through various means such as social media and interpretive signage to further discourage unauthorized access. Other tools such an area closure around the facility may be implemented if required and increased staff presence may be required during critical times of the year.

2.4.4 Release: augmentation of recipient populations

Assuming a sourcing period of up to 5 years, caribou yearlings could be available annually for population augmentation as early as 2026 and will be released into the Tonquin Valley until the population reaches a minimum of 200 animals. Parks Canada anticipates reaching this objective within 5-10 years after the first release.

Successful augmentation relies on successful release of sufficient young animals into the wild.
Two population models were used to evaluate scenarios of captive population sourcing, production, augmentation schedules, and survival depression (the reduction in survival that captive-bred yearlings are expected to experience relative to wild-born yearlings, expressed as a percentage) of augmented animals to predict caribou recovery. The captive population model is a simple stochastic population projection, while the second model is a complex integrated population model built on data from JNP's caribou monitoring program from 2003–present. The two models work together to predict caribou recovery in the Tonquin Valley.

The captive population model estimates production (number of yearlings available for augmentation annually) while maintaining a population of approximately 40 females, given

informed vital rates for reproduction and survival. The integrated population model allows us to evaluate recovery rates for the Tonquin population given release of yearling caribou into the wild population, while varying number and survival depression of those released animals.

Based on the captive population model, Parks Canada predicts that the facility could produce 11–15 female yearlings annually for release; and based on the integrated population model, Parks Canada predicts that the Tonquin population will be recovered to >200 animals between 5-10 years of consistent augmentation.

The modelling exercise identified a few key influential factors to improve the release success. For example, capturing a larger number of females in year one and maximizing captive female survival in the facility would increase the number of yearlings available for release. Decreasing mortality of released yearlings would also help reach the recovery objectives quicker. Notwithstanding further forthcoming work, recovery of the Tonquin population appears to be feasible and likely, while simultaneously retaining yearlings each year to maintain a captive population size.

External reviewers (Hebblewhite 2018; Johnson 2017; Schmiegelow 2017) have identified the benefit of augmenting populations that have existing animals in order to maximize success of reintroduction of naïve animals. The Tonquin population, which is currently at quasi-extinction threshold with only 9 females present, is therefore proposed for augmentation.

The Recovery Strategy and the *Multi-Species Action Plan for Jasper National Park of Canada* (the Action Plan) provide the framework for protecting and recovering caribou in JNP. The objective for the Jasper/Banff LPU is to achieve stable-to-increasing numbers to a minimum of 100 animals, as a step towards achieving self-sustaining local populations in which natural processes (dispersal, migration) can occur. The value of 100 is derived from the national objectives per local population unit (LPU) listed in the Recovery Strategy, wherein an LPU is considered to be self-sustaining when it demonstrates stable or positive population growth over 20 years, is large enough to withstand random events and persist over the long term (50 years), and when there is an increase to at least 100 animals. The Recovery Strategy acknowledges that immediate effort is required to determine more specific population size targets, as 100 is not well substantiated. In the case of the Tonquin population, recovery is focused on achieving stable or positive population growth, the occurrence of natural processes (dispersal, migration), and a population size >100, due to having documented recent declines to quasi-extinction from a population of 100 (i.e., 100 is insufficient).

As recently as 2008, the Tonquin population was >100 animals, yet it declined rapidly to a quasi-extinction low of 35–41 in 2016. Choosing a target population size at which to stop augmentation must take into account this recent lack of resilience at 100 animals, historical population sizes and distribution of the population, recommendations from the Recovery Strategy, and inputs from Indigenous partners. Other populations in the region have experienced sudden and significant drops in population size when total population size is 100–200 (e.g., Narraway, Takla, Quintette), and it is understood that populations decline at faster rates at low population density (Wittmer *et al.* 2010).

It is expected that under a scenario of larger population sizes, expansion of caribou into formerly used areas, and a return to the ecological processes of dispersal, emigration and immigration between adjacent populations will be possible. Ideally, connections with other local populations in British Columbia and Alberta will be re-established as the population becomes more widely and contiguously distributed.

Release into the wild populations
With the main threats causing caribou decline in JNP mitigated (Schmiegelow 2017) and favourable ecological conditions and habitat in the park, the probability for successful augmentation or reintroduction is high. Under the present scenario, the Tonquin population will be the only population with extant animals and will therefore be prioritized for augmentation (Hebblewhite 2018; McShea *et al.* 2018). Selecting the right recipient populations and timing the release of captive-bred animals is crucial to achieving the project's objectives and minimizing mortality after release.

Captive-breeding programs generally use one of two release options:

- hard release; or
- soft release.

Hard release
A hard release occurs when animals are transported to the site and immediately released into the habitat (for example, translocation and release) without temporary protection from predators, supplemental feeding or time to adapt to the unfamiliar environment. This approach is less costly and may be an option with an extant, resident population of caribou. However, this approach can result in high post-release mortality where either the released animals have no population to join, or it is unlikely that they will join a (small) extant population within weeks following release. Although some studies (e.g., Kinley *et al.* 2010) have documented successful hard releases, this approach is not recommended.

Soft release
A soft release entails holding the translocated caribou at the release site in a temporary pen, where they are fed and protected from predators while having an opportunity to acclimate to their new surroundings. Caribou are typically held for about three weeks. Wild animals from the recipient population can be brought into this pen to bond with new animals. Soft release is likely to result in greater survival of yearlings and increased success of augmentation (Slater 2017).

Based on the experience of the South Purcells caribou population translocation, where all but 2 of 19 translocated caribou died after hard release, Parks Canada proposes the soft release option, despite the added cost and associated logistical complications. Soft release provides better group cohesion, especially if caribou from the extant population are present in the pen. A strong population instinct keeps caribou together, and developing this among released captive animals and wild recipient populations is thought to increase integration of released animals into extant populations (Blake and Rowell, personal communication, April 2020).

Based on the timing of release, seasonal population movements, and existing infrastructure required to support a soft release strategy, the release pen for female calves will be located in the Tonquin Valley, and the release pen for male calves will be located in the Edith Cavell area. Parks Canada must complete more work on the details of a soft release strategy, including fence design, transport methods, on-site management, cost, and whether food supplementation will be needed. Releasing female yearlings in the fall or early winter is recommended to reduce predation (Kinley *et al.* 2010). Details will be outlined in a release strategy and supported by the Science and Monitoring Plan, which is currently in development for the project.

Male yearlings will likely be released in March at approximately 10 months of age, decreasing density in the facility before new calves are born. Females will likely be released in September or

October at 15 months, allowing the females to bond with their rutting groups in the pre-winter period when social groups are strongest, and when predation risk is relatively low, with bears in hibernation and wolves' access limited by snow and area closures. By releasing females later than males, the project will draw on lessons from male releases and make any necessary changes to maximize success with the female yearlings.

Indigenous partners have noted that animal care practices, as well as ceremony, have a significant role to play in helping captive caribou accept their release area as their new home. Indigenous partners also identified considerations around where the caribou's natural home range is, and working with their instincts to return to it.

2.4.5 Adapt: research, monitoring and adaptive management

Conservation breeding of caribou will be a major conservation initiative for Parks Canada, and understanding its successes and failures will be critical to adaptively managing the project. A dedicated research and monitoring program is critical to creating a foundation for evidence-based decision-making and adaptive management.

The project will be guided by *Open Standards for the Practice of Conservation*, which provides a framework to define and achieve conservation outcomes. The project will also be guided by advisory and technical committees comprised of representatives of provincial and federal government partners, local Indigenous partners and various experts in caribou conservation. Examples of these committees include:

- Parks Canada Senior Project Advisory Committee;
- External Advisory Committee comprised of Indigenous partners, independent experts and representatives from Alberta, British Columbia and ECCC to better facilitate inter-jurisdictional collaboration and governance;
- Joint technical committees to collaborate on topics such as source population modelling, available numbers, potential capture strategies, animal husbandry practices, caribou release strategies; and
- Indigenous Working Group to collaborate on the development of an Indigenous Inclusion Plan and to provide advice and direction on the interpretation and weaving of Indigenous knowledge into the project.

Parks Canada will also independently engage research scientists to test hypotheses and assumptions, gather data and knowledge, and learn from and integrate results throughout the project's implementation. Continued consultation and engagement with Indigenous partners will guide the project's implementation.

The information gained throughout the project will have benefits beyond adapting and evaluating the project itself. The results from research, monitoring and lessons learned can be shared with other recovery programs. Close collaboration with other jurisdictions, programs and fora (e.g., National Boreal Caribou Knowledge Consortium) has the potential to support the recovery of caribou and other species at risk across Canada and around the world, regardless of the outcome.

2.4.6 End: decommissioning and restoration

Parks Canada will discontinue the project after there is sufficient time to evaluate the project and determine whether the objectives have been met. Parks Canada will need to define a point at which to end the project if mortality in captivity is higher than expected, if augmentation or

reintroduction efforts fail, or if funding or support is withdrawn. If this were to happen, animal care and health considerations would be central to phasing out the project.

At the end of the project, the breeding facility will be decommissioned. Initial assessment shows that it is feasible to reclaim the proposed site. A restoration and reclamation plan will be developed for the site. The project will include a vegetation management strategy to minimize impacts of the breeding facility and release sites.

3. Project Execution and Detailed Impact Assessment Timelines

Based on extensive research and consultation, the project will take 10 to 20 years to complete. Key milestones for the execution of the project and its associated DIA are outlined in Table 1.

Table 1: Project execution and DIA milestones

Project Milestone	Description	Date	Status
Phase 1 - <u>Build - Breeding facility design, construction & operations</u>			
Site assessment (breeding facility)	Hydrogeological, site survey, vegetation community & rare plants, archaeology	2019-07	Complete
RFP advertisement (breeding facility)	Public advertisement of RFP for professional services to design the Caribou Breeding Facility	2021-07	Complete
Consultant contract award (breeding facility)	Award design contract upon evaluation of RFP	2021-10	Complete
Preliminary design report (breeding facility)	Completion of preliminary design report	2021-11	Complete
Public notice for Detailed Impact Assessment (DIA)	Posting of the public notice for the Detailed Impact Assessment on Canada Impact Assessment Registry	2022-03	Complete
Schematic design report (breeding facility)	Completion of schematic design report	2022-03	Complete
Indigenous and public consultations on project proposal and DIA	Indigenous and public consultation took place from April – September, 2022 to support the conclusion of the DIA. Inclusion and collaboration with Indigenous partners, stakeholders and the public will continue throughout the duration of the project	2022-04 – 2022-09	Complete
Detailed Impact Assessment	Completion of DIA and inclusion in tender documents, including the creation of an Indigenous Benefit Package (IBP)	2022-12	Incomplete
Issue for Tender package (breeding facility)	Issuance of stamped Issue for Tender construction package	2022-12	Incomplete
Construction contract award (breeding facility)	Site construction contract awarded	2023-01	Incomplete

Project Milestone	Description	Date	Status
Substantial performance (breeding facility)	99% of all work complete, and site can be granted occupancy	2024-11	Incomplete
Final completion (breeding facility)	Final acceptance of all work	2025-07	Incomplete
Phase 2- Capture - Securing source caribou			
Operational protocols finalized	Husbandry, health and other operational protocols	2025-01	Incomplete
Capture and transport protocols finalized	Planning for caribou capture and transport completed	2025-01	Incomplete
First capture	Capture of caribou from Brazeau and/or other identified source populations.	2025-02	Incomplete
Second capture	Capture of caribou from Brazeau and/or other identified source populations.	2026-02	Incomplete
Phase 3 - Breed - Animal husbandry and care			
First caribou born in captivity		2025-06	Incomplete
Phase 4 - Release - Augmentation of recipient population (Tonquin)			
Final completion of release pens	Exact timing to be confirmed	2025-09	Incomplete
First male augmentation	Exact timing to be confirmed	2026-03	Incomplete
First female augmentation	Exact timing to be confirmed	2026-09	Incomplete
Last augmentation	Exact timing to be confirmed	TBD	Incomplete
Phase 5 - Adapt - Research, Monitoring, and Adaptive Management			
Research, monitoring, and adaptive management	Research, monitoring and adaptation	ongoing	Incomplete
Phase 6 - End - Decommissioning and Restoration			
Decommissioning and restoration (breeding facility and associated infrastructures)	Exact timing to be confirmed (10 to 20-year project)	2040/45	Incomplete

4. Site location and characteristics

Southern mountain caribou naturally occur at low densities and range over large areas, avoiding areas with high human use (Environment Canada 2014). Southern mountain caribou undertake elevational movements between seasonal ranges in response to changing food availability and environmental conditions (e.g., snow depth, snow hardness). Southern mountain caribou require large ranges of relatively undisturbed, interconnected habitat where they can separate themselves (horizontally and by elevation) from predators, modify their geographic use in response to various natural and human-caused habitat disturbances and human activities, and access their preferred food sources (Environment Canada 2014).

4.1 Caribou critical habitat

The Recovery Strategy provides details on critical habitat designation for Local Population Units (LPUs) (one or more caribou populations within a geographic region) and Groups (several LPUs within one of three geographic regions – Northern Group, Central Group and Southern Group – in the southern mountain caribou population) of woodland caribou. Six types of critical habitat for southern mountain caribou have been identified (Environment Canada 2014), three of which occur in JNP.

Critical habitat is identified as the habitat possessing biophysical attributes found within the LPU boundaries and required by southern mountain caribou to carry out life processes necessary for survival and recovery (Environment Canada 2014: Appendix C).

Critical habitat for southern mountain caribou in JNP is found within (Environment Canada 2014):

- all of the area of high elevation winter and/or summer range; and
- matrix ranges (Type 1 and Type 2) that provides an overall ecological condition that will allow for connection between high elevation patches and low predation risk, defined as wolf population densities less than 3 wolves/1,000 km^2.

Biophysical attributes (habitat characteristics) vary both between and within southern mountain caribou ranges. Figure 3 depicts critical habitat for southern mountain caribou in JNP.

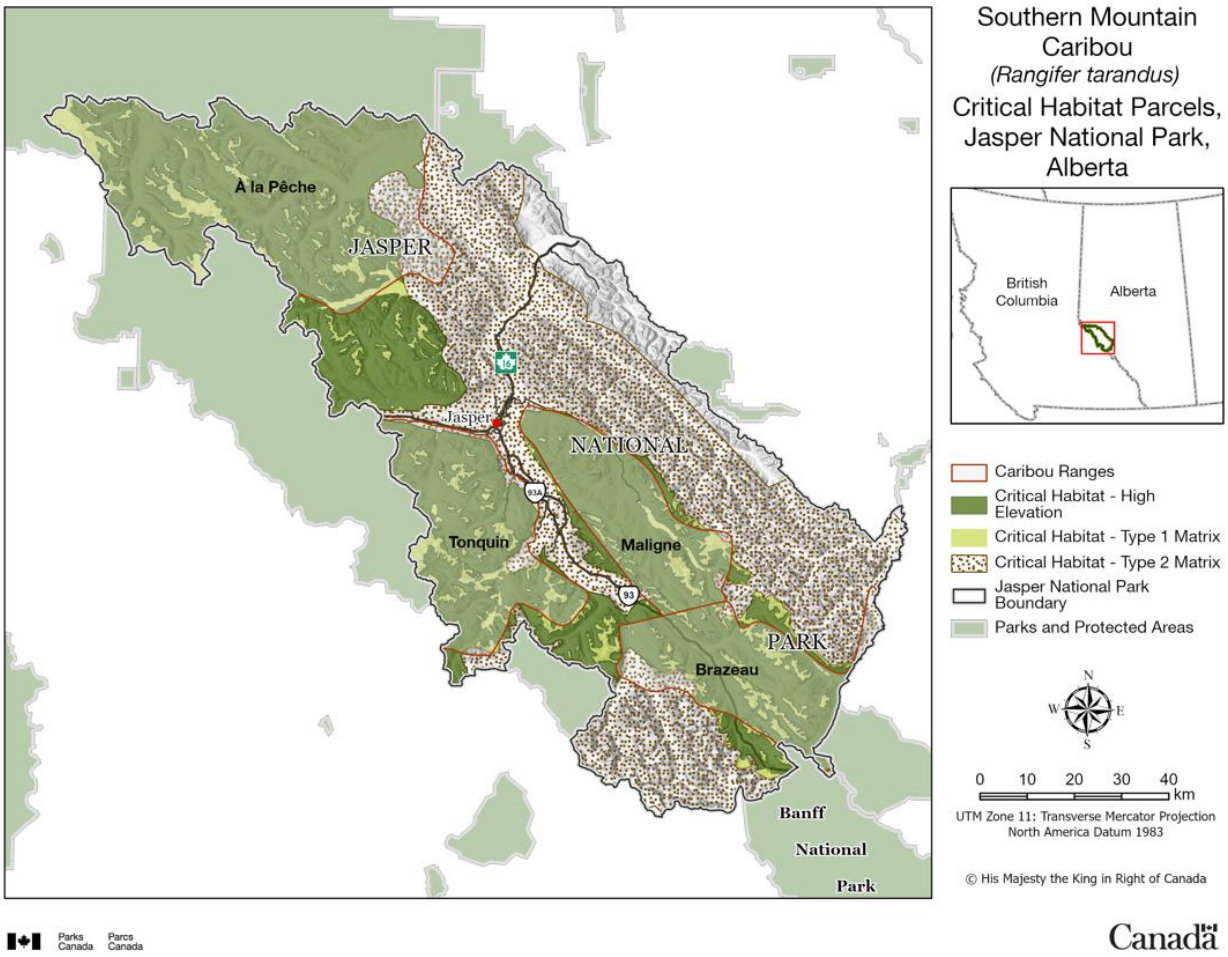

Figure 3: Critical habitat for southern mountain caribou in JNP

Caribou in JNP are part of the Central Group of southern mountain caribou (Environment Canada 2014). Central Group southern mountain caribou use high elevation alpine areas, subalpine parkland and subalpine forests for spring calving, and as their summer range (Environment Canada 2014: Appendix C). These alpine and subalpine areas are also used as winter habitat, along with lower elevation pine forests with lichen ground cover. Central Group southern mountain caribou live in relatively shallow snow areas. They forage primarily on terrestrial lichens either in low elevation mature coniferous forests or on windswept alpine slopes during winter. Caribou in winter also forage on arboreal lichens in low elevation forests, forested wetlands and in subalpine habitats, especially during times when snow conditions are less favourable for cratering (Environment Canada 2014: Appendix C). In summer, they are mostly at higher elevations in the mountains and will eat a variety of forbs and herbaceous vegetation.

4.2 Caribou Local Population Units

Two LPUs are present in JNP: the Jasper/Banff LPU and the À la Pêche LPU (Figure 4). The Tonquin, Maligne and Brazeau populations, are all part of the Jasper/Banff LPU, while the À la Pêche population is transboundary, and responsibility for the population is shared with the Government of Alberta.

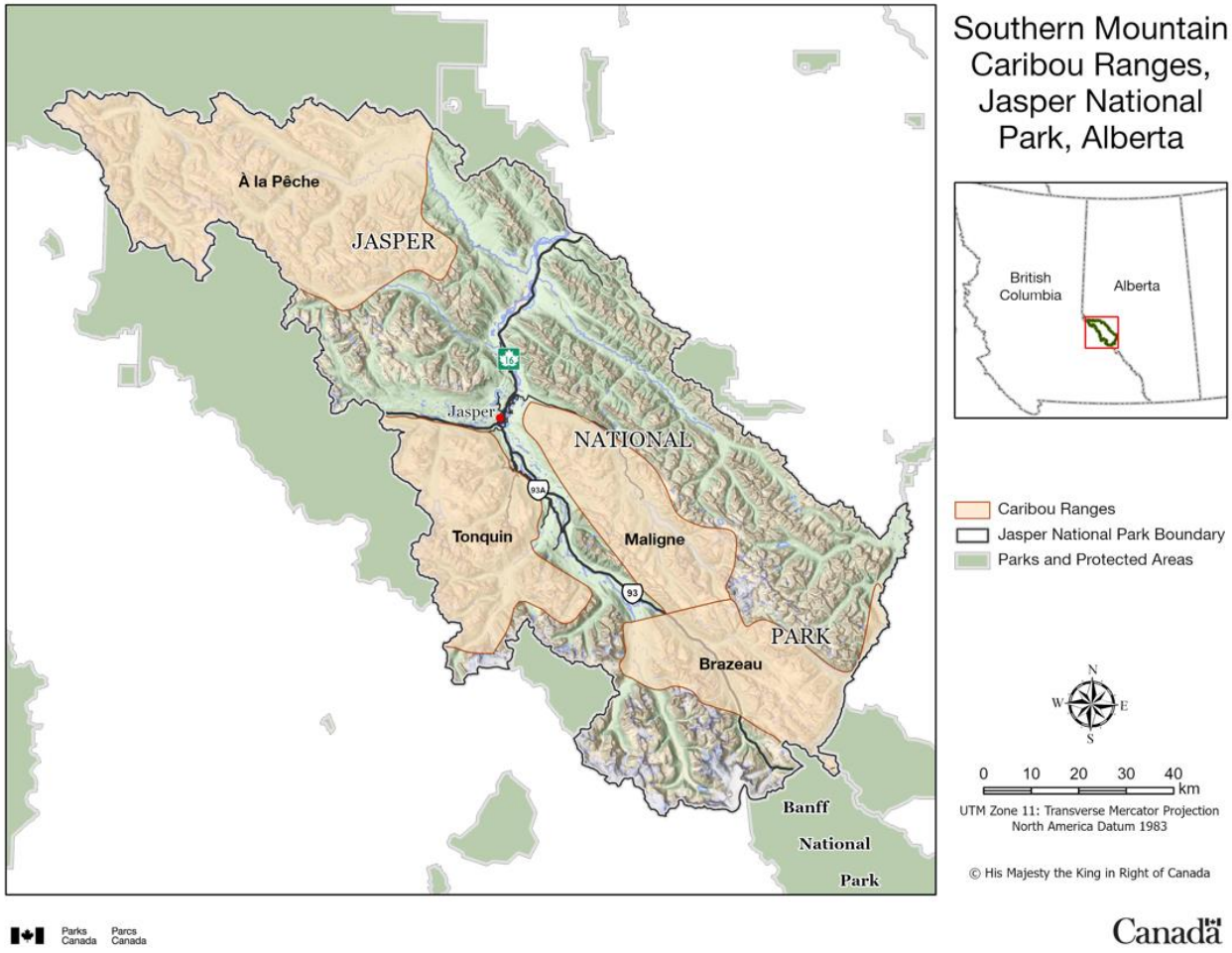

Figure 4: Southern mountain caribou ranges in Jasper National Park

Research and monitoring of caribou in JNP indicates that caribou select mid to high elevations throughout the year, and spend more time in the alpine in summer, compared to winter (Mercer *et al.* 2004). Caribou selection of most topographic and vegetative features depends on both season and ecoregion. For instance, when in the subalpine, caribou select open spruce – subalpine fir forests over pine forests year round. Caribou select forests greater than 150 years old in winter, but not in summer (Mercer *et al.* 2004). Similarly, caribou select areas with low solar radiation and well-drained soils in winter, but not in summer (Mercer *et al.* 2004). Caribou rarely travel within 500 m of roads, but the apparent effect of roads in the resource selection models is accounted for by other correlated covariates such as elevation. Caribou avoid trails with high human use in summer (alpine and subalpine) and winter (subalpine only). They neither select nor avoid high-use trails in the winter in the alpine, presumably because very few high-winter-use trails exist in the alpine (Mercer *et al.* 2004).

Caribou are an indicator of the health of the Alpine ecosystem in Jasper. In the last assessment in 2018, the caribou indicator was considered poor and declining over time (Parks Canada Agency 2018). The Jasper/Banff LPU is at risk of being completely extirpated within the life of the next park management plan (i.e., within the next 10 years). The Maligne population is now considered to be extirpated. The Brazeau population has fewer than 15 individuals. Parks Canada documented a period of steep decline from 2008–2014 in the Tonquin Valley

population, which is now stable at approximately 52 (49–55) caribou, but with only 9 reproductive adult females in 2020 (Parks Canada Agency 2020). Both remaining populations are at or below the quasi-extinction threshold and at a level that is unlikely to recover without additional measures.

The À la Pêche population has increased over the last decade, which is attributed to predator-control measures conducted by the Government of Alberta outside Parks Canada lands (Parks Canada Agency 2018). Approximately 150 individuals are estimated in the À la Pêche population (Manseau, personal communication, 2019).

4.2.1 À la Pêche population range

The À la Pêche population of southern mountain caribou use habitat in northern JNP, the adjacent Willmore Wilderness Park, and the foothills of the Rocky Mountains to the northeast of JNP (Figure 5). The blue outline in the figure is Blue Creek Watershed, a very important valley for caribou in JNP.

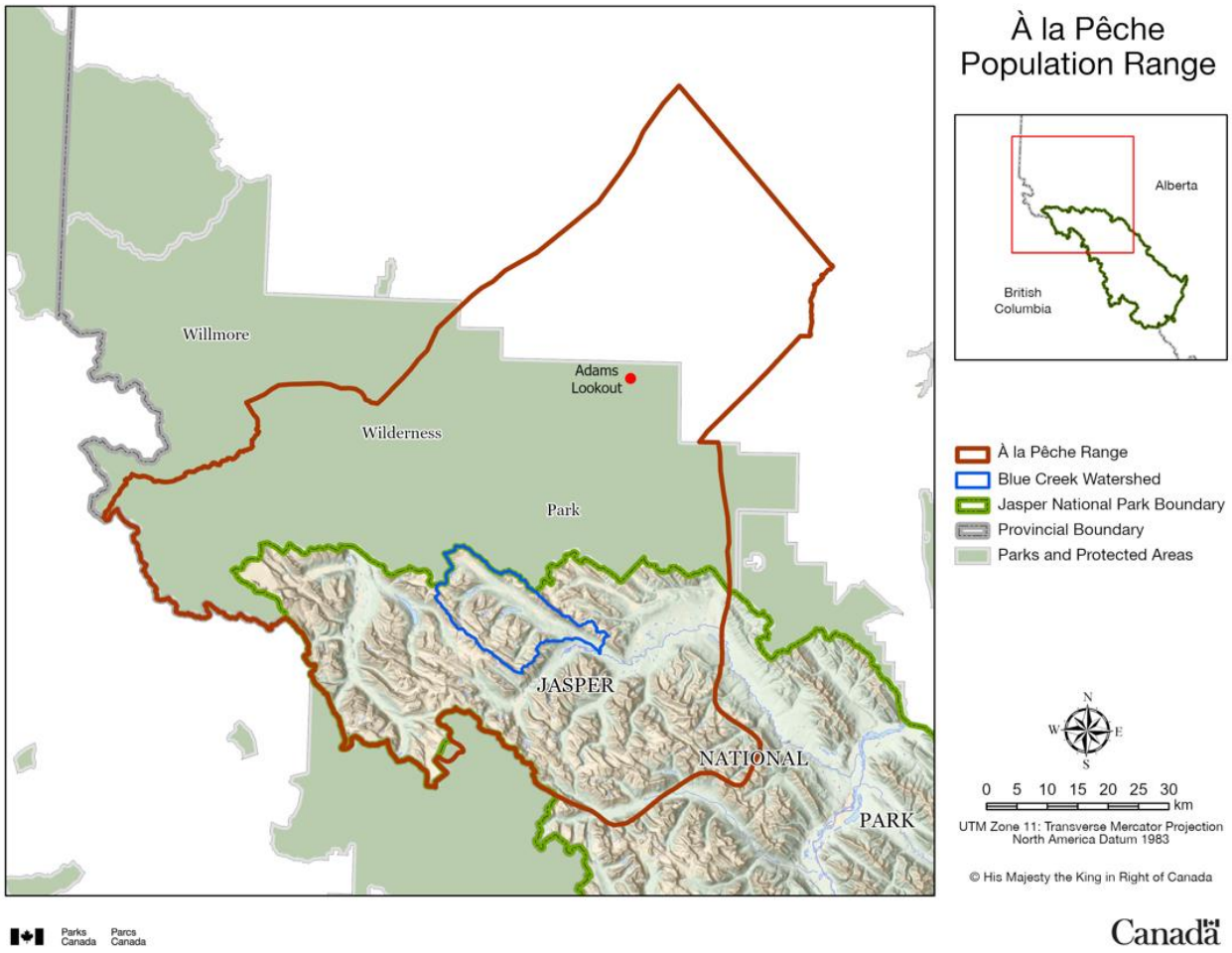

Figure 5: À la Pêche caribou population range

The À la Pêche population is considered partially migratory (Brown *et al.* 1994; Edmonds and Bloomfield 1984). Monitoring data show that caribou in the À la Pêche population exhibit one of

three migratory strategies: seasonal migration between the mountains and foothills; year-round residence in the mountains; or year-round residence in the foothills.

According to Parks Canada records across several decades, some individuals from the À la Pêche caribou population reside year-round in north JNP, particularly in the Blue Creek area (unpublished Parks Canada records). GPS data from seventeen caribou collared in the À la Pêche range during 2001-2020 show that caribou that were captured in JNP in the winter were year-round mountain residents, i.e., they remained within or very close to JNP throughout the year and did not migrate. Post-migration survey flights were conducted in late October during 2019 and 2020 in the Blue Creek area to assess the minimum number of caribou in the À la Pêche population residing year-round within north JNP. Forty-seven caribou were observed in 2019 and 40 caribou were observed in 2020.

4.2.2 Brazeau population range

Caribou of the Brazeau population range mainly within the southern portion of JNP, from the Chaba River on the west boundary, to Brazeau Lake and the Northwest Brazeau River on the population's east boundary (Figure 6). To the north, caribou from the Brazeau occasionally enter the former Maligne Range via Maligne Pass, but generally use habitat south of Maligne Pass. Caribou in this population have been documented using habitat as far south as the Cloister Mountains in the White Goat Wilderness Area, south of JNP.

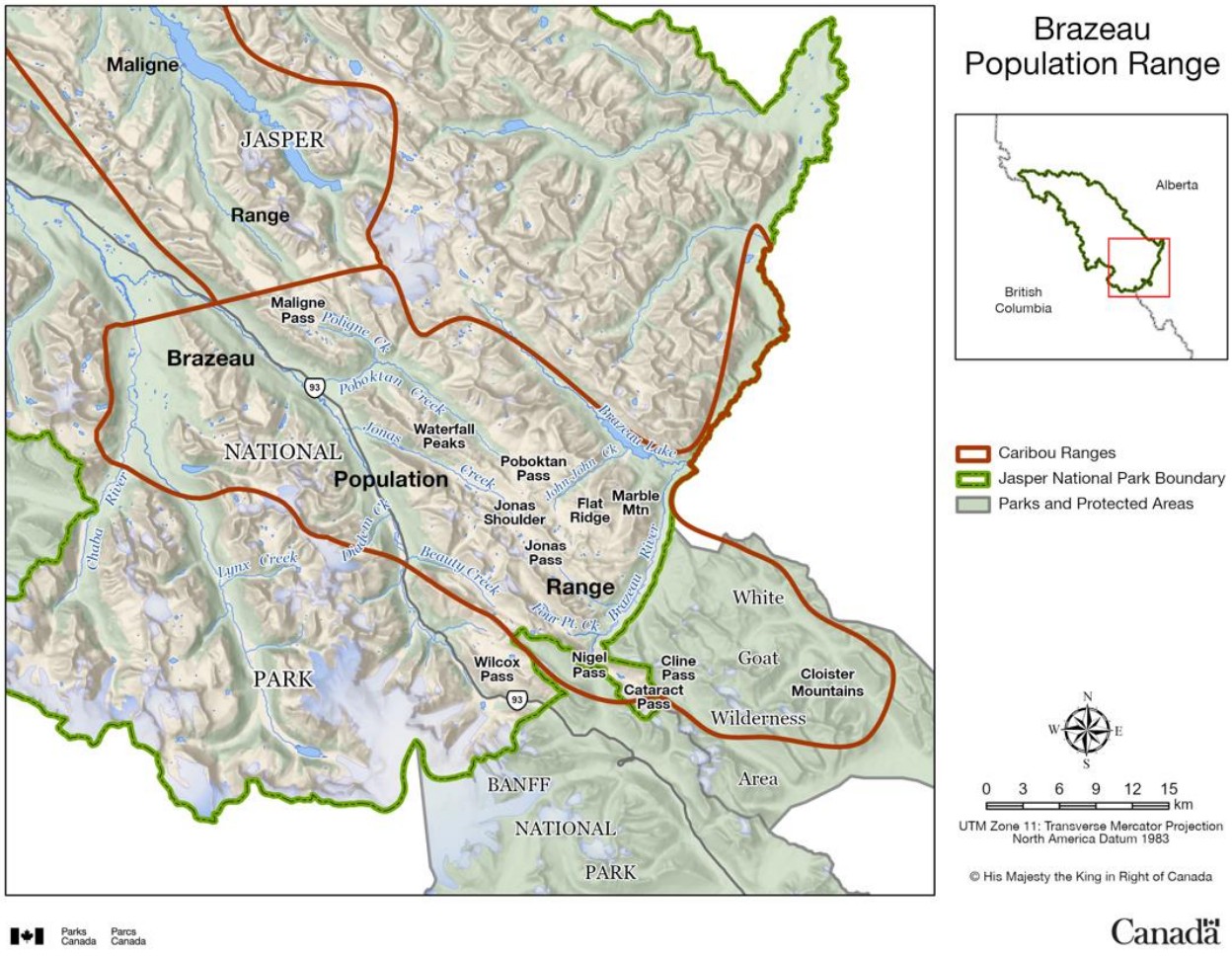

Figure 6: Brazeau caribou population range

Some of the key valleys used by caribou in the Brazeau include, from south to north, Cline and Nigel passes, the Brazeau River, Four Point and Beauty creeks, Jonas and Poboktan passes, Flat Ridge and the west-facing slopes of Marble Mountain, John-John Creek, Jonas Shoulder and Jonas Creek, the west-facing slopes east of Highway 93 from Wilcox Pass to Bubbling Springs, Poboktan and Poligne creeks, and the slopes of Waterfall Peaks (Figure 6). On the west side of Highway 93, caribou roam the slopes and valleys in the Winston Churchill Range from Diadem Creek to Lynx Creek, to the northern tip of the Winston Churchill Range.

4.2.3 Tonquin population range

Type and location of caribou habitat in the Tonquin Valley is well-documented (Bisaillon and Neufeld 2017). Key areas are Majestic Basin to Maccarib Pass, Amethyst and Moat lakes, Clitheroe Basin, Chak Basin, and Campus and Vista passes (Figure 7). On the outskirts of the central valley, caribou are often observed in Clairvaux, Muhigan and Whistlers creeks, Verdant Pass, Lectern Peak and Cavell Meadows, especially in winter (Figure 7).

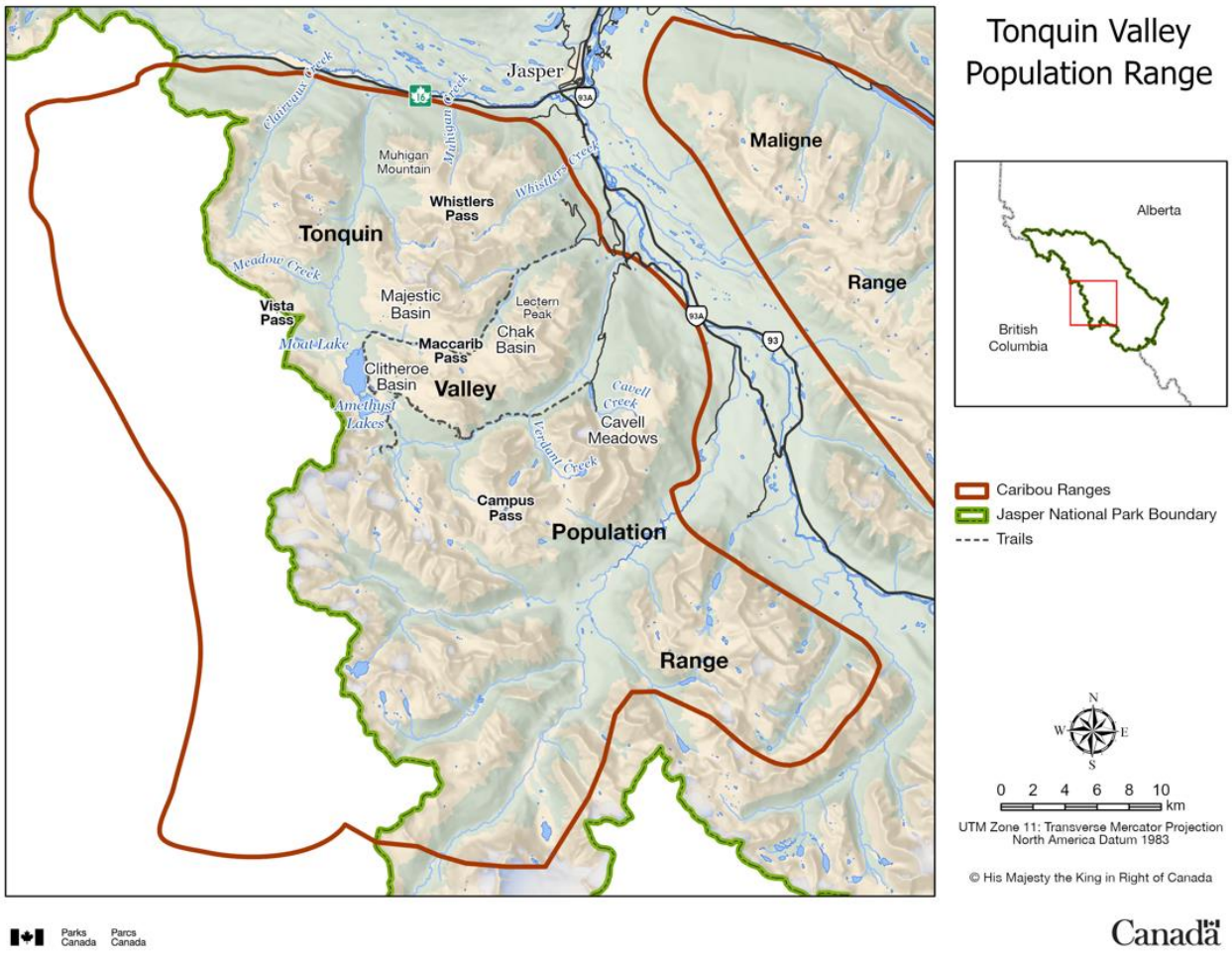

Figure 7: Tonquin Valley caribou population range

In the 70s and 80s, caribou from the Tonquin Valley also frequently used the upper Whirlpool and Middle Whirlpool rivers, and used the Athabasca Valley and into Fryatt and Lick Creek valleys; observation of caribou in these areas is extremely rare today. These areas are designated as high elevation critical habitat.

4.3 Caribou breeding facility

The project will be implemented within JNP. The breeding facility and release sites are within areas designated as wilderness under the *Canada National Parks Act*. This legal designation ensures the project area's wilderness character is maintained in perpetuity. The current land use of the site is natural (forested) and is bordered by forested land in all directions. Figure 8 shows the proposed location for the breeding facility and release sites within JNP.

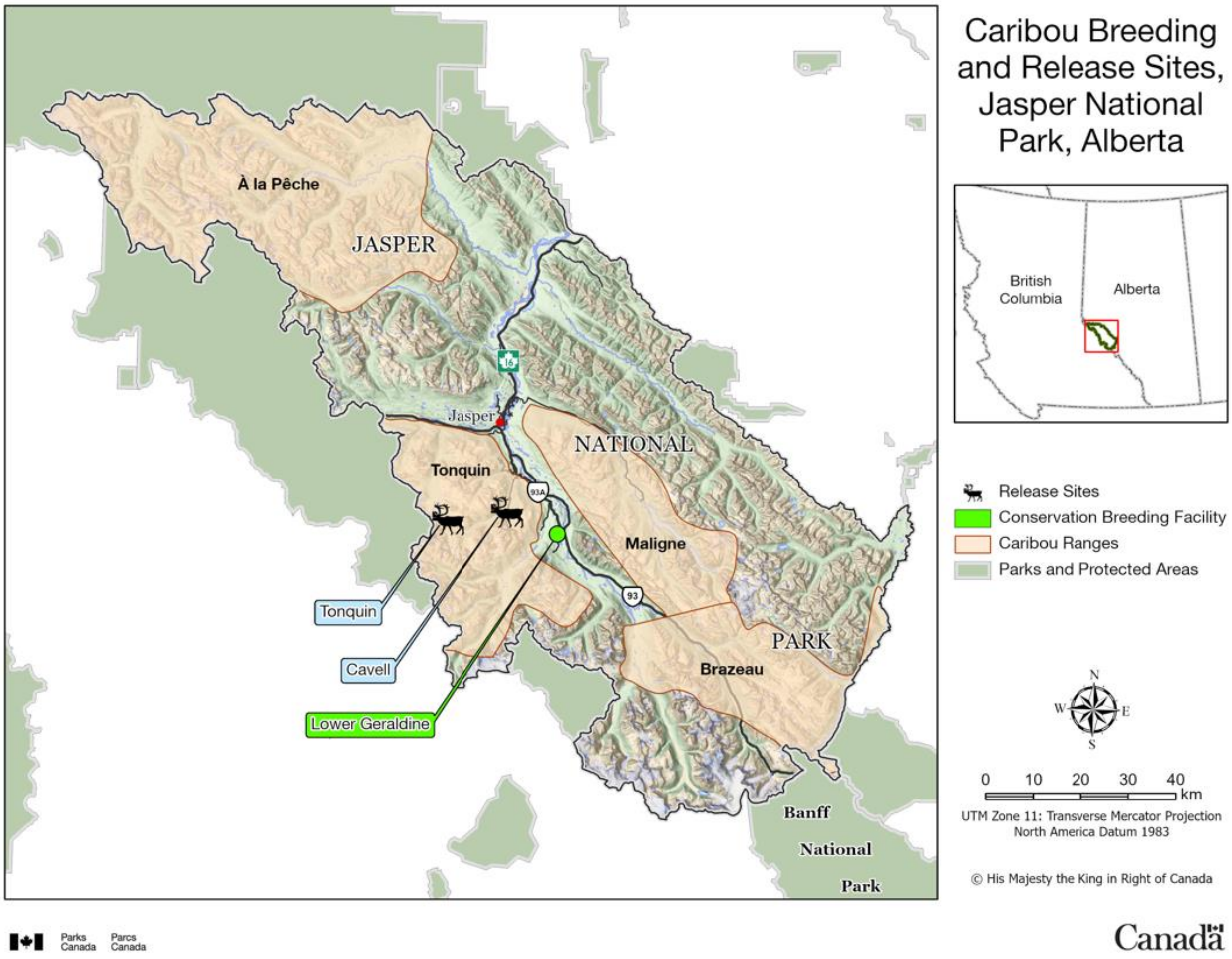

Figure 8: Breeding facility and release site locations

The caribou breeding facility will be located 32 km south of the Jasper townsite, west of Athabasca Falls on Highway 93A, adjacent to the Geraldine Lakes trailhead and Geraldine Fire Road (Figure 9).

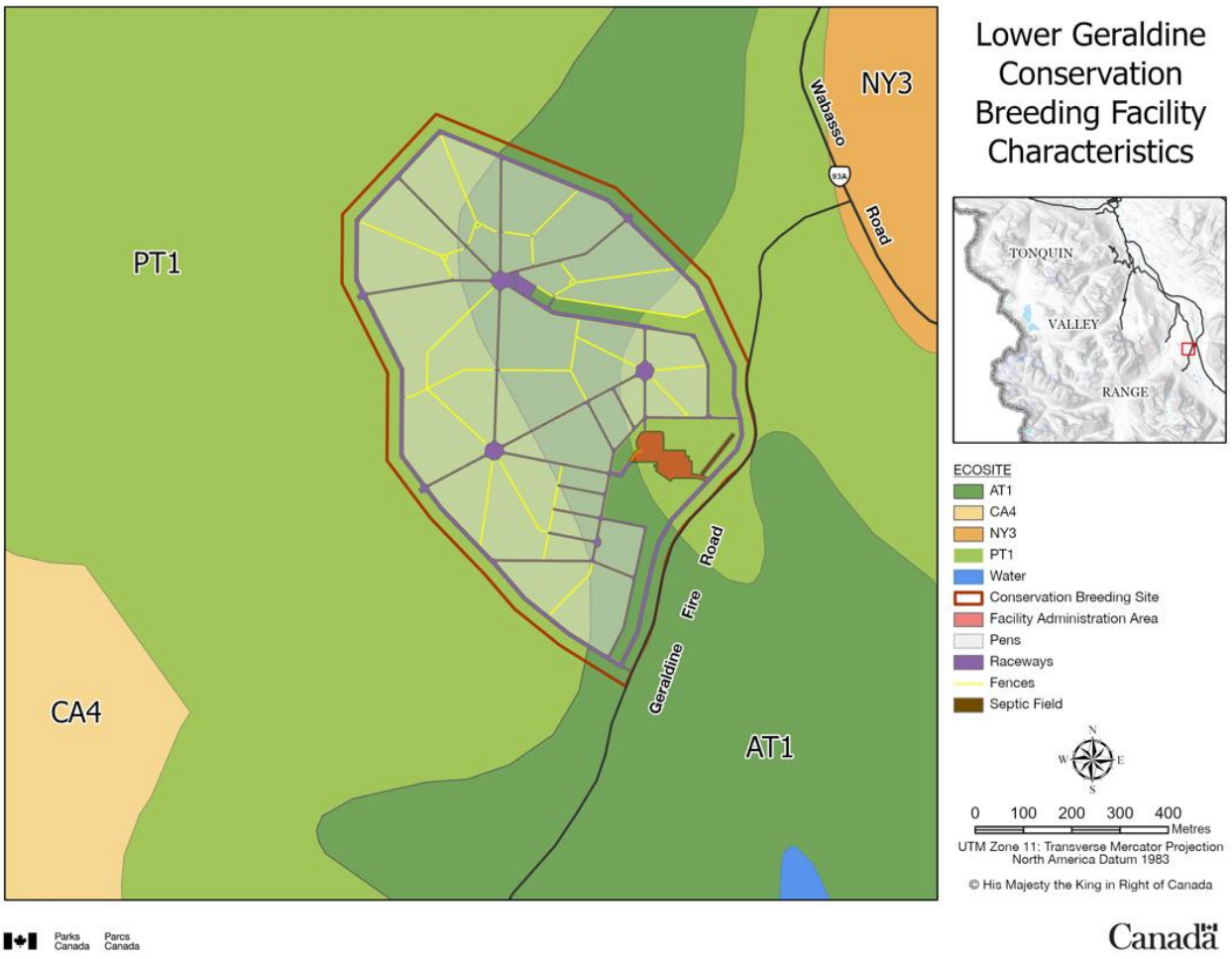

Figure 9: Characteristics of the breeding facility site

Bedrock geology mapping from the Alberta Geological Survey indicates that the site is underlain by Lower Cambrian sedimentary bedrock from the Peyto, St. Piran, Lake Louise and Fort Mountain formations. The sediments are primarily comprised of limestone and sandstone with thin interbeds of siltstone, and are described as mostly shallow marine (AGS 2013). Surficial deposits underlying the site are mapped as glaciofluvial deposits with sediment ranges from massive to stratified, poorly to well-sorted, coarse- to fine-grained, and includes tills (AGS 2013).

There are no water features within 300 m of the site. The Athabasca River is located approximately 1.4 km east. Four water well records were identified within a 2.5 km radius of the site, but only one was completed as a well. Well ID 438653, located 1.3 km east of the site, was completed in surficial sand and gravel deposits to a maximum depth of 12 m below ground surface. The reported yield was 54.5 m^3/day. A flowing artesian water well was also discovered a short distance northeast of the proposed facility. A groundwater well is proposed for caribou watering with an approximate supply objective of 43.2 m^3/day.

The ground surface within the site generally slopes gently downward and east towards the Athabasca River located approximately 1,400 m east of the water well location. The elevation at the wellhead was surveyed at 1,216 metres above sea level with the elevation at Athabasca River estimated at 1,200 metres above sea level.

The breeding facility site is comprised of PT1 (Patricia 1) Ecosite (70%) and AT1 (Athabasca 1) Ecosite (30%). Table 2 presents the vegetation, soils and wildlife characteristics of both PT1 and AT1 Ecosites.

Table 2: Breeding facility site vegetation, soils and wildlife characteristics

Ecosites	Area that occurs in the project footprint	Vegetation, Soils and Wildlife Characteristics
Patricia Ecosite (PT1)	70%	• Vegetation: comprised of C6 (lodgepole pine/buffaloberry showy aster) and C19 (lodgepole pine/buffaloberry/twinflower plant communities), which were the upland plant communities identified within the breeding facility. • Soils: dominant soils are Orthic and Eluviated Eutric Brunisols and Brunisolic Gray Luvisols • Ungulates: highly important to ungulates, especially deer and elk year-round; • Carnivores: important to wolf, coyote and cougar; • Small mammals: highly important to the survival of bats (big brown, little brown, and long-legged), red squirrel and red-backed voles; • Birds: highly important to Sharp-shinned Hawk, Common Raven, Solitary Vireo and Yellow-rumped Warbler
Athabasca Ecosite (AT1)	30%	• Vegetation: same as in PT1 • Soils: Orthic and Eluviated Eutric Brunisols, although Eutric Brunisols are the dominant soils. • Ungulates: highly important to ungulates, especially deer and elk year-round • Carnivores: important to wolf, coyote and cougar; • Small mammals: highly important to the survival of bats (big brown, little brown, and long-legged). Varying hares and red squirrels occur in AT1 Ecosite. • Birds: highly important to Olive-sided Flycatcher, American Robin, Western Tanager, Dark-eyed Junco, and Yellow-rumped Warbler.

4.4 Caribou release sites in Tonquin Valley

Two release sites have been proposed in the Tonquin Valley: the Cavell release site located in the Edith Cavell area, approximately 100 metres north-east from the Mount Edith Cavell Wilderness Hostel, and the Tonquin Valley release site, likely to be located close to the Tonquin Warden Station. Both release sites are located in the upper subalpine ecoregion (Holland and Coen 1982). The Cavell release site is comprised of CA1 (Cavell 1) Ecosite (Figure 10) while the Tonquin Valley release site is comprised of both SX1 (Sphinx 1) Ecosite (8.6%) and SX2 Ecosite (91.4%) (Figure 11).

It is important to note that these proposed release sites are tentative at this time. Final release sites will be selected based on additional work but located in this general area. Findings from these proposed sites could potentially be used to help select the final sites. Parks Canada may also look at the area more generally and assess multiple locations.

4.4.1 Cavell release site

The CA1 Ecosite occurs on hummocky or ridged morainal landforms consisting of non-calcareous, medium-textured till. Soils are distributed in a pattern governed by drainage conditions. Soils of the well- to moderately-well-drained upland segments are distributed in a secondary pattern reflecting degree of eluvial (Ae) horizon development. Eluviated Dystric Brunisols are dominants. Vegetation is distributed in a pattern governed by drainage conditions and dominated by dry Engelmann spruce — subalpine fir/false azalea (C14), Engelmann spruce — subalpine fir/feathermoss (C13), Engelmann spruce — subalpine fir/tall bilberry/liverwort (C21), wet-spruce species/Labrador tea/brown moss (011), Engelmann spruce — subalpine fir/rock willow/bracted lousewort (014), dwarf birch-shrubby cinquefoil-willow/brown moss (s1) and dwarf birch-shrubby cinquefoil/needlerush (S3)

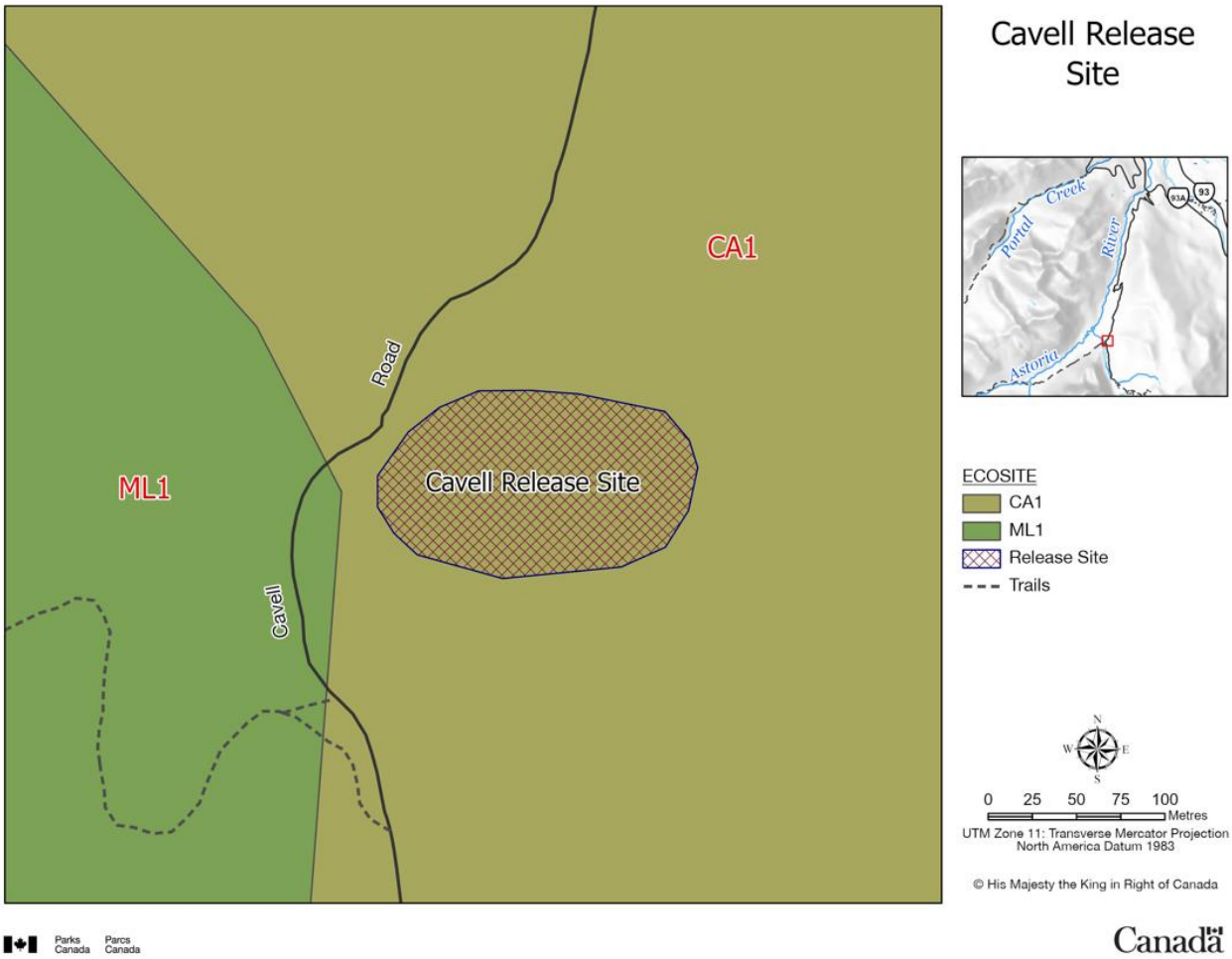

Figure 10: Proposed Cavell release site

CA1 Ecosite is moderately important to ungulates in summer, primarily to deer and elk. The only forage species that was eaten in test plots was willow (*Salix barclayii*) (Holland and Coen

1982). Up to 1 m of snow was recorded; CA1's low importance in winter may be largely due to deep snow (Holland and Coen 1982).

CA1 has high importance to carnivores because of its high importance to marten, weasel, lynx and a variety of other species that occur in CA1. A moderate number of small mammals occur here. There are high densities of masked shrews and red-backed voles. There are a medium number of breeding bird species that occur here at high densities. CA1 is highly important to Boreal Chickadee, Varied Thrush, Swainson's Thrush, Yellow-rumped Warbler, Townsend's Warbler, Pine Siskin and Dark-eyed Junco.

4.4.2 Tonquin Valley release site

The proposed Tonquin Valley release site is comprised of SX1 and SX2 ecosites (Figure 11).

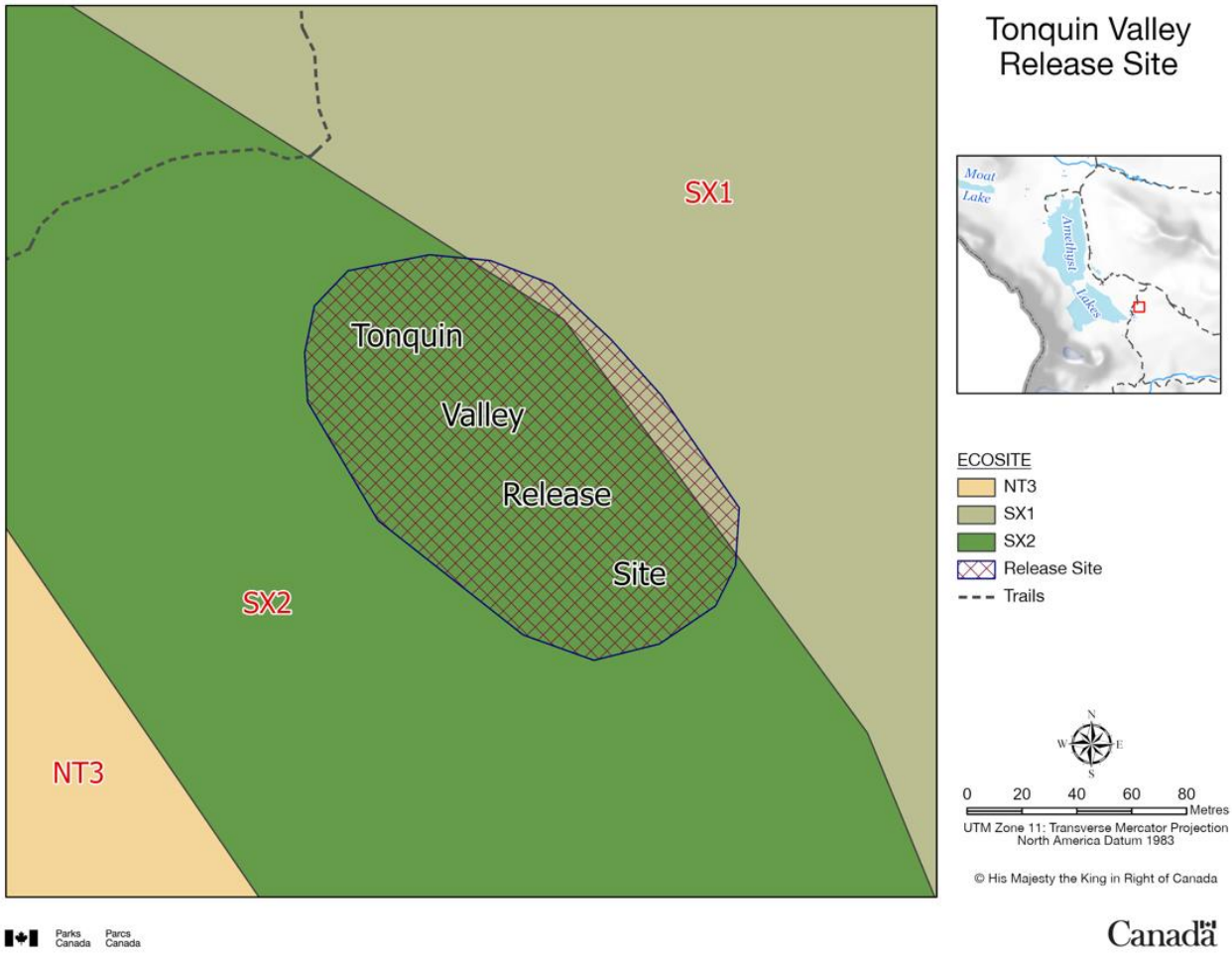

Figure 11: Proposed Tonquin Valley release site

Ecosite SX1 encompasses moist-to-wet morainal landforms dominated by meadow vegetation. Morainal blankets, consisting predominantly of non-calcareous, medium-textured till, overlying inclined, hummocky and ridged bedrock, are typical. Thin, discontinuous veneers of altered, fine, stratified fluviolacustrine material are subdominant. A complex set of genetically related soils, best represented by the Orthic Gleysol, Rego Gleyed, Gleyed Ferro-Humic Podzol and Gleyed Dystric Brunisol subgroups, characterize SX1. Vegetation is also complex and reflects several interaction factors. The vegetation pattern which best characterizes Sx1 is one in which

the fleabane-valerian (H16) and arctic willow-cinquefoil (L7) vegetation types (v.t.s) are dominant and the heather-everlasting (L5) and willow/cinquefoil (S8) v.t.s are subdominant.

SX1 Ecosite is moderately important in summer and of low importance in winter for ungulates, but is highly important in autumn and winter to caribou where they occur. Very deep snow (recorded up to 1.6 m) inhibits ungulate movement. Forage use was recorded on sedges (C*arex aquatilis* and *scirpoidea*), tufted hair grass, timothy grass, bluegrass (*Poa alpina* and *epilis*) and willows (*Salix arctica* and *barratiana*). This ecosite is moderately important to carnivores, particularly to wolf, coyote and cougar in summer, and weasel and marten year-round. SX1 is highly important for small mammals. The density of small mammals is high. There is a moderate number of species; the ecosite sustains high densities of dusky shrew, hoary marmot, Columbian ground squirrel, northern bog lemming, long-tailed vole and porcupine. The uncommon Richardson's water vole occurs here. A high number of breeding bird species occur in SX1 at low densities. SX1 Ecosite is highly important to Willow Ptarmigan and Water Pipit.

SX2 encompasses moist-to-wet morainal landforms dominated by open forest. Morainal blankets overlying inclined bedrock are typical. Non-calcareous, medium-textured till is the most common, but several tracts are composed of calcareous, medium-textured till. Soil distribution on SX2 is complex and related to degrees of gleying and saturation, geomorphic activity and the presence of primary mineral-bearing, surface veneers. The Orthic Gleysol, Rego Gleysol, Gleyed Ferro-Humic Podzol and Gleyed Dystric Brunisol subgroups with imperfect-to-poor drainage best represent SX2 soils. Vegetation of SX2 Ecosite is complex and reflects, in the main, degree of seepage. A pattern in which the Engelmann spruce-subalpine fir/valerian-fleabane-(09) v.t. is dominant and Engelmann spruce-subalpine fir/heater (010) is subdominant characterizes SX2.

For ungulates, the importance of SX2 is very similar to SX1 Ecosite except that Sx2 is highly important to moose in summer. Deep snow (recorded up to 1.3 m) limits ungulate activity in winter. Forage species on which use was recorded include bluebunch, wheat grass, dwarf birch, sedges (*Carex scirpoidea*), hair wildrye, bracted lousewort, timothy, alpine bluegrass, shrubby cinquefoil, willow (*Salix artica*, *barrattiana*, *glauca* and *vestita*) and globe-flower. SX1 is highly important, notably to marten, weasel and wolverine, species which can negotiate deep snow. There are high densities of small mammals, including masked shrew, Columbian ground squirrel, red-backed vole, heather vole and porcupine. A high number of breeding birds occurs in SX2 Ecosite. It is highly important to Pine Siskin and Golden-crowned Sparrow.

4.5 Work camp to be established in Kerkeslin Pit

It is proposed to establish a work camp and equipment storage/laydown facility within a former gravel pit known as the Kerkeslin Borrow Pit (Figure 12) or at another suitable location.

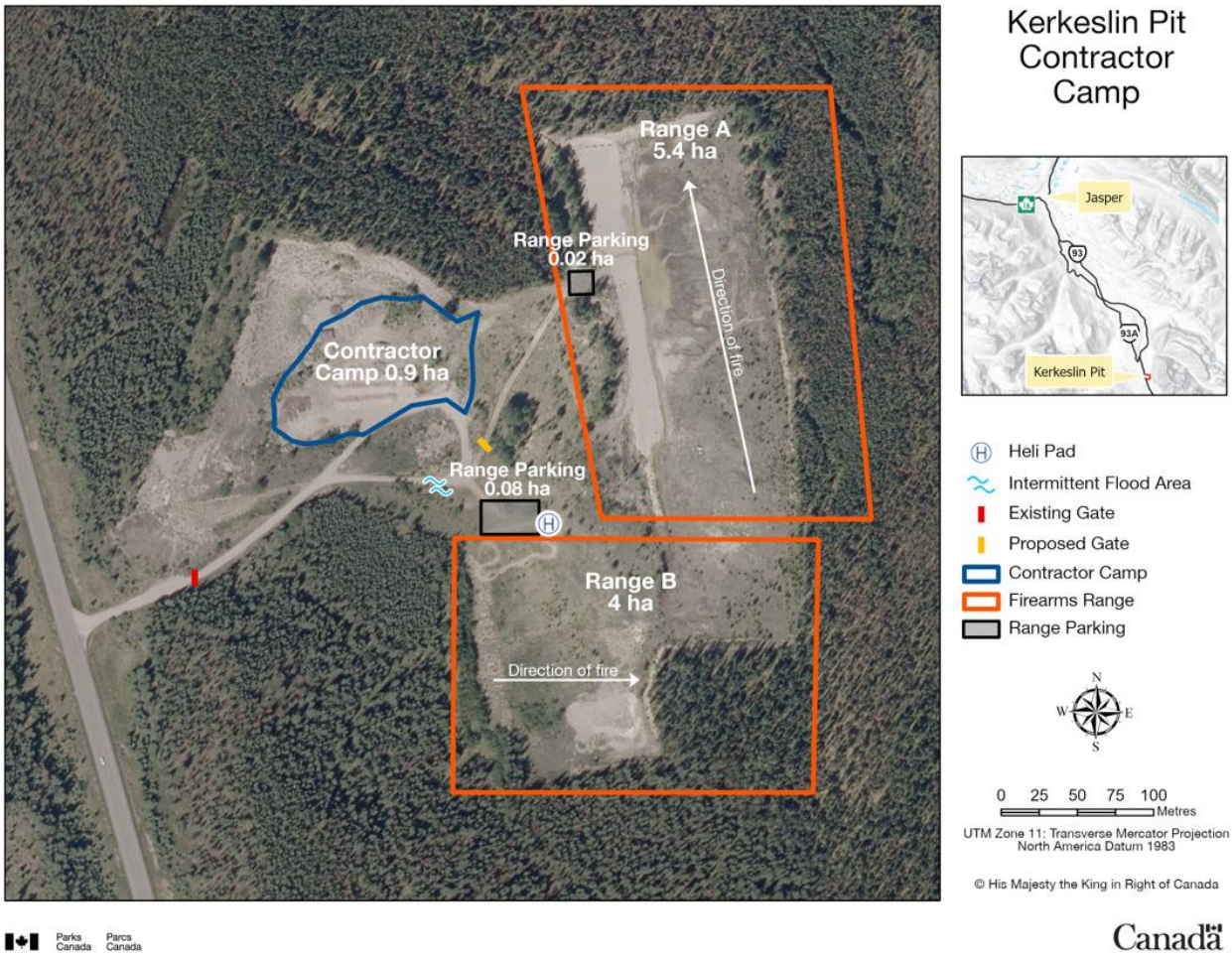

Figure 12: Proposed contractor camp site

Kerkeslin Borrow Pit is located approximately 5 km south of Athabasca Falls on Highway 93, at an elevation of approximately 1200 metres above sea level. The entire gravel pit is located within the Patricia 1 montane Ecosite, which occurs on ridged or hummocky terrain. The pit is situated 10m above the Athabasca River, and has low potential for flooding. Subsurface materials comprise a relatively well sorted package of coarse grained glaciofluvial sediments of indeterminate thickness.

The pit was cleared of trees and was a site of active extraction between 1958 and the early 1970s. Subsequent to this, the pit was used as a disposal site for road construction and maintenance debris.

Currently, the eastern end of the pit is used intermittently as a firearms range for Parks Canada personnel and Royal Canadian Mounted Police required to carry a firearm as part of their duties. Gates and signage are in place to control access, and earthen berms prevent any downrange hazard. The Kerkeslin Firearms Range Protocols (2022) specifies approved uses, along with detailed safety protocols to ensure the safe operation of this facility. Clear communications between the contractor and the firearms range administrator will be established and will ensure strict application of the safety protocols.

The western end of the pit is also used intermittently as a firewood storage area and as an equipment storage and laydown facility. The pit has not been remediated and represents

existing disturbed land. There is very little vegetation growing within the pit floor. There are some invasive, non-native plant species present, such as oxeye daisy, sweet clover and Canada thistle.

The borrow pit has been designated as a contaminated site (Site 15412075). Based on air photo analysis and consideration of the past uses of the site, the site was found to have potential to have been contaminated with metals and/or hydrocarbons. As these materials are relatively inert, no follow up work or field investigations have been conducted to date, and the contamination is expected to pose no risk to workers present.

The proposed work camp and storage/laydown facility would be located in the western end of the pit, in an area separate from the shooting range. Contractors will be accommodated in self-contained trailers. Safety and communication protocols will be implemented to avoid any conflict between the work camp and the shooting range.

The proposed camp complex is situated outside of critical caribou habitat.

5. Scope of the Detailed Impact Assessment

The scope lays the groundwork for the DIA, and includes the identification of project-environmental interactions, as well as the identification of valued components (VCs), and the supporting rationale for those components. VCs are key ecological and cultural resources that are characteristic of the environment, unique or outstanding features, and/or are important to main visitor experience objectives.

The *Guide to the Parks Canada Process under the Impact Assessment Act* defines VCs as values that have a higher probability of being affected by a project and that are considered to be particularly important to fulfilling Parks Canada Agency's mandate (Parks Canada Agency 2020). Once identified, VCs become the focus of an assessment; therefore, selecting VCs helps ensure the greatest effort is put into evaluating how the project may affect the elements most at risk (Parks Canada Agency 2020).

The scope of the DIA also includes the initial application of the evidence-based decision-making model, the standards of proof, and the level of risk or importance assigned to a VC. While low-risk VCs (small mammals, birds, etc.) will be discussed, this DIA will mainly focus on the effects of the project on high- and medium-risk VCs. High- and medium-risk VCs and related key issues are presented in Table 3. Assessment endpoints represent the key properties of VCs that should be protected, while measurement indicators are quantifiable (i.e., measurable) expressions of changes to assessment endpoints.

Table 3: High- and medium-risk valued components and rationale

Valued Components (VCs)	Rationale	Measurement indicators	Assessment endpoints
Brazeau Caribou Population	Impacts of capture and relocation to the conservation breeding facility of all animals of this population on the population-itself, range and LPU.	A caribou population with 10 or fewer reproductive females is considered functionally extinct, even though a few of the animals may live for a prolonged period. Risk of mortality during capture and transport for caribou is less than the high risk of mortality in the wild (Hebblewhite 2018).	Protection of Brazeau animals from known extinction and preservation of Jasper/Banff LPU local adaptive genetics.
À la Pêche Caribou Population (Sourcing caribou from the À la Pêche population is dependent on ongoing discussions with the Government of Alberta and ECCC)	Potential impacts of limited caribou removal on long-term viability of the population. Uncertainty about the exact number of caribou that can be removed safely to support the project	The size of the À la Pêche caribou population has grown in the past decade due to wolf control by the Government of Alberta. This population is genetically and behaviourally appropriate for augmentation into south Jasper recipient populations (Neufeld and Calvert 2020). It has sufficient genetic diversity to act as founder for a captive population. Parks Canada will work with the Government of Alberta, ECCC and Indigenous partners to determine acceptable numbers to avoid jeopardizing the population. A preliminary caribou source modelling completed by Parks Canada and Environment and Climate Change Canada indicates that it is possible to use a limited number of caribou from the À la Pêche population without affecting its long-term viability (Neufeld and Calvert 2020). Additional work will be completed to determine the safe and acceptable number of animals that could be removed from the population.	Long-term viability of the À la Pêche population ensured.

Valued Components (VCs)	Rationale	Measurement indicators	Assessment endpoints
Tonquin Caribou Population	Potential impacts of limited caribou removal and addition of captive-bred caribou to the population, range and LPU	The intent is to augment the population to at least 200, based on the recent decline from 100 and historical values of the population's size (Neufeld 2020). This population size would likely result in some expansion of the habitat into former areas like the upper Whirlpool and Middle Whirlpool rivers, the Athabasca Valley and into Fryatt and Lick Creek valleys (Neufeld 2020).	Tonquin Caribou Population consists of enough animals to sustain the population or improve its abundance while having safe access to sufficient suitable habitat, both now and into the foreseeable future.
Vegetation, and soils (primarily during breeding facility and work camp construction and operation)	Soils and vegetation form the foundation of a healthy terrestrial ecosystem	Habitat availability - changes to the health of existing vegetation communities present; Changes to soil caused by disturbance (i.e., soil loss, sedimentation, and compaction).	Protection and maintenance of existing soils and healthy and diverse native vegetation communities.
Surface and groundwater quality and subsurface drainage (primarily during the breeding facility and work camp construction and operation of the facility)	Potential for changes to surface and groundwater from spills, hazardous material, and pulses of nutrients and fecal-coliforms	Groundwater assessed through pumping tests and assessment for long-term sustainability. Groundwater quality assessed through comparison to baseline samples.	Maintenance of groundwater quality and quantity.
Wildlife and Predator Habitat Security	Potential impacts to representatives of subalpine wildlife community, including species at risk (grizzly bear)	Habitat availability, movement patterns, abundance, grizzly bear habitat secured. Thresholds for security: greater than 78 % that bear management unit is considered to be secure; between 68-78 % that unit is considered to be secure, but of concern.	Maintenance of self-sustaining and ecologically effective wildlife populations.

Valued Components (VCs)	Rationale	Measurement indicators	Assessment endpoints
Species at Risk (Little Brown Myotis, Olive-sided Flycatcher, and Common Nighthawk)	Accidental mortality during facility construction of endangered or threatened species under Schedule 1 of SARA	Habitat availability, movement patterns, and abundance.	Maintenance of self-sustaining and ecologically effective populations.
Heritage Sites	Potential impacts to both known and unknown heritage sites.	Changes in conditions of heritage sites	Preservation of heritage sites
Indigenous Values and Connections to Caribou	Indigenous partners may have concerns with the approach selected to recover caribou in JNP, involvement with the project, benefits, and alignment with their values.	Changes in access and connection to resources important to Indigenous communities.	Preservation of Indigenous values and connections to caribou.
Wilderness Character and Visitor Experience Opportunities	Potential to see caribou in the wild may lead to an increase in the number of backcountry visitors seeking wilderness experiences and also greater support for protected areas, environmental protection, and species at risk.	Changes to wilderness character and visual aesthetics. Support for parks and protected areas	Maintenance of wilderness experience visitors are seeking in the backcountry.

It is important to note that, although not part of the scope of this DIA, all main threats contributing to caribou population decline in JNP, including high numbers of elk and deer, human-facilitated predation by wolves, human disturbance, habitat loss and fragmentation inside the park, and small population effect will continue to be monitored and addressed in critical habitat. Any emerging threats to caribou survival will also be identified, monitored and mitigated to support the augmentation of the Tonquin population.

The DIA focus is on the 10 to 20-year caribou conservation breeding and augmentation project (the project) and not on the additional recovery measures, such as the seasonal winter closures, already implemented. These measures are anticipated to remain in place irrespective of the approval of the project. Although localized and short duration closures could be used to ensure the success of the project, there is currently no plan to expand the winter closures or implement additional summer use restrictions. The recovery measures already implemented will be reviewed periodically and adjusted as required.

The ecological integrity of JNP is the primary consideration in the DIA process for the project. Given that Jasper National Park is part of the UNESCO-designated Rocky Mountain Parks World Heritage Site, the DIA's conclusions about the ecological integrity of JNP are also relevant to ensuring that the values for which UNESCO designated the Canadian Rocky Mountain Parks a World Heritage Site are maintained. Given that the potential for the project to have adverse effects on the values recognized by the UNESCO designation is negligible, no further assessment of this VC will be included in this DIA.

6. Alignment with conservation priorities and policies

6.1 Canada's conservation priorities

Southern mountain caribou is one of six priority species identified under the Government of Canada's *Pan-Canadian Approach to Transforming Species at Risk Conservation in Canada* (ECCC 2018). Caribou are identified as a priority for conservation action because of their ecological, social and cultural value to Canadians, and because their recovery can have significant benefits for other species at risk and biodiversity within the ecosystems they inhabit. The project is consistent with the Minister of Environment and Climate Change Canada's priority to enhance protection of Canada's endangered species.

6.2 Parks Canada's legislation and policies

Parks Canada is the federal authority responsible for managing national parks, national historic sites and national marine conservation areas, in accordance with the Government of Canada's legislative and policy framework. In JNP, the *Canada National Parks Act* and its regulations, Canada's *Species at Risk Act*, the *Jasper National Park of Canada Management Plan* (Management Plan; Parks Canada Agency 2022a), the Recovery Strategy, the Multi-Species Action Plan and the *United Nations Declaration on the Rights of Indigenous Peoples Act* provide the framework for protecting and recovering caribou in Jasper, as follows:

- Section 8(2) of the *Canada National Parks Act* states that the maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks.

- Canada's *Species at Risk Act* identifies the southern mountain population of woodland caribou as a "threatened species." This project reflects two key principles from the *Species at Risk Act*:
    - "… the Government of Canada is committed to conserving biological diversity and to the principle that, if there are threats of serious or irreversible damage to a wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty…."
    - "Canada's protected areas, especially national parks, are vital to the protection and recovery of species at risk."

- The 2022 Jasper National Park of Canada Management Plan (Management Plan) makes several mentions of the importance of caribou for JNP, and establishes direction to implement caribou conservation measures.

In the planning context section of the Management Plan, woodland caribou were described as an iconic species at risk that have continued to decline in the park, despite conservation actions to address threats to their survival. The continued survival of caribou in Jasper also forms a key component of the Management Plan's vision for the desired future state of JNP.

This project aligns with the Management Plan's commitment to develop and implement a caribou conservation breeding and population augmentation program, with the initial goal of rebuilding the Tonquin population to self-sustaining numbers by 2032, subject to review and approval through Parks Canada's impact assessment processes and consultation with Indigenous partners, provincial governments, and the public (Objective 1.4, Target 2).

The Management Plan also directs JNP to:

- manage large areas of the park as wilderness, where minimal facilities and low levels of human use contribute to providing the habitat requirements of wide-ranging species like wolverine, mountain goats, caribou, grizzly bears and wolves (Objective 1.1);
- maintain wolf and elk densities at levels which support the likelihood of caribou populations to be self-sustaining, and the natural dynamics of montane vegetation communities are maintained (Objective 1.1, Target 3);
- improve the conservation status of woodland caribou (Objective 1.4);
- sufficiently mitigate threats to caribou persistence to support caribou recovery as outlined in the *Multi-species Action Plan for Jasper National Park* (Parks Canada Agency 2017) and the *Recovery Strategy for the Woodland Caribou, Southern Mountain Population (Rangifer tarandus caribou) in Canada* (Environment Canada 2014). Regularly review the efficacy of these mitigations and take additional measures as appropriate (Objective 1.4, Target 1);
- work with Indigenous partners and collaborate with provincial governments, academic institutions and other stakeholders to protect caribou habitat, promote caribou habitat connectivity and support the presence of self-sustaining caribou populations on the landscape (Objective 1.4, Target 3);
- use seasonal area closures as appropriate in the Tonquin, Brazeau and À La Pêche caribou ranges to protect caribou habitat, discourage facilitated predator access, and support caribou recovery (Objective 2.7, Target 2);
- maintain year-round recreational access in the Maligne caribou range, subjective to caribou recovery requirements and visitor safety and ecological integrity objectives (Objective 2.7, Target 3);
- consider adjustments to the operating parameters for existing overnight backcountry facilities to support ecological gains such as caribou recovery objectives and to support visitor experience and learning (Key Strategy 5);
- improve the ability of keystone species like caribou and grizzly bears to thrive in the Tonquin Valley, while respecting the long history of human use of the area (Objective 7.2.1);
- review the impacts of recreational use [in the Tonquin Valley], especially horse use, on . . . species at risk . . . and take measures as needed to address concerns (Objective 7.2.1, Target 3); and
- continue to allow visitors to access the Tonquin Valley in the summer months, subject to requirements for caribou recovery and ecological integrity (Objective 7.2.1, Target 5)

- The Recovery Strategy considers a Local Population Unit (LPU) to be self-sustaining when the following is met: the population shows a stable or positive increase in growth over 20 years; the population becomes large enough to withstand random events and can persist over the long term (50 years); and the population reaches at least 100 caribou total (Environment Canada 2014). The Recovery Strategy also indicates that for some LPUs with small population sizes, investment in intensive management options (e.g., maternal penning, augmentation) may be required to achieve recovery goals. Where threats have been addressed in currently unoccupied areas, reintroduction may be possible. A conservation breeding project may be considered where viable sources for augmentation or reintroduction are not available.

- The JNP Multi-Species Action Plan guides caribou recovery efforts based on the broad goals and objectives of the Recovery Strategy. The Action Plan indicates (pages 14 and 16) that Parks Canada will (for the Jasper/Banff LPU):

    - achieve stable-to-increasing numbers to a minimum of 100 animals as a step towards achieving self-sustaining local populations in which natural processes (dispersal, migration) can occur;
    - where caribou have been extirpated, examine opportunities for restoration;
    - work with partners to determine next steps for augmentation of the Jasper/Banff LPU in Jasper National Park; and
    - prioritize actions based on assessment of conditions including predator-prey dynamics, predation risk, and translocation recovery priority of other caribou populations (e.g., British Columbia).

- Collaboration with Indigenous partners on the project aligns with the *United Nations Declaration on the Rights of Indigenous Peoples Act*. Article 25 of the United Nations Declaration of the Rights of Indigenous Peoples states that "Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, … and other resources and to uphold their responsibilities to future generations in this regard".

6.3 Parks Canada zoning

As part of the Parks Canada Agency (Parks Canada)'s land management strategy to maintain ecological integrity and provide opportunities for visitor experience, Parks Canada has developed a zoning system to minimize human-induced change on lands and culturally sensitive sites. Zoning provides direction for managers and visitors about park resources, suitable activities and ongoing research. The system is composed of Zones I to V described below. Further details on each zone are found in the *Parks Canada Guiding Principles and Operational Policies* (Parks Canada Agency 1994) and are summarized as follows:

- Zone I – **Special preservation** is applied to sites or features that have been designated as needing special protection because they contain or support unique, threatened or endangered natural or cultural features, or are "among the best examples of the features that represent a natural region," (Parks Canada Agency 1994). Development and motorized access within Zone I areas are strictly prohibited (Parks Canada Agency 1994). The key consideration of this zone is preservation.

- Zone II – **Wilderness** zones are large areas of natural landscape that are representative of the region, and where minimal human interference is a prominent aspect of managing these areas (Parks Canada Agency 1994). Together with Zone I, these areas provide the largest contribution towards preserving ecological integrity. Zone II areas have minimal services and facilities but provide visitors with some access to more remote areas. Recreational activities are permitted in these areas so long as they do not interfere with preservation of natural areas and ecosystem functionality. Vehicle access is not permitted, though strictly controlled air access may be permitted in remote northern parks. Most of the zone consists of steep mountain slopes, glaciers and lakes.

- Zone III – **Natural environment** zones provide an interface for visitors to experience a park's natural and cultural heritage values via outdoor recreational activities requiring only minimal services and facilities (Parks Canada Agency 1994). Some motorized vehicle activity is permitted in Zone III, but it may be controlled.

- Zone IV – **Outdoor recreation** zones provide park visitors with areas to enjoy and appreciate, and in which to learn about the park's ecology and heritage values; these limited areas include necessary services and facilities (Parks Canada Agency 1994). Minimizing impacts to ecological integrity is a management priority. Motorized vehicles are permitted to access Zone IV, though some areas may have specific guidelines regarding access. This zone includes front country facilities, park roads, and supporting infrastructure such as gravel pits.

- Zone V – The **Park Services** zone represents areas with the highest density of visitor services and facilities (Parks Canada Agency 1994). Park administration and operation functions are typically found in these zones. Similar to the other zones, maintenance of ecological integrity remains a management priority.

The breeding facility (the Geraldine site), is located in Zone II. Motorized access and circulation are not permitted in Zone II lands save for exceptional park administration purposes involving resource protection (Canadian Parks Service 1987). The facility will be accessed from the existing Geraldine Fire Road, which is zoned as Zone IV.

The facility lands are also designated as wilderness under the *Wilderness Area Declaration Regulations*. Section 14 of the *Canada National Parks Act* prohibits the carrying out of any activities likely to impair the wilderness character of areas designated as wilderness under these regulations, save for the purposes of "park administration." Furthermore, the Parks Canada *Action Plan for the Declaration of Wilderness Areas in National Parks* (2000) specifies that activities and facilities which are essential for the purposes of ecosystem management are permitted in a declared wilderness area.

The work camp for the construction of the facility, likely to be located at the Kerkeslin Borrow Pit, is located within outdoor recreation - Zone IV.

6.4 Critical habitat and assessing impacts

With the Recovery Strategy in place, Parks Canada is required to assess the impact of activities on caribou and associated critical habitat. The *Species at Risk Act* (SARA) and supporting policies guide the assessment process (Environment Canada 2003). An activity/project and associated mitigations are assessed as to whether the residual effects will contravene SARA prohibitions related to protection of individuals from harm/harassment (section 32) or

protection of critical habitat from destruction (section 58), and ultimately whether the activity will jeopardize the survival and recovery of this species at risk.

The assessment process aligns with current legislation, and in applying the Recovery Strategy to the requirements of SARA, Parks Canada has identified the following items to consider when assessing destruction of caribou habitat: impacts to biophysical attributes and their subsequent impacts on habitat function; minimal disturbance; cumulative effects; and likelihood to destroy other critical habitat attributes. Parks Canada examines each factor to determine whether there will be an impact on habitat function (as per the definition of "destruction"), and then determines whether or not the activity/project will jeopardize survival and/or recovery of the species.

Additionally, Parks Canada developed a process by which to determine the level of assessment required for projects in JNP and to assess impacts to caribou individuals or critical habitat (e.g., a guide for determining levels of assessment required for new projects on Parks Canada lands in JNP). Since 2015, Parks Canada has used this guide to assess projects. Parks Canada has also developed a set of draft best practices for routine activities (e.g., flying in caribou habitat), and continues to refine these documents. Parks Canada aims to align all its activities in caribou critical habitat with SARA requirements.

Overall, the project aligns with the Parks Canada Mandate, the *Parks Canada Guiding Principles and Operational Policies* (Parks Canada Agency 1994), the Parks Canada Departmental Plan (Parks Canada Agency 2022b) and the Jasper Field Unit Results Plan. It also complements Parks Canada's external relations and visitor experience goals and demonstrates Parks Canada's leadership in recovering species at risk. Outreach, education and off-site interpretation activities on caribou conservation and conservation breeding will be part of the external relations and visitor experience plan for this project. The project will also integrate Indigenous perspectives and languages through collaboration with Indigenous partners to tell this conservation story.

7. Indigenous and public consultation

Caribou conservation is a high profile issue across Canada, involving many jurisdictions and resulting in public attention. This project will be a collaboration between federal and provincial governments, Indigenous partners, academic institutions and other organizations committed to caribou recovery. Conservation breeding of caribou at this scale is a novel approach in North America. For these reasons, Parks Canada was committed to providing multiple opportunities for participation and conversation about the proposed project to ensure that the project and the Detailed Impact Assessment (DIA) are based on the best available knowledge and information.

Prior to the launch of formal consultations in 2022, Parks Canada engaged with Indigenous partners, stakeholders, and the public on various aspects of the proposed project and caribou recovery more broadly to assist in the initial development of the project. A number of activities were conducted in this early engagement, including:

- Indigenous, stakeholder, and public engagement on the *Conservation Strategy for Woodland Caribou* in 2014 led by Environment Canada starting in 2007;
- Indigenous, stakeholder, and public engagement on the *Multi-Species Action Plan for Jasper National Park* in 2017;

- engagement activities with Indigenous partners on the proposed conservation breeding project in 2019, including written information, a site visit, and participation in the archaeological impact assessment of the proposed facility site;
- an independent review of the proposed conservation breeding project by a group of international experts, the governments of Alberta and British Columbia, an Indigenous partner, and Parks Canada staff, facilitated by Foundations of Success in January 2021; and
- Indigenous, stakeholder, and public consultation on the Draft Management Plan for Jasper National Park in the spring and summer of 2021, which included strategic direction and objectives for caribou recovery in the park.

In spring and summer 2022, a formal consultation process was initiated on the caribou conservation breeding project, the scope of the DIA, and the draft DIA. Consultation is critical to understanding more fully the potential adverse impacts of this proposed project. Activities and tools used in Indigenous, stakeholder, and public consultation are summarized below. Feedback received and how it was used to inform the proposed project and DIA are summarized in the following section and additional details are provided in Appendix A.

7.1 Indigenous consultation

Parks Canada has specific obligations to conduct meaningful consultation with Indigenous partners on any project that may have an adverse impact to Indigenous interests and rights. Moreover, Indigenous consultation demonstrates Parks Canada's respect of Indigenous peoples and reflects the Government of Canada's commitment to a renewed relationship with Indigenous peoples rooted in the principles of the United Nations Declaration on the Rights of Indigenous Peoples and now enshrined in the *United Nations Declaration on the Rights of Indigenous Peoples Act*.

In recognition of the critical role that Indigenous peoples play in the protection of natural and cultural resources, all DIAs involve Indigenous consultation and engagement. This consultation and engagement is necessary to facilitate the assessment of the proposed project on Indigenous rights and values in a manner that fosters reconciliation, healing and cooperative relations, and, as well, will strengthen understanding of all environmental elements and values of concern.

A variety of methods and tools were used to consult Indigenous partners in the spring and summer of 2022. In February, a project update letter and notice of consultation was sent to 24 Indigenous partner groups. This letter provided background information about the proposed project, reviewed the engagement activities conducted in the years prior, and notified partners about Parks Canada's intent to consult on the proposed project and draft DIA in 2022. Partners were invited to share ideas and recommendations on how they would like to be consulted.

In April 2022, Parks Canada hosted a virtual information session to provide background information on the history and current status of caribou in Jasper National Park and a high level overview of the proposed project. Thirteen representatives from eight different partner groups attended the information session. In May 2022, all partner groups were invited to a virtual consultation session. The purpose of this session was to provide detailed information about each phase of the proposed project and engage in conversation about questions, concerns, and recommended mitigations for each phase. Fourteen representatives from ten different partner groups attended this session. In June 2022, all partner groups were invited to a virtual consultation session focused on partnering and collaboration possibilities for the proposed

project. This session was held in response to requests from Indigenous partners during the early engagement phase to be collaborators on the project if it proceeds, and to receive benefits through contracting, employment, and other partnering activities. Twelve representatives from nine different partner groups attended this session.

Also in June 2022, all partners were invited to one of two site visits to the proposed location of the breeding facility. For each site visit, an in-person meeting was held in the morning to review the feedback received so far to ensure it was understood correctly and to receive any additional information or insights that partners wished to share. In the afternoon, Parks Canada staff and partners traveled to the proposed location of the breeding facility to discuss in more detail potential impacts of the specific location, as well as of the project more generally. Fifteen representatives from twelve different groups attended one of the site visits.

In July 2022, the full project proposal and draft DIA were emailed or hard-copy mailed to all 24 partner groups. Partners were invited to review the proposal and draft DIA and provide feedback in writing or through a meeting to discuss the proposed project further. No partner groups provided written feedback or requested a meeting. In August 2022, notice and information about the launch of the first phase of the contracting process for construction of a caribou conservation breeding facility (qualification of interested suppliers) was sent to all partner groups, partner group economic development contacts, and partner-owned business contacts. This notification was prompted by a recommendation made by partners during the June 2022 partnering and collaboration session to ensure that partners were notified and given information about Parks Canada's contracting processes related to this proposed project.

Table 4 summarizes the Indigenous consultation activities held in 2022.

Table 4: Indigenous consultation activities in 2022

Date	Consultation Activity	Participants / Recipients
February 28	Update letter and notice of consultation	24 Indigenous partner groups
April 7	Information Session	13 representatives from 8 groups
May 11	Consultation Session	14 representatives from 10 groups
June 1	Partnering and Collaboration Session	12 representatives from 9 groups
June 15 and 22	Site Visits	15 representatives from 12 groups
July 14	Letter Sharing Full Project Proposal and Draft DIA	24 Indigenous partner groups
August 31	Notification of the start of Phase One of the contracting process	24 Indigenous partner groups, including their economic development contacts and partner-owned business contacts

7.1.1 Feedback from Indigenous partners

Parks Canada engaged with Indigenous partners on the project before 2020, inviting them to share their knowledge and perspectives on the use of conservation breeding to recover caribou in the park. During this early dialogue, Parks Canada heard from some Indigenous partners about the importance of their participation and collaboration in the project, the importance of Indigenous knowledge, language, spirituality and ceremony to inform the project, a desire for economic opportunities associated with the project, and a concern about raising caribou to be wild.

Throughout consultations in 2022, Indigenous partners expressed support for the proposed conservation breeding project. They said they were excited to see what the project becomes and that they wanted to do something to try to save the caribou. One partner shared that that caribou, like bison, are blessings. Partners want to see caribou come back to the landscape and they want young people in their community to see caribou in the future.

However, partners have also expressed some concerns with the project including:

- the project not proceeding quickly enough;
- the need to find a balance between sustainable caribou populations and visitation;
- potential impacts to source populations, particularly the À la Pêche and Brazeau populations;
- capture myopathy;
- keeping caribou wild;
- the health and well-being of caribou in the facility;
- the ability of captive-raised caribou to survive in the wild and be integrated into wild populations;
- the potential effects of the breeding centre on other uses of the land;
- potential impact of humans on newly-released caribou;
- potential impacts of climate change on caribou and caribou habitat; and
- potential need for predator control to support the re-introduction of caribou.

Indigenous partners also made a number of recommendations and requests to strengthen the project, which fell into two major areas:

- the need for collaboration with Indigenous partners, including contracting, employment, and other partnering opportunities; and
- the need for Indigenous knowledge, ceremony, and spirituality to inform the project.

Parks Canada shares these concerns and will continue to work with Indigenous partners and other experts to refine the project throughout implementation. Parks Canada will also continue to work with Indigenous partners to define collaboration on the project and how Indigenous knowledge and spirituality can inform the project going forward. Parks Canada will facilitate ceremonies as requested by Indigenous partners.

7.1.2 Indigenous consultation and the DIA

Based on the feedback provided by Indigenous partners, Parks Canada made a number of adjustments to the DIA, including:

- strengthening the narrative of Section 8.9 to reflect feedback received, including referencing the development of an Indigenous Inclusion Plan to ensure a suitable process is established for further collaboration with Indigenous partners;
- strengthening the wording in the DIA to indicate that Parks Canada will work with provincial, federal and local Indigenous partners, as well as other experts in caribou conservation, to avoid imperiling the long-term viability of source populations and to recognize that additional work is required in this regard;
- strengthen wording in the DIA that Parks Canada will collaborate with an Indigenous working group that will provide advice and direction on the interpretation and weaving of Indigenous knowledge into the project;
- adding relevant details to Sections 3 and 8.9 to reflect the development of an Indigenous Benefits Package as part of the contracting process for the construction of the project;
- identifying the types of potential advisory and technical committees that might be formed and include Indigenous partners in Sections 2.4.5 and 8.9;
- adding relevant details about the Science and Monitoring Plan, and Indigenous working group and potential technical committees to address knowledge deficiencies to Sections 2.4, 8.7, and 11; and
- including a commitment to collaborate with Indigenous partners on outreach and education programming, knowledge sharing, plant harvest opportunities and antler collection and sharing in Section 8.9.

Additional details on the feedback provided by Indigenous partners, Parks Canada's response and how the DIA was changed to reflect this feedback is outlined in Appendix A.

7.2 Stakeholder and public consultation

Stakeholder Consultation

As with Indigenous consultation, it is important to understand potential adverse impacts to stakeholder interests related to the proposed project through meaningful consultation. The perspectives offered by stakeholders during consultation can lead to a more effective assessment process, and can help inform the proposed project by adding important insights and values.

In March 2022, a project update letter and notice of consultation was sent to 28 stakeholder organizations. All stakeholder groups were invited to one of several virtual meetings held in the spring. The purpose of these meetings was to provide detailed information about each phase of the proposed project and engage in conversation about questions, concerns, and recommended mitigations for each phase. Ten organizations attended one of seven meetings. In July 2022, the project proposal and draft DIA were shared with 28 stakeholder organizations. Stakeholders were invited to review the proposal and draft DIA and provide feedback in writing or by requesting a meeting to discuss the proposed project further. Five stakeholders provided detailed written feedback on the proposed project and DIA.

Public consultation

Meaningful public consultation is integral to an effective, open, and transparent assessment process and can help inform the development of the proposed project by providing a more complete perspective and identifying important insights and values. Members of the public were provided multiple opportunities and different tools to learn more about the proposed project,

the scope and draft DIA, and to provide feedback, identify concerns, and recommend mitigations to address their concerns.

In April 2022, a presentation on the history and status of caribou in the park and an overview of the proposed project was provided at Jasper National Park's Annual Public Forum. In June 2022, a virtual session to present detailed information about each phase of the proposed project and engage in conversation about questions, concerns, and recommended mitigations for each phase was offered for Jasper Field Unit staff members. This session was attended by 16 staff members. Also in June 2022, identical virtual and in-person public sessions were held to present detailed information about each phase of the proposed project and engage in conversation about questions, concerns, and recommended mitigations for each phase. Each session was attended by about 25 people. On three different dates in late August and early September 2022, information booths were set-up at the Old Fire Hall in Jasper. Members of the public who stopped at the booth were provided information about caribou and the proposed project, and were invited to provide feedback on the proposed project by email or through the engagement website.

The Jasper National Park website provided detailed information about the history and current status of woodland caribou in the park, shared the proposed project, provided links to the draft DIA on the Canadian Impact Assessment Registry, and invited feedback through a survey, through the project page hosted on Let's Talk Mountain Parks engagement website, or by email. Overall, Parks Canada received 41 survey responses, 10 posts on the Let's Talk Mountain Parks project page, 324 identical campaign letters, and 27 emails.

Table 5 summarizes the public consultation activities and submissions received.

Table 5: Public consultation activities and submissions in 2022

Date	Consultation Activity	Participants / Submissions
April 27	Annual Public Forum Update	(unknown attendance)
June 20	Parks Canada Staff Session	16 participants
June 23	Virtual Public Session	~25 participants
June 27	In-Person Public Session	~25 participants
August/September	Information Booths at Old Fire Hall	3 events (unknown attendance)
July to September	Online Engagement	41 survey responses 10 posts on Let's Talk Mountain Parks 324 identical campaign letters 27 emails

7.2.1 Feedback from stakeholders and the public

Stakeholders
Throughout consultations in 2022, stakeholder groups have been largely supportive of the proposed conservation breeding project. A number of these groups recognize that such an intensive project is required as the last best chance for caribou recovery in Jasper National Park. While supportive of the project, stakeholders have expressed some concerns, including:

- potential impacts to source populations, especially the À la Pêche population;
- potential impacts to caribou habitat and caribou from visitor use;
- protection of caribou habitat in Jasper National Park, especially caribou ranges that are currently or may in the future be unoccupied (i.e., Maligne and Brazeau ranges);
- keeping caribou in the facility wild;
- unclear exit strategy from the project; and
- communication approach from Parks Canada to the public about caribou and caribou recovery in Jasper National Park.

Stakeholders made a number of recommendations and requests to strengthen the project, including:

- Parks Canada should develop a plan to take action if captive-raised calves start to habituate in the breeding facility;
- Parks Canada should integrate caribou habitat use patterns with visitor use data to define an evidence-based threshold of visitation beyond which caribou are adversely affected that can inform access management in caribou habitat;
- Parks Canada should take action to reduce recreation pressures on caribou and on critical caribou habitat by building awareness and acceptance in recreational and backcountry users about human impacts on caribou and caribou habitat;
- Parks Canada should use consistent messaging about the intention to return caribou to unoccupied caribou ranges through the breeding project and thus the need to protect caribou habitat in these ranges;
- Parks Canada should keep communications open and engage with tourism and recreational groups as partners in caribou recovery; and
- Parks Canada should work with adjacent jurisdictions and Indigenous partners on a landscape level caribou restoration program.

Public
Throughout consultations in 2022, a significant majority of the public have expressed support for the proposed conservation breeding project. Of the nearly 60 individuals who expressed an explicit opinion about the proposed project, roughly 90 percent indicated they were in support of the proposal. If the 324 individuals who sent identical emails as part of the Canadian Parks and Wilderness Society campaign initiative and indicated their cautious support of the project are included, then those who have indicated some level of support of the project is roughly 98 percent. Only six members of the public expressed their opposition to the project, stating that the project was not a good use of funds, that caribou should follow their natural course without intervention and that funding should be directed to park assets instead. Many respondents, however, did not explicitly express their support or opposition to the project. Instead, they identified questions or concerns with the project, and in some cases offered recommendations to address their concerns.

Members of the public provided feedback on the proposed project during one of the two public sessions, through email, or through the online survey or Let's Talk Mountain Parks project page. Some of the most frequently expressed concerns about the project included:

- a larger population of caribou in Jasper National Park may lead to more visitors going into the backcountry in order to see caribou in the wild and in turn create more pressures and negative impacts on caribou;
- the possibility that Parks Canada will expand or impose new restrictions on visitor access to caribou habitat as caribou populations increase and caribou are re-introduced to unoccupied caribou ranges;
- that conservation breeding alone is not enough to recover caribou populations; Parks Canada also needs to protect and restore caribou habitat and do more education and outreach about caribou recovery in the park;
- the project is moving too slowly;
- both support for and opposition to human intervention to recover caribou populations;
- project funding, both the significant costs of the project and whether funding might be removed or curtailed, potentially impacting the well-being of caribou in the facility;
- both support for and opposition to predator control to support caribou recovery;
- potential impacts to source populations;
- genetic diversity in the breeding population;
- disease transmission, particularly chronic wasting disease;
- keeping caribou wild in the facility;
- the ability of captive-raised caribou to survive in the wild and integrate with wild populations; and
- potential impacts of climate change on caribou and caribou habitat.

Members of the public made a number of recommendations and requests to strengthen the project, including:

- Parks Canada should do more than establish a breeding program; other measures should continue to be taken or introduced, including outreach and education, seasonal closures, permanent closures as needed, and limiting development in the park;
- Parks Canada should consider how to protect the facility from interested visitors, including appropriate signage, fencing, and surveillance;
- Caribou should be returned to source populations when possible to ensure those populations are not imperiled in the long-term;
- Parks Canada should develop a strong monitoring program and use adaptive management to ensure success of the project; and
- Parks Canada should share more information about the program, the science, release camera footage of caribou inside the breeding centre, etc.

7.2.2 Stakeholder and public feedback and the DIA

Parks Canada shares many of the concerns raised by stakeholders and the public and reviewed each of the specific recommendations made. Some of the feedback and recommendations are outside of the proposed conservation breeding project itself, but are related to caribou recovery in Jasper National Park more broadly and will be considered in that context. Parks Canada will continue to engage with the public and stakeholders as the project is implemented.

Based on the feedback provided by the public, Parks Canada made a number of adjustments to the DIA, including:

- strengthening the wording in the DIA to indicate that Parks Canada will collaborate with provincial, federal and local Indigenous partners, as well as other experts in caribou conservation, to avoid imperiling the long-term viability of source populations and to recognize that additional work is required in this regard;
- strengthening wording in the DIA that Parks Canada will collaborate with an Indigenous working group that will provide advice and direction on the interpretation and weaving of Indigenous knowledge into the project;
- identifying the types of potential advisory and technical committees that might be formed;
- identifying climate change and human use impacts on caribou and caribou habitat as a knowledge gap that will be addressed through the science and monitoring plan in Section 11; and
- referencing the science and monitoring plan regarding the monitoring of predator and prey populations and clearly identifying that targeted and specific predator management actions (relocation or removal) will be implemented if necessary.

Additional details on the feedback provided by the stakeholders and the public, Parks Canada's response and how the DIA was changed to reflect this feedback, is outlined in Appendix A.

7.3 Government partner feedback

Parks Canada has been working closely with Environment and Climate Change Canada (ECCC), the Government of Alberta (Alberta), and the Government of British Columbia (British Columbia) for a number of years as the possibility of caribou conservation breeding as a recovery strategy for the Jasper/Banff Local Population Unit (LPU) was explored. These government partners have provided valuable information and insights that influenced the early development of the project proposal. Meetings with these partners are on-going. In July 2022, these government partners were provided the project proposal and draft DIA, and invited to provide feedback and identify any concerns they may have. All three government partners provided written comment.

7.3.1 Feedback from government partners

Parks Canada has been collaborating on southern mountain caribou recovery with ECCC, Alberta, and British Columbia for a number of years, including exploring conservation breeding in Jasper National Park. In 2022, these government partners provided detailed written feedback on the project proposal and draft DIA.

Government partners identified a number of concerns, including:

- the need for clear communication, collaboration and coordination between jurisdictions, particularly concerning the potential translocation of caribou from populations on provincial lands to the proposed breeding facility in Jasper National Park;
- potential impacts to source populations; specifically, government partners are concerned that the removal of caribou from populations provincially managed and those with

shared jurisdictional management may limit the provinces' abilities to stabilize and recover these southern mountain caribou populations; and
- whether the current ecological conditions in Jasper National Park can support caribou recovery, including specific concerns around the perceived low survival rates of caribou in Jasper National Park, the use of the maximum wolf density cited in the *Recovery Strategy for Woodland Caribou (2014)*, and Parks Canada's decision to not consider predator control as part of the recovery strategy in Jasper National Park.

Government partners recommended the development of a specific agreement and the establishment of advisory and technical committees to guide ongoing work regarding the potential translocation of caribou from populations on provincial lands to the proposed breeding facility in Jasper National Park. They also recommended updated modeling work to identify the number of caribou and a timeline for removal of caribou from provincial populations such that the long-term viability of the source populations is not imperilled.

7.3.2 Government partner consultation and the DIA

The project proposal and DIA were revised based on the feedback provided by government partners. Changes included:

- including a commitment to continue collaborating and cooperating with government partners, including the development of appropriate formal agreements, consistent with the *Species at Risk Act*;
- identifying potential external advisory and technical committees that will be established to support the conservation breeding project in Jasper National Park on topics such as the identification of source populations and animal husbandry;
- strengthening the wording in the DIA to indicate that Parks Canada will work with provincial, federal and local Indigenous partners, as well as other experts in caribou conservation, to avoid imperiling the long-term viability of source populations and to recognize that additional work is required in this regard, including updated modeling;
- including a commitment to only capture caribou on provincial lands or from a shared population (i.e. À La Pêche population) under a Parks Canada – provincial agreement;
- including a commitment to develop a predator management strategy that will establish thresholds and conditions for which targeted, localized predator management (e.g. relocation or removal) may be utilized; and
- updating the maximum wolf density needed to support caribou recovery and associated references based upon the recommendations made.

Additional details on the feedback provided by government partners, Parks Canada's response and how the DIA was changed to reflect this feedback, is outlined in Appendix A.

8. Impact assessment

This DIA describes baseline conditions (existing environment), environmental impacts, mitigations, residual impacts and cumulative effects for ten (10) Valued Components (VCs) in the context of the most appropriate phases of the project, including:

1. Facility design, construction and operations;
2. Capture: securing source caribou;

3. Breeding: animal husbandry and care;
4. Release: augmentation of recipient populations;
5. Adapt: research, monitoring and adaptive management; and
6. Decommissioning and restoration.

The 10 VCs are:

1. Brazeau caribou population;
2. À la Pêche caribou population;
3. Tonquin caribou population;
4. Vegetation and soils;
5. Surface and groundwater quality and subsurface drainage;
6. Heritage sites and cultural resources;
7. Wildlife and predator habitat security;
8. Species at Risk under Schedule 1 of SARA;
9. Indigenous values and connection to caribou; and
10. Wilderness character and visitor experience opportunities.

Impacts to Source Caribou Populations

It is imperative that the viability of source populations is not compromised through the actions of removing caribou for the creation of a captive population for conservation breeding. Research with provincial, federal, local Indigenous and academic partners is ongoing, applying the best available information and knowledge to determine impacts of removals on potential source populations.

8.1 Brazeau caribou population

8.1.1 Existing environment

Parks Canada began regular caribou population monitoring in 2002, and has collected information on caribou population size and trends in Jasper National Park for nearly 20 years (Mercer 2002; Mercer *et al.* 2004; Moeller *et al.* 2018; Neufeld 2006; Neufeld and Bisaillon 2017; Neufeld and Bisaillon 2021; Neufeld and Bradley 2007; Neufeld and Bradley 2009; Neufeld *et al.* 2014; Whittington *et al.* 2005). The Brazeau caribou population is too small to generate meaningful population estimates, therefore only minimum counts are used available. Minimum counts in the Brazeau valley were 45 caribou in 1984, 39 in 1988, 32 in 1993, and then dropped to 8 in 1996 (Neufeld and Bradley 2009). Between 1997 and 2006, these numbers fluctuated between 13 and 24. In 2007 and 2008, 20 and 13 caribou were observed, respectively (Neufeld and Bradley 2009). The Brazeau population has been below the quasi-extinction threshold since approximately 2004.

It is estimated that the Brazeau population currently has 10 - 15 individuals, with very few females (Neufeld and Bisaillon 2017 and 2021). This number is not self-sustaining and puts the population at imminent risk of extirpation (Decesare *et al.* 2010; Hebblewhite 2018; Johnson 2017; Schmiegelow 2017). The Brazeau population is functionally extirpated, but contains genetics that would be of value to the captive breeding population.

8.1.2 Impacts and mitigation measures

Potential impacts of the project to the Brazeau caribou population will occur primarily during the relocation of the Brazeau population to the breeding facility, the capture phase and during the breeding phase, for animal husbandry and care. All caribou will be captured, the population depopulated and made non-existent, but individuals and genetics will be protected and passed along to the next generations. Table 6 outlines the potential effects to the Brazeau caribou population, as well as mitigation measures.

Table 6: Summary of potential effects to Brazeau caribou population, and mitigation measures

Activities	Potential Impacts	Mitigations
Relocation of Brazeau Population	Impacts to the Brazeau population's abundance and ecology (depopulating and relocating all animals to breeding facility).	• Entire population will be relocated to the conservation breeding facility to maintain genetic continuity and adaptive behaviour. • Explore potential of returning original Brazeau animals and captive bred animals to the Brazeau region, re-establishing caribou in the region. • Make every effort to decrease mortality risk for each animal by following proper animal care protocols.
Capture, handling and transport by helicopter	Caribou are likely to be stressed during capture, and are at risk of injuring themselves.	• Apply for and obtain Research & Collection permits, including review by the Animal Care Committee, and SARA permits (SARA Permit Decision Tool will be utilized to show how the project meets the SARA permit preconditions). • Follow best practices established in other caribou capture, captive-rearing and translocation programs, including *Alberta Wildlife Animal Care Committee Class Protocol #008: Ungulate Capture by Net-Gunning, Handling and Release*. • Schedule capture when there is sufficient snow on the ground, as caribou will be found more quickly, move at slower speeds, and have adequate cushion during capture. • Enforce chase and handling times and pursue caribou groups no more than two times and no more than two pursuits per

Activities	Potential Impacts	Mitigations
		day, as per approved animal care permits. • Ensure veterinary oversight during capture, transport, and handling of caribou in transit, including administration of sedatives during transit. • Respect, as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.
	Other animals could be disturbed by helicopter flights when caribou are translocated from the Brazeau to the breeding facility.	• When possible, follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground when ferrying caribou between capture areas and staging areas.
Breeding: good animal husbandry; care and expertise with facility management and captive conditions	Pen overuse could lead to environmental contamination and increased exposure to pathogens and disease introduced from live caribou from other populations.	• Design breeding facility based on site conditions and existing captive management examples. • Follow husbandry techniques and protocols; review protocols frequently. • Follow proper preventive medicine, health monitoring and adaptive management. • Follow biosecurity measures to prevent introduction or spread of diseases. • Use multiple smaller pens with timed pen rotation. • Respect, where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.

Relocation of Brazeau Population

Securing source caribou will involve capturing all animals of the Brazeau caribou population, effectively depopulating the Brazeau, and transporting them to the conservation breeding facility. Animals are likely to be stressed during the capture and will be at risk of injuring themselves or experiencing capture myopathy if capture techniques are poor.

Relocating all animals of the Brazeau population to the breeding facility will have effects on the Brazeau population's abundance and ecology. The entire population will be relocated to the conservation breeding facility to maintain genetic continuity and adaptive behaviour. Depending on the success of augmenting the Tonquin population, Parks Canada will explore the

potential of returning original Brazeau animals and captive bred animals to the Brazeau region, re-establishing caribou in the region.

Capture, handling and transport by helicopter
Impacts associated with capture, handling and transport of these animals will be mitigated by following best practices that have been established in other caribou capture, captive-rearing and translocation programs, including *Alberta Wildlife Animal Care Committee Class Protocol #008: Ungulate Capture by Net-Gunning, Handling and Release*. The SARA Permit Decision Tool will utilized to show how the project meets the SARA permit preconditions. Key best practices include applying for and obtaining required Research & Collection, Animal Care Task Force and SARA permits; giving caribou calming medications under veterinary care while in transit; following wildlife flight guidelines; and, where possible, maintaining minimum flight elevations of 500 m above ground to mitigate disturbance to other wildlife during caribou translocation.

Breeding: animal husbandry and care
Disease risk is a major deciding factor for success in all conservation breeding programs (Ballou 1993; IUCN/SSC 2013; Snyder *et al.* 1996). Space and lower animal density is paramount for animal health and welfare. Risk of disease increases if animal density in the breeding facility is too high. Although the final number will be based on continuing expert consultation, a maximum of 40 females in the breeding facility is proposed. Risks to animal health will be mitigated with planning and breeding facility design and existing captive management examples.

High densities and pen overuse can lead to environmental contamination, and invariably increased exposure to pathogens or disease introduced from live caribou from other populations (Blake and Rowell 2017). In a captive management setting, most of the health and reproductive problems are directly attributable to errors made in husbandry and facility maintenance. Examples of such errors include irregular feeding protocols, accidentally housing females in estrus adjacent to surplus bulls, and improper gate management (Blake and Rowell 2017). It is therefore important to integrate animal health with facility management and animal husbandry.

Animal health during the project will be supported through proper husbandry techniques and protocols, preventive medicine, health monitoring, biosecurity measures and adaptive management. Use of large pens will not mitigate overuse and density-dependent contamination of high-use areas. Instead, use of multiple smaller pens with timed pen rotation is recommended (Blake and Rowell 2017).

The health and disease risk assessment identified Chronic Wasting Disease (CWD; an infectious and degenerative disease of the central nervous system that affects species of the deer family [i.e., cervids]) as a future risk for caribou (Macbeth 2015). CWD is caused by abnormal proteins called *prions*. In later stages CWD results in weight loss, behavioral changes, drooling and poor coordination. CWD is fatal in all cases.

There have been no incidents of CWD in JNP (Merrill *et al.* 2019). The closest infection to the proposed conservation breeding site in Jasper is ~350 km away from Jasper (risk of infection occurs at ~50 km or less) but CWD is spreading westward and is expected to enter the park ungulate populations in coming years.

Parks Canada maintains close communication with the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba regarding management and surveillance activities for CWD in wild

and domestic cervids as well as with the Canadian Food Inspection Agency, and other CWD research groups (e.g., the Alberta Prion Research Institute, Edmonton, Alberta; Canadian Wildlife Health Cooperative, Saskatoon, Saskatchewan) on new findings related to this disease. CWD surveillance occurs in most national parks in western Canada, including JNP where samples from road-killed cervids are all submitted to provincial partners for CWD testing (<50 samples annually). To better understand and mitigate this disease, a CWD strategy will be developed as part of the broader animal husbandry plan, to incorporate rigorous disease surveillance, health monitoring, mitigation, and response plans for potential disease outbreaks at all project phases.

8.1.3 Residual effects and significance

Brazeau caribou population will be depopulated and the population will no longer exist although the individual animals will still exist in captivity. There is also a risk that individual animals or their calves might die. Residual adverse effects to the Brazeau population are presented in Table 7.

Table 7: Significance of residual impacts of the project to Brazeau caribou population

Activities	Residual impacts	Magnitude
Relocation of Brazeau Population	Brazeau area is depopulated.	**Positive** impact over the long term as genetics and adaptive behaviours will be preserved through the captive breeding program.
Capture, handling and transport by helicopter	Caribou are less stressed during the capture and are less at risk of injuring themselves.	**Minor** due to following existing and effective best practices established in other caribou breeding programs
Breeding: animal husbandry and care	Less exposure to pathogens, disease or contaminated environment	**Minor** due to following existing and effective husbandry techniques and protocols

Summary: Because of the fine-scale genetic and behavioural variation in caribou, especially in western Canada, and the numerous resultant failures of caribou translocations across ecotypic boundaries in the scientific literature, Jasper/Banff LPU, including the Brazeau population, are considered among the best and most appropriate source caribou for captive breeding (Hebblewhite 2018). Capturing and relocating all animals of the Brazeau population to the conservation breeding facility will not only protect these valuable animals from future extinction, but will also preserve Jasper/Banff LPU local adaptive genetics (Hebblewhite 2018; McShea *et al.* 2018; Slater 2017). This ensures the conservation of the evolutionary potential of the Jasper/Banff LPU through the fine-scale genetic and behavioural adaptation to Jasper, maximizes probability of success of augmented caribou from captive breeding in adapting to Jasper conditions, and is the most technically feasible, cost-effective and timely recovery strategy (Hebblewhite 2018). This approach is also consistent with the revised Committee on the Status of Endangered Wildlife in Canada (COSEWIC) classification for caribou, and recommendations by COSEWIC and the International Union for Conservation of Nature (IUCN) to use locally-sourced animals, when available, for augmentation or translocation (Hebblewhite 2018). Where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou will also be respected. Given the above mitigations,

significant residual adverse effects to the Brazeau caribou population from the 10 to 20-year project are unlikely to occur.

8.2 À la Pêche caribou population

8.2.1 Existing environment

Historical sizes of caribou populations in Alberta are imprecise because caribou distribution was generally contiguous; distinct populations didn't exist as they do today. However, it is generally accepted that caribou population sizes in western Alberta were larger and more stable in the early 1900s (Edmonds and Bloomfield 1984). Records prior to 1940 are particularly sparse, but by the late 1940s, hunting of caribou was closed in the Athabasca Forest Reserve (the present-day Willmore Wilderness Park (Willmore) and adjacent foothills, i.e., much of the range of the À la Pêche population). It was thought that the previously numerous caribou of this region had migrated or moved northwest to adjacent land in British Columbia, where thousands of caribou had been reported (Edmonds and Bloomfield 1984). Hunting reopened in 1950, and by 1956 Stelfox estimated that caribou were scarce, and that approximately 200–300 caribou were present in the Athabasca Forest Reserve. Stelfox's 1961 estimate increased to 800–1000 in 1961, and further to 1200–1600 in 1966, based on sightings reported by forestry officers, hunters, guides and trappers. Sightings reported from JNP and Willmore around 1960 were estimated at 375–450 animals (Edmonds and Bloomfield 1984).

Caribou numbers in the À la Pêche population started declining in the mid-1960s, but formal population estimates were rare and continued to be vague from 1960–1990. The first studies with radio collars were initiated in 1979–1983 in the caribou ranges near Grande Cache, and since 1998, the Government of Alberta has monitored adult female survival and recruitment to determine annual population growth rates. From 2005–2014, growth rate calculations were imprecise, often with confidence intervals overlapping zero, but the data supported declines (Eacker *et al.* 2019). Since 2015, because of ongoing wolf control by the Government of Alberta, the À la Pêche population has experienced positive population growth through increased survival and recruitment rates (Eacker *et al.* 2019). Survival values of 0.92 and 0.96 and female recruitment of 0.20 and 0.14 for 2016 and 2017, respectively, indicate that the population is doing well and is expected to continue to grow if current conditions of low wolf density are maintained into the future.

Lambda (population growth metric) values were 1.16 and 1.12 in 2016 and 2017 respectively (Eacker *et al.* 2019), indicating that the population grew by 16% and 12% in those years, respectively. The population numbered approximately 152 animals (minimum 139 from recent scat DNA collection) in winter 2017-2018 (Manseau, personal communication), of which approximately40% are adult females (~60). Wolf control has continued to present day, and the population has continued to experience higher survival and recruitment, with a mean lambda of 1.16, 1.04, and 1.12 in 2018–20, respectively (Government of Alberta, unpublished data).

Considering that the population has grown on average 12% (4.2%–15.7%) since 2016, it is expected that by 2025 the A La Pêche will be well over 200 caribou, with the assumption that the Government of Alberta's wolf control program continues. Moreover, many of these females will be among younger age classes (3–8 years old) due to increased recruitment from 2016–21, allowing potential removal of females for placement in a caribou conservation breeding facility (Neufeld and Calvert 2020).

8.2.2 Impacts and mitigation measures

Park Canada's priority is to ensure the long-term viability of the À La Pêche population by not risking the significant recovery efforts invested by the Government of Alberta to stabilize and grow the population. At the time of anticipated capture, it is estimated that more than 200 caribou will be available to support the project. Based on preliminary work completed to date, Parks Canada estimates that potentially between 10-20 female caribou from the À la Pêche population could be removed over a period of 5 years to help populate the founding breeding population. Caribou removed from the À la Pêche population would be primarily females, plus calves and a few males, biasing toward younger animals (Hebblewhite 2018; Neufeld 2020). According to the preliminary analysis, Parks Canada anticipates that the À la Pêche would recover to its pre-capture population level of over 200 caribou within five years. Decisions related to removals will be based on an agreement between the Government of Alberta and Parks Canada on the shared management of the À la Pêche population.

Table 8 outlines the potential effects to the À la Pêche caribou population and mitigation measures.

Table 8: Summary of potential effects to À la Pêche caribou population and mitigation measures

Activities	Potential impacts	Mitigations
Relocation of À la Pêche animals to the breeding facility.	Impacts to the À la Pêche population's abundance and ecology (removal of adult females, males and calves) in the short term	• Capture caribou over a period of 5 years. • Capture small numbers of caribou from other wild populations (e.g., Brazeau, Tonquin and other regional populations located in BC) to decrease the impact on the À la Pêche population. • Return of founding animals or progeny after captive population is well established may be considered, dependant upon support and recommendations from provincial and Indigenous partners and based on health monitoring protocols. • Work collaboratively with the Government of Alberta and Indigenous partners to revisit initial models to determine a suitable number of animals that won't jeopardize the long-term viability of the À la Pêche population.
Capture, handling and transport by helicopter	Caribou are likely to be stressed during capture, and are at risk of injuring themselves.	• Apply for and obtain Research & Collection permits, including review by the Animal Care Committee, and SARA permits (SARA Permit

Activities	Potential impacts	Mitigations
		Decision Tool will be utilized to show how the project meets the SARA permit preconditions). • Follow best practices established in other caribou capture, captive-rearing and translocation programs, including *Alberta Wildlife Animal Care Committee Class Protocol #008: Ungulate Capture by Net-Gunning, Handling and Release*. • Schedule capture when there is sufficient snow on the ground, as caribou will be found more quickly, move at slower speeds, and have adequate cushion during capture. • Enforce chase and handling times and pursue caribou groups no more than two times and no more than two pursuits per day, as per approved animal care permits. • Ensure veterinary oversight during capture, transport, and handling of caribou in transit, including administration of sedatives during transit. • Respect, as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.
	Other animals could be disturbed by helicopter flights when caribou are translocated to the breeding facility.	• When possible, follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground during ferrying or transit between capture work and staging area.
Breeding: good animal husbandry; care and expertise with facility management and captive conditions	Pen overuse could lead to environmental contamination and increased exposure to pathogens and disease introduced from live caribou from other populations.	• Design breeding facility based on site conditions and existing captive management examples. • Follow husbandry techniques and protocols; review protocols frequently.

Activities	Potential impacts	Mitigations
		• Follow proper preventive medicine, health monitoring and adaptive management. • Follow biosecurity measures to prevent introduction or spread of diseases. • Use multiple smaller pens with timed pen rotation. • Respect, where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.

Relocation of À la Pêche animals to the breeding facility.
Conservation breeding for caribou recovery will require founding a robust captive population with genetic and behavioural similarities to source animals in JNP. The À la Pêche caribou population is one of the many populations being considered for founding a captive population. Other populations being considered are located in British Columbia and discussions with the Government of British Columbia are underway to model the potential for various source populations in that province. Consultation with local Indigenous groups will need to be conducted by the Government of British Columbia with support from Parks Canada to assess the impact of various removal scenarios on all of these populations.

Preliminary caribou source modelling (Neufeld and Calvert 2020) indicates that the À la Pêche population can be considered as a source population for caribou conservation breeding, without affecting its long-term viability, but that consideration and collaboration with the Government of Alberta, ECCC and local Indigenous partners to fully understand the impacts is required. Modelling of the impacts of removals demonstrates that the population should be resilient to removals of up to 28 animals. Therefore, Parks Canada suggests that removing 10-20 caribou won't affect the long-term viability of the A La Pêche population.

In collaboration with provincial, Indigenous and federal partners, specific additional practices could be considered to lessen potential impacts of caribou removals, including:

- Return of founding animals or progeny after captive population is well established may be considered, dependant on discussions with the Government of Alberta and on advice from the technical steering committee and health monitoring protocols;
- Consider additional genetically appropriate source populations to allow development of a captive population of close to 40 animals within a few years of initial capture. This will also help improve genetic diversity within the facility and reduce impacts to the À la Pêche population. For example, using a few females from the Columbia North population should be strongly considered with close collaboration with the Government of British Colombia and local Indigenous groups; and
- Slow the establishment of the captive population to 40 breeding females, by capturing fewer females per year, but over more years.

As a result, caribou captures to populate the conservation breeding facility will occur over a period of 5 years (Neufeld and Calvert 2020), and will likely include some calves, (especially female calves), if the females captured still have young calves at heel. Expected key impacts to the source population will therefore include removal of adult females, and also reduction in total number of calves recruited for several years, due to a reduced number of breeding females in the population (Neufeld and Calvert 2020).

The À la Pêche population is transboundary, and the responsibility for the population is shared with the Government of Alberta, ECCC, and Indigenous Partners and is covered under a S.11 Agreement between Alberta and the Government of Canada. Collaboration with interested Indigenous partners as caretakers of the À la Pêche herd, the Government of Alberta, and ECCC, will be maintained. Information about the project will also be shared and discussed through ongoing engagement with Indigenous communities with historical connection to Jasper. Further work in collaboration with the Government of Alberta and Indigenous partners will ensure that long-term viability of the À la Pêche herd will not be jeopardized

Capture, handling and transport by helicopter
Caribou are likely to be stressed during capture, handling and transporting by helicopter, and are at risk of injuring themselves. This will be mitigated through the use of best practices established in other caribou capture, captive-rearing, and translocation programs. Please refer to Brazeau caribou population mitigation measures (Section 8.7.2 Impacts and mitigation measures) for more details.

8.2.3 Residual effects and significance

Residual adverse effects to the À la Pêche population are presented in Table 9. Residual impacts are expected to occur after mitigations, but none are anticipated to cause significant adverse long-term impacts (won't affect the long-term viability of the population nor the recovery objectives set under the S.11 Agreement). The implementation of a combination of mitigations (established best practices of capturing, capturing caribou over a period of5 years, translocating small numbers of caribou from other sources, etc.) will likely lessen the potential impacts of caribou removals and will ensure that the population is stable and continues to recover.

Table 9: Significance of residual impacts of the project to À la Pêche caribou population

Activities	Residual impacts	Magnitude
Relocation of À la Pêche animals to the breeding facility.	Impacts to the population's abundance and ecology	Preliminary results indicate **Minor and of short duration** due to consideration and implementation of a combination of mitigations to lessen potential impacts of caribou removals. Further review and analysis is needed.
Capture, handling and transport by helicopter	Caribou are less stressed during the capture and are less at risk of injuring themselves.	**Minor** due to following existing and effective best practices established in other caribou breeding programs
Breeding: animal husbandry and care	Less exposure to pathogens, disease or contaminated environment	**Minor** due to following existing and effective husbandry techniques and protocols

Summary: The À la Pêche herd , due to ongoing wolf control by the Government of Alberta, has experienced positive population growth because of increased survival and recruitment rates since 2016 (Eacker *et al.* 2019). Preliminary analyses on impacts of removals on the À la Pêche population show that removal of approximately 10-20 females over a period of 5 years would not risk the long-term viability of the population (Neufeld and Calvert 2020). As a result, given the above mitigations, significant residual adverse effects to À la Pêche population from the 10 to 20-year project are considered low, but further review and analysis in collaboration with the Government of Alberta, Indigenous partners and ECCC is needed. If, after further analyses, impacts to the À la Pêche population are considered to be too large and detrimental, Parks Canada, in collaboration with the Government of Alberta, will consider the following: reducing the number of females captured from the population; returning a portion of females to the wild after retaining their calves for breeding stock in the facility; or supplementing the À la Pêche population with calves born in the facility after the Tonquin population is recovered (Neufeld 2020). Where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou will also be respected.

8.3 Tonquin caribou population

8.3.1 Existing environment

The Tonquin Valley has long been a popular wilderness destination in JNP. The area provides an abundance of alpine vistas and secure habitat for grizzly bears, and is home to one of Jasper's remaining populations of southern mountain caribou. Historical records and Indigenous knowledge indicate that the Tonquin caribou population was once much larger, but today this population has declined to the point where it is facing imminent extinction. Caribou in the Tonquin Valley numbered over 180 in the early 1960s, and over 100 as recently as 2008, but Parks Canada documented a period of steep decline from 2008–14 in the Tonquin population, which is now stable at approximately 52 (49–55) caribou, but with only 9 adult females in 2020.

A suite of actions that were meant to cumulatively protect the population was initiated more than 10 years ago, but due to persistently high wolf density until 2014, the actions were not sufficient to eliminate the decline. Today, under a scenario of lower wolf density, the population is too small to recover on their own, even though it has stabilized. To minimize direct human disturbance to caribou, Parks Canada has taken steps to restrict the type and timing of human recreation in caribou habitat, including implementing winter access closures from November 1 to May 15; discontinuing cross-country ski track setting; limiting snowmobile use; restricting horse use; prohibiting ski lift developments in the Tres Hombres or Outer Limits areas of Marmot Basin; restricting access by bicycle, glider or motor vehicle; preventing the establishment of new trails; limiting overnight use and random camping; restricting dogs from caribou habitat; and providing education and guidelines for park users and aircraft on ways to avoid disturbing caribou. There are also reduced speed zones on the Icefields Parkway.

The Tonquin population is part of a complex ecological system with many factors combining to impact the population (Neufeld 2020). Factors like stochastic events, potential for disease, cumulative impacts, condition of females and natural population variation may explain in part the continued decline of the Tonquin population. However, the biggest issue facing caribou at the present time is very low numbers, from which the population cannot recover on its own. The current situation may be compounded by the fact that small populations become more susceptible to decline, and individuals in small populations have reduced reproductive success

and survival. Given the current population size and the low number of females, recovering the Tonquin caribou population will be challenging, and is not likely to occur naturally on its own. It is unlikely that any additional actions (beside augmentation) will translate into caribou population growth or increase the number of reproductive females, and therefore recover the population.

In order to determine recovery potential for the Tonquin population as a result of conservation breeding, two models were developed for the respective captive and wild populations:

- captive population model: in-facility conservation breeding population model; and
- wild population model: augmentation of Tonquin population using integrated population model.

Both models work together to project recovery potential of the Tonquin caribou population (Neufeld 2020).

In the captive population model, the framework provides an opportunity to vary vital rates, variability, and proportions of yearlings removed for augmentation, as well as starting population sizes and age distributions, but does not capture large potential catastrophes of, for example, predator incursion or disease outbreak, where many females could die. This is a risk of a captive facility but is not easy to quantify and could be disastrous; it is acknowledged that influential uncertainty is not considered.

The wild population model uses the 2007-2021 integrated population model for the current Tonquin population (Moeller *et al.* 2018). Built-in assumptions of that model include, for example, that previously experienced ecological conditions in the Tonquin Valley will continue to be experienced (e.g., low median adult female survival). The model is therefore somewhat pessimistic, as recent work on wolf density and adult female survival in JNP has demonstrated that ecological conditions are more favourable for caribou than they used to be (Neufeld 2020). Additionally, mitigations such as winter closures were expanded last year and continue to be implemented

8.3.2 Impacts and mitigation measures

Parks Canada intends to capture a few animals (to be determined after forthcoming analysis) from the Tonquin and Brazeau populations to establish the breeding population, and, in subsequent years, to capture additional caribou from several regional populations from Alberta and British Columbia. The goal is to release several animals into the Tonquin population to increase it to a more sustainable level. The benefits of augmenting populations that have existing animals, in order to maximize the success of reintroduction of naïve animals are well documented (Hebblewhite 2018; Johnson 2017; Schmiegelow 2017). Augmentation to a population of a minimum of 200 is intended, based on the recent decline from 100, and historical values of the population's size (Neufeld 2020). Modelling potential scenarios contributed to better understanding the implications of varied actions or parameters (Neufeld 2020). Impacts and mitigations are assessed and discussed during the capture and release phases for the Tonquin caribou population in Table 10.

Table 10: Summary of potential effects to Tonquin caribou population, and mitigation measures

Activities	Potential impacts	Mitigations
Relocation of Tonquin animals to the breeding facility	Impacts to the Tonquin population's abundance and ecology in the short term	• Run caribou source modelling to ensure potential impacts of capture are well understood. • Translocate small numbers of caribou from other wild or captive sources so as to not further imperil this already very small population. • Replace individual animals after captive population is well established through quickest augmentation schedule.
Capture, handling and transport by helicopter from Tonquin Valley to the breeding facility, if considered	Caribou are likely to be stressed during capture, and are at risk of injuring themselves.	• Apply for and obtain Research & Collection permits, including review by the Animal Care Committee, and SARA permits (SARA Permit Decision Tool will be utilized to show how the project meets the SARA permit preconditions). • Follow best practices established in other caribou capture, captive-rearing and translocation programs, including *Alberta Wildlife Animal Care Committee Class Protocol #008: Ungulate Capture by Net-Gunning, Handling and Release*. • Schedule capture when there is sufficient snow on the ground, as caribou will be found more quickly, move at slower speeds, and have adequate cushion during capture. • Enforce chase and handling times and pursue caribou groups no more than two times and no more than two pursuits per day, as per approved animal care permits. • Ensure veterinary oversight during capture, transport, and handling of caribou in transit, including

Activities	Potential impacts	Mitigations
		administration of sedatives during transit. Respect, as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.
	Other animals could be disturbed by helicopter flights when caribou are translocated to the breeding facility.	• When possible, follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground during ferrying or transit between capture work and staging area.
Breeding: good animal husbandry; care and expertise with facility management and captive conditions	Pen overuse could lead to environmental contamination and increased exposure to pathogens and disease introduced from live caribou from other populations.	• Design breeding facility based on site conditions and existing captive management examples. • Follow husbandry techniques and protocols; review protocols frequently. • Follow proper preventive medicine, health monitoring and adaptive management. • Follow biosecurity measures to prevent introduction or spread of diseases. • Use multiple smaller pens with timed pen rotation. • Respect, where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.
Release: augmentation of recipient populations; release site fence construction; transport of caribou by helicopter; holding translocated caribou at release site in temporary pen for about three weeks	Caribou released in the Tonquin Valley over several years, supporting the recovery of the Tonquin population.	• Positive: recovery of the Tonquin population will increase the resilience of the population to normal ecological processes such as predation and avalanches. Restoration of the population to a self-sustaining level where human intervention is minimal.
	Caribou are likely to be stressed during transportation from the breeding facility to the	• Follow best practices established in other caribou capture, captive-rearing and translocation programs, including *Alberta Wildlife Animal Care Committee*

Activities	Potential impacts	Mitigations
	release site and are at risk of injuring themselves.	*Class Protocol #008: Ungulate Capture by Net-Gunning, Handling and Release*. • Respect Indigenous cultural and spiritual protocols surrounding Indigenous relationships with caribou and the land.
	Post-augmentation mortality may affect recruitment of yearlings into the wild population of adult females.	• Refine caribou augmentation modelling to ensure potential impacts of augmentation are well understood. • Train captive animals to be predator-averse. • Provide translocated animals with access to supplemental forage. • Release yearlings with wild-caught adult females through soft-release, or soft-released with wild females from the Tonquin population. • Ensure vital rates measured/experienced in the wild population are conducive to population stability. • Continue to monitor and address main threats contributing to caribou population decline where appropriate. • Respect Indigenous cultural and spiritual protocols surrounding Indigenous relationships with caribou and the land. • Monitor predation of caribou by large carnivores. Targeted and specific predator management (relocation or removal) may be used under pre-established conditions to support the augmentation of caribou within the Tonquin range. A predator management strategy will be developed.

Relocation of Tonquin animals
The project proposes capturing a few male and female animals from the Tonquin population, and several wild animals from regional populations, to be translocated to the conservation breeding facility over a period of 5 years. This will preserve regional genetics within the captive population that will otherwise disappear. However, although males contribute minimally to population growth because of harem breeding (i.e., five or fewer males do the majority of breeding), this male capture has potential to impact the Tonquin population's abundance and ecology with the removal of dominant breeders. Thus, while a larger initial capture size in year one, with an age distribution biased toward younger animals will likely result in the highest productivity, returning founding males after the captive population is established, through the quickest augmentation schedule, will shorten the impact to the Tonquin population's abundance and ecology. Additional caribou source modelling will be run to ensure potential impacts of capture are well understood and can be addressed adequately.

Capture, handling and transport by helicopter
Caribou are particularly sensitive to capture, handling and transport stress, and are at risk of injuring themselves. Please refer to Brazeau caribou population mitigation measures (Section 8.7.2 Impacts and mitigation measures) for more details.

Release: augmentation of recipient populations
Caribou augmentation modelling indicates that the most influential parameter on number of yearlings available for release is adult female survival in captivity (Neufeld 2020). If adult female survival in captivity is less than 80% each year (or averaged across all years), there will not be sufficient yearlings produced to maintain breeding stock or supplement wild populations. It will therefore be of utmost importance to maximize health and wellness of adult females, even if reproductive rates or calf survival is slightly lower.

Post-augmentation survival depression can affect recruitment of yearlings into the wild population of adult females (Neufeld 2020). Protocols will focus on maximizing yearling survival in the wild through soft-penning, releasing yearlings with wild-caught adult females (from the facility and considered less suitable for captivity), or perhaps soft-penned with wild females from the Tonquin population. Because captive-bred animals are naïve to wild environments, it is not expected that they will have equivalent survival values compared to wild-raised yearlings. Models indicate that if survival of naïve, released yearlings is 50% of what their wild counterparts experience (in the wild, yearlings experience a 64% annual survival rate), the Tonquin population will nevertheless experience an upward trajectory (Neufeld 2020). In other words, a 32% annual survival rate of augmented females will result in Tonquin population growth. Increasing this survival rate would mean faster recovery, so in addition to following best practices established in other caribou capture, captive-rearing and translocation initiatives, all existing and emerging threats contributing to caribou population decline, including predation risk, will be identified, monitored and addressed in order to increase chances of survival of yearlings. It is therefore conceivable that after 3–5 years of augmentation in the Tonquin Valley, efforts could be shifted to focus monitoring on the newly recovered Tonquin population to ensure the trajectory remains stable (Neufeld 2020).

Post-release mortality is an important knowledge gap, as reintroducing captive-bred caribou to the wild has rarely been attempted and limited data exist (Watts and Ford 2019). If post-release mortality is severe and protracted, recovery of the population will be very slow. Understanding the details of mortality of captive-bred yearlings will be critical information in adaptively managing release or rearing techniques, for example: training captive animals to be predator-averse, providing translocated animals with access to supplemental forage, or creating a soft-

release area with modified predator abundance and/or food (Watts and Ford 2019). Targeted and specific predator control (relocation or removal) will be used to support the augmentation of caribou within the Tonquin range.

Releasing caribou in the Tonquin Valley over several years is projected to support the recovery of the Tonquin population and to increase the resilience of the population to normal ecological processes such as predation and avalanches. If successful, the project intends to bring the Tonquin population to a minimum of 200 caribou, with the intent of restoring the natural ecological processes associated with a healthy population. Ultimately, the project aims to restore the population to a self-sustaining level where human intervention is minimal.

Research, monitoring and adaptive management
Research and monitoring activities will generate useful information and will overall result in positive impacts. Modern GPS radio collars, which have the ability to be programmed with geo-fences and mortality detectors, and which can provide updated positions via satellite uplink every 15 minutes, are the primary means by which caribou will be monitored once they are released from the soft-release sites. Nonetheless, helicopter flights will be necessary, and will be conducted at greater than 500 m above ground level to minimize disturbance to caribou and other animals. Ecological consequences of mixing animals from different populations (Brazeau, À la Pêche and Tonquin) and adding captive yearlings will also be monitored. With this new information, caribou augmentation modelling will be refined to ensure potential impacts of augmentation are well understood in order to be properly addressed.

8.3.3 Residual effects and significance

Residual adverse effects to the Tonquin population are presented in Table 11. Residual impacts are expected to occur, but none are anticipated to cause significant adverse impacts through soft-penning and continued monitoring of all threats contributing to caribou population decline.

Table 11: Significance of residual impacts to Tonquin population

Activities	Residual impacts	Magnitude
Relocation of Tonquin animals to the breeding facility	Impacts to the population's abundance and ecology	**Negligible** due to return of founding animals through the quickest augmentation schedule possible
Capture, handling and transport by helicopter	Caribou are less stressed during the capture and are less at risk of injuring themselves	**Minor** due to following existing and effective best practices established in other caribou breeding programs
Breeding: animal husbandry and care	Less exposure to pathogens, disease or contaminated environment	**Minor** due to following existing and effective husbandry techniques and protocols
Release: augmentation of recipient populations	Post-release mortality minimized to the extent possible	**Minor** due to releasing several animals, implementing soft-release approaches and continued monitoring of threats contributing to caribou population decline

Summary: Removal of a few animals can have adverse effects, while releasing several animals is mostly positive. Introduction of captive yearlings into the Tonquin population will be monitored to detect any changes to the behaviour of wild animals. Ecological consequences of mixing animals from different populations and adding captive yearlings will also be evaluated and addressed. Where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou will be respected. As a result, given the above mitigations, significant residual adverse effects to the Tonquin population from the 10 to 20-year project are unlikely to occur.

8.4 Vegetation and soils

JNP is divided into three ecoregions: montane, subalpine and alpine, which are broad landscape units with characteristic species, communities and physical environments. The subalpine ecoregion lies between the montane and alpine ecoregions. The subalpine ecoregion is divided into upper subalpine and lower subalpine regions. The breeding facility site and work camp are located within the montane ecoregion, while the release sites (Cavell and Tonquin Valley release sites) are located in the upper subalpine ecoregion. The vegetation of the montane ecoregion is characterized by forests of Douglas fir, trembling aspen, lodgepole pine and grasslands. The subalpine ecoregion vegetation consists of lodgepole pine, Engelmann spruce, subalpine fir, meadow and avalanche path communities.

8.4.1 Existing environment

A desktop assessment and field assessment for rare plants and vegetation communities were conducted for the breeding facility (Stantec Consulting Ltd. 2019). The desktop assessment included review of *Ecological Land Classification (ELC) of Banff and Jasper National Parks* (Holland and Coen 1982), interpretation of aerial imagery, mapping of plant communities, and review of database and spatial records of rare plants and communities known to occur in the proximity of the breeding facility footprint. Spring and summer rare plant surveys were conducted to assess rare plants and vegetation communities within 100 m of the breeding facility footprint.

Soils
Patricia 1 (PT1) and Athabasca 1 (AT1) are the key Ecosites in the breeding facility footprint (Section 4.3). Moreover, PT1 encompasses calcareous glacial landforms dominated by Brunisolic and Luvisolic soils. PT1 occurs on valley floor benchlands; ice contact stratified drift B (calcareous, variably-textured) is a significant constituent of some tracts. Veneers of eolian material A (calcareous, medium-textured) and eolian material B (altered, medium-textured) occur sporadically. Soils of PT1 are rapidly- to well-drained. The Montane Ecosite, PT1, occurs on ridged or hummocky moraine or morainal blankets overlying ridged or hummocky bedrock. The moraines consist of calcareous, medium-textured till (till C). The dominant soils are Orthic and Eluviated Eutric Brunisols and Brunisolic Gray Luvisols. The PT1 Ecosite is the most extensive Patricia Ecosite and is commonly found on broad valley floor benchlands throughout the Montane Ecoregion. Occasionally, PT1 tracts occur on lower slopes of valley walls. The Athabasca Ecosite (AT1) occurs on calcareous, coarse-textured glaciofluvial material in the Montane Ecoregion. Soils are Orthic and Eluviated Eutric Brunisols although Eutric Brunisols are the dominant soils.

Orthic and Eluviated Eutric Brunisols and Brunisolic Gray Luvisols are characterized by thin sola developed under well-drained conditions. These soils have weak textural B horizons, some with sufficient pedogenic clay film development to be Bt horizons, occurring at or below the till-

eolian interface. Iron, aluminum and humus-enriched Bm horizons developed in the eolian material B veneers often overlie the textural B horizons. These upper sola Bm horizons are absent on the accessory Orthic Gray Luvisols. Eluvial (Ae) horizons are discontinuous across the landscape and are often only weakly expressed in the absence of eolian material B. In some localities, surface erosion or deposition inhibits Ae development. Small wet depressions with Rego and Orthic Gleysols and Terric Mesisols may occupy up to 20% of some tracts. Orthic and Eluviated Dystric Brunisols occur rarely and only on the low lime till of western Jasper. Lithic soil phases occur infrequently and are associated with morainal veneers.

Plant communities

Both PT1 and AT1 ecosites are comprised of C6 (lodgepole pine/buffaloberry (*Sheppopulationia Canadensis*) showy aster (*Eurybia conspicua*)) and C19 (lodgepole pine/buffaloberry/twinflower (*Linnaea borealis*)) plant communities, which were the upland plant communities identified within the breeding facility site. Most of the breeding facility study area and a 100 m buffer, 151.2 ha (76%), is covered by C19 (lodgepole pine/buffaloberry/twinflower) plant community (Figure 13).

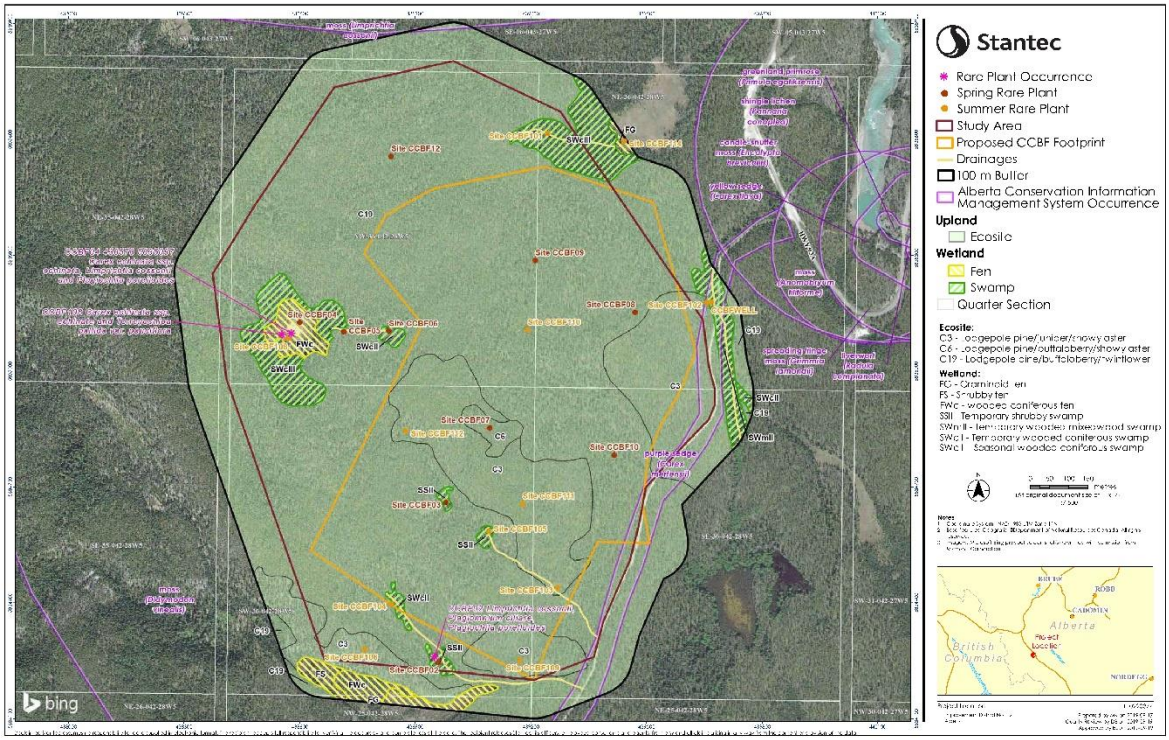

Figure 13: Breeding facility rare plant communities

The C3 (lodgepole pine/juniper/showy aster) plant community covered 32.5 ha (16%) of the breeding facility study area and 100 m buffer. This plant community was also dominated by lodgepole pine in the overstory, with lesser components of aspen, Engelmann spruce (in both the canopy and the subcanopy). The shrub layer was dominated by ground juniper, dwarf bilberry (*Vaccinium caespitosum)* and buffaloberry, with hairy wild rye, showy aster (*Eurybia conspicua*) and harebell (*Campanula rotundifolia*) in the herb layer. Feather mosses (stair-step moss and Schreber's moss) composed most of the ground cover.

There is one area covering 1.0 ha (1%) classified as a C6 (lodgepole pine/buffaloberry/showy aster) plant community (Figure 13). This plant community had lodgepole pine in the canopy and subalpine fir dominating the subcanopy. The shrub layer was dominated by buffaloberry, common Labrador tea, subalpine fir and ground juniper, but the herbaceous layer was dominated by showy aster and hairy wild rye (*Leymus innovatus*). The moss layer is similar to C19.

Plant communities were dominated by lodgepole pine in the overstory, with aspen (*Populus tremuloides*) and black spruce (*Picea mariana*) as less dominant components in the canopy, or present in the subcanopy. The shrub layer was dominated by buffaloberry, with inclusions of subalpine fir (*Abies bifolia*), Engelmann spruce (*Picea engelmannii*), black spruce, common Labrador tea (*Rhododendron groenlandicum*), ground juniper (*Juniperus communis*) and myrtle-leaved willow (*Salix myrtillifolia*). Twinflower was common in the herbaceous layer, along with bunchberry (*Cornus canadensis*) and common bearberry (*Arctostaphylos uva-ursi*). The moss layer was dominated by Schreber's moss (*Pleurozium schreberi*) and stair-step moss (*Hyloconium splendens*).

Fen and Swamp Wetland Types
Following wetland descriptions of the *Alberta wetland Classification System* (ESRD 2015), seven wetland types were identified within the breeding facility study area and 100 m buffer (Figure 13), including three (3) fens and four (4) swamp wetland types buffer as outlined below:

1. *FG Graminoid Fen*
   Graminoid fens have greater than 40 cm of organic soil accumulation, have less than 25% cover of trees and shrubs and are dominated by sedge species (*Carex* spp.), brown and sphagnum moss (ESRD 2015).

2. *FS Shrubby Fen*
   Shrubby fens also have greater than 40 cm of organic soil accumulation and have 25% or more shrub cover and less than 25% cover of trees (ESRD 2015). Autumn willow (*Salix serissima*) and dwarf birch (*Betula pumila*) dominated the shrub layer with water sedge (*Carex aquatilis*) and golden moss (*Tomentypnum nitens*) dominating the herbaceous and moss layers.

3. *FWc Wooded Coniferous Fen*
   Wooded coniferous fens have more than 40 cm of organic soil accumulation and greater than 25% cover of coniferous trees (ESRD 2015). Black spruce was the dominant tree species in the canopy and dwarf birch in the shrub layer. Several species of sedge dominated the herbaceous layer and golden moss was the dominant moss species observed.

4. *SSII Temporary Shrubby Swamp*
   Temporary shrubby swamps have less than 40 cm of organic matter and less than 25% tree cover (ESRD 2015). A temporary shrubby swamp that was surveyed was dominated by flat-leaved willow (*Salix planifolia*) in the shrub layer, and several species of sedge and dwarf raspberry (*Rubus arcticus*) in the herbaceous layer. Golden moss and stair-step moss dominated the moss layer.

5. *SWmII Temporary Wooded Mixedwood Swamp*
   Temporary wooded mixedwood swamps have less than 40 cm organic matter accumulation and more than 25% tree cover with both coniferous and deciduous

species with at least one quarter of the total canopy cover (ESRD 2015). Engelmann spruce, aspen and lodgepole pine composed the canopy. Hungry willow (*Salix famelica*), bracted honeysuckle (*Lonicera involucrata*) and common Labrador tea (*Rhododendron groenlandicum*) were common in the shrub layer and water sedge dominated the herbaceous layer.

6. *SWcII Temporary Wooded Coniferous Swamp*
   Temporary wooded coniferous swamps have less than 40 cm organic matter accumulation and more than 25% coniferous tree cover (ESRD 2015). Black spruce and lodgepole pine composed the tree canopy. The shrub layer was composed of willow and sedge species in the shrub and herbaceous layers. Schreber's moss dominated the moss layer.

7. *SWcIII Seasonal Wooded Coniferous Swamp*
   Seasonal wooded coniferous swamps have less than 40 cm organic matter accumulation and more than 25% coniferous tree cover (ESRD 2015). This plant community had white spruce, black spruce and pine in the overstory, black spruce and willow in the shrub layer. The herbaceous layer was dominated by hairy wild rye and sedges. Stair-step moss dominated the moss layer.

Rare plants
There are 185 vascular plants, 159 non-vascular plants, 166 species of lichen and 28 plant communities listed as tracked elements in the Alberta Conservation Information Management System (ACIMS) with the potential to occur in the Montane natural subregion (ACIMS 2017). Of those listed, 28 have been historically observed within 5 km of the breeding facility study area (Stantec Consulting Ltd. 2019). A total of 106 vascular, 39 non-vascular and 32 lichen species were observed during field surveys (Figure 13, Stantec Consulting Ltd. 2019).

Non-native vegetation
For this DIA, non-native invasive plants, or "weeds," include plant species identified for priority management within JNP. A field survey of the breeding facility conducted in September, 2022 identified invasive, non-native vegetation species (oxeye daisy and sweet clover) along the transitional zone of the Geraldine Fire Road. No non-native invasive vegetation was observed within the proposed breeding facility footprint.

Work Camp and Equipment Staging/Laydown Facility
The proposed camp/ laydown facility is proposed to be situated within Kerkeslin Borrow Pit. Kerkeslin Pit is an existing disturbed area located within PT1. Subsurface materials comprise a relatively well sorted package of coarse grained glaciofluvial sediments of indeterminate thickness. There is little to no vegetation in the main disturbed area of the gravel pit, though the edges have an established base layer of avens (Figure 12). Several non-native plants, like oxeye daisy, Canada thistle and sweet clover, were observed to be present during a site visit of the proposed work camp location.

8.4.2 Impacts and mitigation measures

Potential adverse effects to vegetation and soils will occur primarily during the construction, breeding and release phases of the project. Table 12 presents a summary of potential effects on vegetation and soils, along with information about key mitigation measures.

Table 12: Summary of potential impacts to vegetation and soils and mitigation measures

Activities		Potential impacts	Mitigations
Breeding facility design		Positive impacts by considering the project setting and prioritizing caribou welfare	**Positive** - no mitigation required The following mitigations reinforce the positive impacts of the engineering design: • Complete field investigations to support terrain stability mapping for final footprint location to be incorporated into geotechnical and engineering final design and engineering phase. • Minimize workspace in unstable or potentially unstable terrain. • Develop a grading plan following further design and technical investigation.
Construction	Breeding Facility: Topsoil harvesting, utility construction, earthworks, grade preparation and road construction; animal treatment lab, handling barn, site office, short-term accommodation space and vehicle/ equipment storage spaces; site fences, animal feeders, waterers and site security infrastructure	Loss, alteration or disturbance of native vegetation	• Limit vegetation clearing to the breeding facility footprint. Mark and enforce these boundaries. • Follow the tree clearing diagram (Figure 14). • Minimize disturbance to sensitive vegetation communities where mitigation or reclamation is unlikely to be successful. • Utilize existing access roads and disturbances to minimize need for new linear disturbance.
		Loss, alteration or disturbance of rare vegetation	• Avoid rare plant occurrence locations where possible. • Utilize selective thinning instead of tree removal where practicable.
		Introduction and spread of non-native seeds and forest pests	• Complete pre-construction invasive plant survey to identify locations of invasive plant species for mitigation and control. • Develop a non-native vegetation management strategy that aligns with JNP's integrated pest management plan.

Activities		Potential impacts	Mitigations
			• Pressure-wash or steam-clean construction equipment (level 2 clean) prior to accessing the site to prevent transport of invasive plants, including seeds. Tire treads, wheel wells and bumper areas will be clear of dirt and plant debris. • Follow methods to control non-native vegetation as identified in the JNP Integrated Pest Management Plan (Parks Canada 2022d), including use of cultural control of non-native vegetation on topsoil and subsoil stockpiles, use of mechanical control along access roads, hand-picking and disposal of non-native vegetation at approved site, and use of non-residual herbicides.
		Soil erosion and compaction resulting from equipment and machinery use and facility general maintenance activities	• Conduct vegetation clearing without disturbing soils and root systems when and where feasible. • Develop and implement an Environmental Protection Plan to direct soil salvage and handling, manage erosion control and compaction/rutting risk. • Limit soil disturbance to only those areas required for breeding facility construction and operations. • Monitor area surrounding breeding facility for sedimentation and erosion risks • Rehabilitate eroded areas.
		Soil contamination from accidental fuel/oil spill or leak	• Develop and implement spill response plan for any potential contaminant releases. • Develop and implement safety protocol to ensure responsible transport of hazardous material.

Activities		Potential impacts	Mitigations
			• Rehabilitate any contamination from accidental spill or leak.
	Work Camp / Laydown Yard	Loss, alteration or disturbance of native vegetation	• Confine camp and yard to disturbed area within Kerkeslin borrow pit. • Develop a work camp management plan. • Restrict vegetation clearing to previously disturbed area as defined by Figure 12
		Introduction and spread of non-native seeds and forest pests	• Contractor to strip off top layer (5-8 cm) of soil from areas identified as infested with non-native vegetation. Contractor must conduct this stripping before they are permitted to use designated areas within the pit. • Scraped soil will be stockpiled in a designated area and managed for non-native vegetation throughout the construction period. The material will be redistributed after the work camp is decommissioned and continue to be managed for non-native vegetation at least one-year post restoration. This includes methods such as culture control, mechanical control, hand-picking and use of non-residual herbicides as necessary. • Contractor to implement a non-native vegetation management plan in the pit for duration of construction that aligns with the JNP integrated pest management plan. • Equipment to be pressure-washed or steam-cleaned (level 2) before arriving on site and dry-brush cleaned (level 1) before moving to another area to minimize spread of non-native vegetation.

Activities		Potential impacts	Mitigations
		Soil compaction resulting from equipment and machinery use	• Limit soil disturbance to only those areas required for contractor camp and laydown area. • Monitor area of camp and laydown yard for sedimentation and erosion risks. • Significant erosion and rutting concerns must be rehabilitated upon camp decommissioning.
		Soil contamination from accidental fuel/oil spill or leak	• Develop and implement spill response plan for any potential contaminant releases. • Develop and implement safety protocol to ensure responsible transport of hazardous material. • Rehabilitate any contamination from accidental spill or leak.
Breeding: animal husbandry and care: good husbandry, facility management, captive conditions and expertise		Introduction of new non-native plants	• Use processed pellets to feed caribou; Imported hay will not be used • Contain potential for non-native plant introduction by doing supplementary feeding in feeding pens only. • Closely monitor all feeding areas for new non-native vegetation and treat immediately if detected.
		Soil compaction due to concentrated trampling impacts of caribou	• Rotate caribou between pens, and manage adaptively to ensure that vegetation cover is maintained to the extent possible • Supplementary feeding of caribou
		Onsite treatment of breeding facility wastewater	• Treat facility wastewater using conventional septic fields. • Locate septic fields inside the perimeter. • Direct wastewater produced at the handling barn and the administration buildings into two septic tanks.

Activities	Potential impacts	Mitigations
		• Clean the septic tanks as required and at least once a year with a hydro vac truck. • Ensure Parks Canada wastewater effluent standards and/or applicable provincial standards are met by following the most stringent.
Release: augmentation of recipient populations	Harm to rare and sensitive plants during release site fence construction	• Conduct pre-installation survey to identify rare plant occurrence locations. • Avoid rare plant occurrence locations or alternatively transplant.
	Excessive grazing of pasture resulting in damage to vegetation, especially in riparian areas, and soil compaction	• Stock caribou as per estimates for range capacity in soft release sites. • Closely monitor overall availability of natural forage, especially in riparian areas. • Rotate caribou release annually if necessary.
Decommissioning and restoration	Potential for soil contamination from accidental fuel/oil spill or leak and hazardous material	• Develop and implement spill response plan for any potential contaminant releases. • Develop and implement safety protocol to ensure responsible handling and transport of hazardous material. • Rehabilitate any contamination from accidental spill or leak. • Conduct post-project vegetation monitoring to eliminate any chance for non-native vegetation establishment at the breeding facility. • Develop a restoration plan for facilitating vegetation regeneration following facility decommissioning.

Breeding facility design

Breeding facility design is anticipated to have positive impacts on vegetation and soils as it considers the breeding facility setting and prioritizes caribou welfare. Field investigations to support terrain stability mapping in the final footprint location will be incorporated into the geotechnical and engineering final design and engineering phase. The breeding facility design will limit the amount of vegetation clearing for the purpose of wildfire risk reduction (Figure 14), and soil disturbance to the breeding facility footprint.

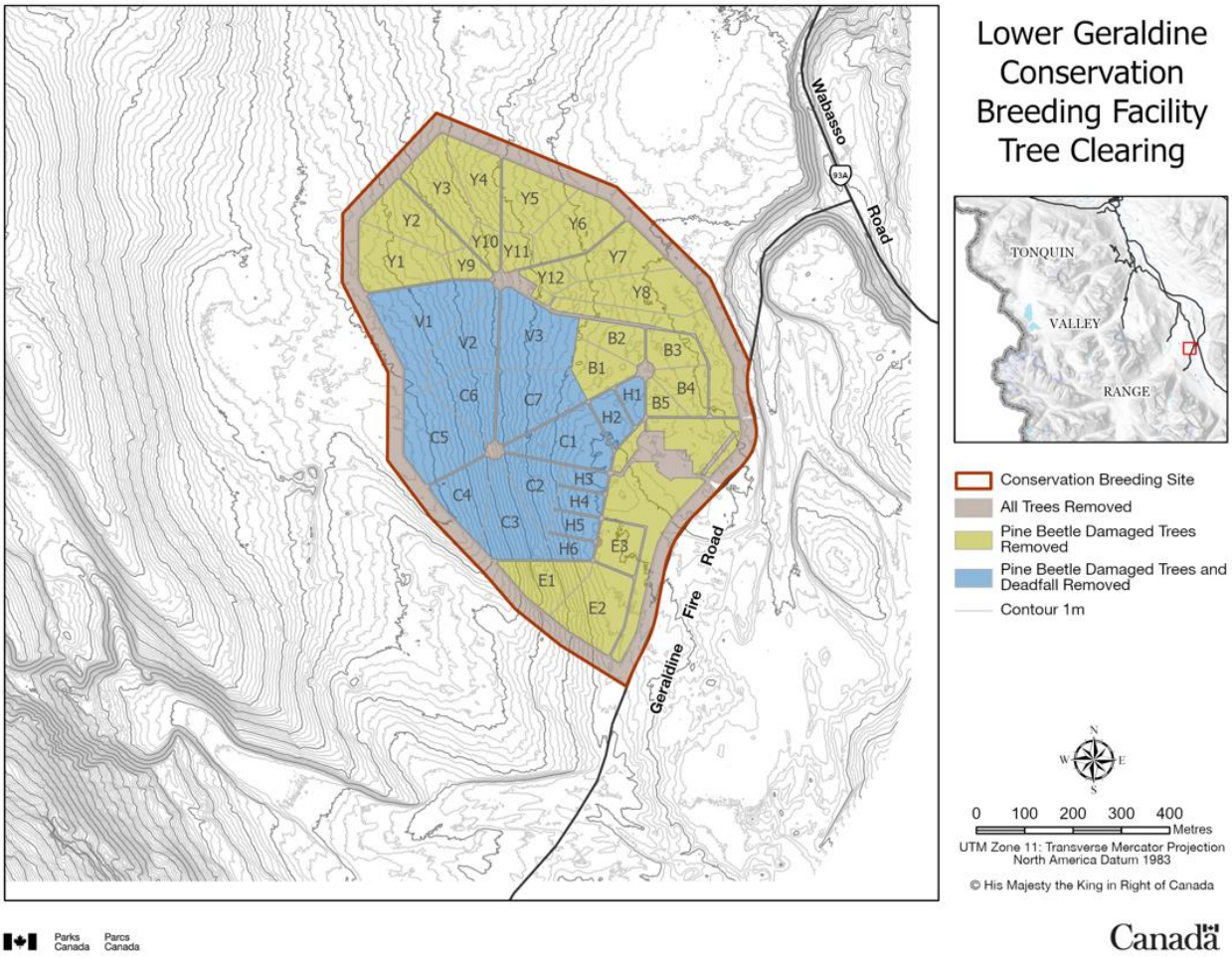

Figure 14: Breeding facility tree clearing diagram

The tree clearing diagram (Figure 14) illustrates where the different tree clearing procedures will be implemented. Standing trees with pine bark beetle damage within the perimeter fence will be removed. All the pine bark beetle damage and dead fall will be removed in the calving, cow and harem pens. However, the evidence suggests that trees that survived the epidemic are likely more resilient and have a higher likelihood of surviving future pine bark beetle threats. As such, surviving tree with pine bark beetle damage will be retained where feasible. All trees and deadfall will be removed in the perimeter fire buffer, raceways, bull catch pens, and building centre to create a fire guard.

Construction
Potential effects on vegetation and soils associated with the breeding facility construction include loss, alteration or disturbance of native vegetation; introduction and spread of non-native vegetation; soil compaction and erosion; soil contamination resulting from caribou treatment and handling facilities; utility installation; road construction; site security infrastructure; equipment and machinery use; and facility general maintenance activities. During construction of the 65 ha breeding facility, direct effects on plant communities will result from tree removal and stripping of herbaceous and non-vascular vegetation layers, as well as the removal of topsoil and subsoil, including roots and associated plant propagules.

Changes to soil quality, quantity and distribution may result from breeding facility construction and maintenance activities, leading to increased soil erosion and/or compaction. Changes to soil resources have the potential to alter terrestrial (e.g., vegetation) and aquatic (e.g., water quality) ecosystems. Accidental spills or leaks of chemicals or hazardous material (e.g., petroleum products) could occur during equipment operation, maintenance, fueling or fuel storage during breeding facility construction, which could affect soil quality and forest community condition.

Soil erosion risk is one of the primary concerns for disturbed soils, because the removal of vegetation cover exposes soil particles to wind and water. Depending on terrain and soil characteristics, with continuous exposure to wind, rain, snow movement or snow melt, soil materials may be eroded, washed or blown away, resulting in redistribution of soils and a reduction in soil quality and quantity. In the case of thin soils, such as Orthic and Eluviated Eutric Brunisols and Brunisolic Gray Luvisols, erosion may deplete the quantity of soil over bedrock, limiting the material for re-vegetation.

Soil quality and the capability of soil to support vegetation can also be reduced if soil becomes compacted. Compaction of topsoil and subsoil can lead to a decrease in long-term productivity because of an increase in soil bulk density and soil strength; reductions in soil aeration (i.e., soil oxygen); reduced water infiltration and available soil water; restricted root growth; reductions in soil microbiological activity; and lowered nutrient uptake by vegetation. Compacted soil may influence reclamation success as it can alter plant establishment and subsequent plant growth.

Key mitigation measures will be implemented to control and reduce potential effects of the breeding facility construction and operations on vegetation and soils. Disturbance will be minimized on sensitive vegetation communities where reclamation is unlikely to be successful. The tree clearing diagram for the breeding facility will be followed. Existing access roads and disturbances will be utilized to minimize the need for new disturbance. A site-specific Environmental Protection Plan will be developed and implemented to direct vegetation clearing, soil salvage and handling, prevent non-native vegetation introduction and spread and manage erosion control and compaction/rutting risk.

Known rare plants are located outside the proposed breeding facility footprint. Should construction of a building or road be required on or near the location of a rare plant, transplantation of the plant population is an option. Transplantation of vascular and non-vascular species is experimental, may not be successful, and success may be difficult to determine. Should a pen be located around or near a rare plant, options will include attempting transplant and consideration of protecting the plant with an exclosure.

Soil salvage preserves and retains topsoil and subsoil for reclamation, by stripping and storing soil in a manner that will reduce loss and degradation until soils are required for post-construction reclamation. Through proper handling and conservation, degradation of soil by

erosion, compaction, rutting, loss of viable plant material or admixing with underlying soil will be managed. For access roads to and within the breeding facility, all mineral topsoil and shallow organics (40 cm or less in depth) will be salvaged. Actual topsoil stripping depths will be determined prior to stripping. Soil stockpiles will be located on stable foundations. Topsoil and subsoil could be used on the sides or banks of the access road to support vegetation growth along the roadway.

Although no noxious or prohibited noxious weeds were observed during field surveys in the breeding facility footprint, invasive, non-native vegetation species (oxeye daisy, Canada thistle and sweet clover) were observed along the Geraldine Fire Road and at the proposed work camp site. Therefore, there is potential for non-native vegetation to be introduced during the construction, operations and breeding phases of the project. Once introduced into native ecosystems, invasive plant species can survive and reproduce, and have the capacity to displace native plants, reduce biodiversity and alter ecosystem function. They can do this through aggressive competition for moisture, nutrients and light, and possibly due to the lack of predators and pathogens (Hejda *et al.* 2009). The following are suggested methods to control regulated non-native vegetation (Stantec Consulting Ltd. 2019):

- use cultural control of non-native vegetation (i.e., seeding of competitive species) on topsoil and subsoil stockpiles;
- use mechanical control (mowing) along access roads and breeding facility;
- hand pick and dispose of non-native vegetation at an approved site; and
- use non-residual herbicides as necessary for control of invasive, non-native vegetation.

Potential effects of the establishment of the work camp and equipment storage/laydown yard in Kerkeslin Borrow Pit include loss, alteration or disturbance of native vegetation, spread of non-native vegetation, soil compaction and erosion, and soil contamination from a spill. The area is used intermittently as a firewood storage area and as an equipment storage and laydown facility. The pit has not been remediated and represents existing disturbed land. There is little to no vegetation growing within the upper tier of the pit area, although there is an established blanket of avens in the lower tier (Figure 12). Therefore, given the current state of the borrow pit, impacts from the work camp and laydown yard are anticipated to be minimal.

The contractor will be required to prepare a detailed work camp management plan and non-native vegetation management plan, to be reviewed and approved by Parks Canada prior to construction. The camp facilities and laydown areas will be confined to the previously disturbed area within the pit, as delineated in Figure 12. Any required vegetation clearing and grading will be restricted to this area. To prevent spread of non-native vegetation from the work camp to the breeding facility site, non-native vegetation management will be required. This will include stripping the top 5-8 cm layer of soil from areas identified as infested with non-native vegetation prior to establishment of the work camp and laydown areas. The scraped soil will be stockpiled in a designated area and managed for non-native vegetation throughout the construction period. The material will be redistributed after the work camp is decommissioned and continue to be managed for non-native vegetation at least one-year post restoration. Significant erosion or rutting as a result of the camp or laydown activities will be rehabilitated upon decommissioning of the camp. Cleaning of equipment will be required to minimize potential spread of non-native vegetation. The contractor will remediate any accidental spills or leaks. The work camp will use fully self-contained trailers – drinking water will be picked up from approved facilities and sewage will either be trucked away or disposed of in existing sani-dump facilities in JNP.

No restoration is anticipated following the decommissioning of the work camp and equipment storage/laydown facility because the pit is anticipated to remain in use as an equipment and material storage area into the future.

Breeding: animal husbandry and care
Potential effects on vegetation and soils associated with the breeding phase of the project include introduction of new non-native vegetation/weeds through facility management and soil compaction, due to concentrated trampling impacts of caribou within the pens, especially around feeders and waterers. Corresponding mitigation measures include using processed pellets to feed caribou, containing the potential for non-native plant introduction by limiting supplementary feeding to feeding pens only, and closely monitoring and treating all feeding areas for new non-native vegetation immediately if detected. Imported hay will not be used. Caribou will be rotated between pens and given supplementary feed to reduce soil compaction.

The facility wastewater is proposed to be treated onsite using conventional septic fields. Septic fields will be located inside the perimeter (see Figure 9).

It is anticipated that wastewater produced at the handling barn and the administration buildings will be directed into a series of two septic tanks depending on the anticipated effluent loading strength and organic waste or debris entering from the handling barn. From the septic tank(s), the effluent will gravity drain into a surge tank, followed by a pump chamber, where a pump will distribute to a septic field for treatment. It is also anticipated that cleaning of the septic tanks with a hydro vac truck will be needed once a year and therefore tank location will be in proximity to the facility centre parking lot or access road. Parks Canada will ensure that Parks Canada wastewater effluent standards and/or applicable provincial standards are met. The most stringent standards will be followed.

Release: augmentation of recipient populations
Potential effects on vegetation and soils associated with the release phase of the project include harm to rare and sensitive plants during release site fence construction, and excessive grazing of pasture, resulting in damage to vegetation, especially in riparian areas, and soil compaction. Pre-installation survey along the fence line will be conducted to identify rare plant occurrence locations. If identified, these occurrence locations will be avoided and an exclusion area around the rare plant location will be constructed.

Decommissioning and restoration
Overall, positive impacts will result from decommissioning and restoration activities; however, potential for soil contamination may occur from accidental fuel/oil spill or leak and hazardous material handling. Development and implementation of a spill response plan for any potential contaminant release, as well as a safety protocol to ensure responsible handling and transport of hazardous material, will reduce these potential impacts. It is also important to keep in mind that without on-going, multi-year, monitoring of vegetation communities after final restoration, the chance of non-native vegetation infestation increases. A restoration plan will be developed for the project and will include post-project vegetation monitoring.

8.4.3 Residual effects and significance

Residual adverse impacts are expected to occur after mitigations from the breeding facility construction, breeding and release phases, but none are expected to be significant. Effects on vegetation and soils are expected to be minor (Table 13), due to mitigation, use of appropriate

construction methods, and adherence to applicable best management practices and related industry guidance.

Table 13: Significance of residual impacts to soils and vegetation

Activities		Potential impacts	Magnitude
Construction	Breeding Facility	Disturbance of native vegetation	**Minor** as vegetation disturbance will be limited to those areas required for construction and maintenance activities and site will be fully restored at the end of the project
		Potential introduction and spread of non-native vegetation	**Minor** given implementation of a non-native vegetation management plan
		Soil erosion and compaction resulting from equipment and machinery use, and lay-down areas	**Minor** as soil disturbance will be limited to only those areas required for construction and maintenance activities; to be restored to the extent possible at end of the project
	Contractor camp / laydown yard	Disturbance of native vegetation	**Minor** as vegetation disturbance will be limited to previously disturbed unrestored areas
		Spread of non-native vegetation	**Minor** given implementation of non-native vegetation management plan within the yard.
		Soil compaction resulting from equipment and machinery use and work camp facilities	**Minor** as area is actively disturbed as a borrow pit. Soil disturbance and grading will be limited to only those areas required for the camp facilities and laydown yard and will be confined to previously disturbed areas; to be restored to the extent possible at end of the project
Breeding: animal husbandry and care		Introduction and spread of new non-native plants	**Negligible** given that processed pellets will mainly be used to feed caribou; imported hay will not be used; any supplementary feeding will take place in feeding pens only
Release: augmentation of recipient populations		Overgrazing of release sites	**Negligible** because caribou will remain in the release site for a maximum of 3 weeks and could be rotated between release sites, if necessary

Summary: Overall, there is a good understanding of the breeding facility construction effects on vegetation and soils and restoration within the project footprint. The project is expected to affect approximately 65 ha of land at the facility site and 2 ha of land at the work camp site. Vegetation and soils have the potential of being directly affected by the project footprint. However, taking into account the implementation of the above mitigations, significant adverse impacts on vegetation and soils from the 10 to 20-year caribou conservation breeding and augmentation project are unlikely to occur.

8.5 Surface water quality and subsurface drainage

8.5.1 Existing environment

A field program involving the drilling, installation, development and testing of a water source well at the proposed breeding facility was conducted (McElhanney Consulting Services Ltd. 2019). A wetland survey was also conducted, through which seven wetland types were identified within the breeding facility study area and 100 m buffer, including three fens and four swamp wetland types (Stantec Consulting Ltd. 2019). This included graminoid fen (FG), shrubby fen (FS), wooded coniferous fen (FWc), temporary shrubby swamp (SSII), temporary wooded mixedwood swamp (SWmII), temporary wooded coniferous swamp (SWcII), and seasonal wooded coniferous swamp (SWcIII).

A water well search was completed using the Alberta Environment and Parks water well database. Four water well records were identified within a 5 km radius of the breeding facility, but only two water wells with completion details. Well ID 438653 located 1.3 km east of the site, and a flowing artesian water well (Well ID 372444), were discovered a short distance northeast, at 4.7 km from the proposed facility location. Both wells were completed in surficial sand and gravel deposits to a maximum depth of 19.2 m below ground surface. There are no water features within 300 m. The Athabasca River is located approximately 1.4 km east of the breeding facility location. Groundwater flow across the breeding facility site is anticipated to be east towards the Athabasca River.

The breeding facility area is generally level in a north/south direction with the dominant slope being eastward across the site at a calculated gradient of 0.05 m/m^2 towards the Athabasca River. Based on published geological information available for the study area, the surficial deposits at the site are mapped as glaciofluvial deposits with sediment ranges from massive to stratified, poor to well-sorted, coarse- to fine-grained and includes tills. Bedrock geology mapping from the Alberta Geological Survey indicates that the site is underlain by Lower Cambrian sedimentary bedrock from the Peyto, St. Piran, Lake Louise and Fort Mountain formations. The sediments are primarily comprised of limestone and sandstone with thin interbeds of siltstone, and are described as mostly shallow marine.

The proposed work camp and laydown/staging facility in Kerkeslin Borrow Pit drains in a westerly direction towards the Athabasaca River. The facility area is situated approximately 200m from the river. The direction of groundwater flow is unknown, but is likely in a northern direction to, and possibly parallel to, the Athabasca River. There are no wells or significant water features within the pit. Intermittent ponds form in the eastern portion of the pit in May and June. Fresh water will be hauled to the camp for drinking water.

8.5.2 Impacts and mitigation measures

Effects to surface water and subsurface drainage will occur primarily during the conservation breeding facility construction, including well installation and use, and the breeding and release phases of the project. Table 14 presents the summary of potential effects on surface water quality and subsurface drainage, along with information about key mitigation measures.

Table 14: Summary of potential effects on surface water quality and subsurface drainage and mitigation measures

Activities		Potential Impacts	Mitigations
Breeding facility design		Positive impacts by considering the project setting and prioritizing caribou welfare. Good drainage is key to caribou welfare.	**Positive** - no mitigation required The following mitigations reinforce the positive impacts of the engineering design: • Exclude wetlands from the interior of the breeding facility • Use wetlands ringing the breeding facility to form the alignment of the perimeter fence of the breeding facility
Construction	Breeding facility construction: well location, installation and use	Water quality impact due to tree clearance, soil erosion and sedimentation during well installation	• Develop and implement an erosion control and sedimentation plan
		Well and aquifer may be vulnerable to surface contamination sources	• Locate well away from anticipated future known sources of potential contamination • Locate water well up-gradient from surficial contamination • Establish wellhead protection area where the capture zone of the aquifer around the well is free of contaminants
	Work camp / laydown yard	Water quality impact due to equipment washing	• Do not allow wash water to enter any waterbody or wetland.
		Potential for water contamination from accidental fuel/oil spill or leak, hazardous material release	• Develop and implement spill response plan for any potential contaminant release.
Breeding: good animal husbandry; care and expertise with facility management and captive conditions		Well water has potential to be contaminated	• Establish baseline water quality for production well. • Establish groundwater monitoring schedule. • Employ multi-barrier approach of source protection, treatment as required and distribution monitoring.

	Caribou behavior including trampling can cause soil compaction, expose soils, and may cause release of sediment and nutrients into adjacent wetlands.	• Implement regular pen rotation scheme, particularly in spring, summer and fall.
	During spring run-off, pulses of nutrients and fecal-coliforms are possible into wetlands as manure is mobilized.	• Determine run-off patterns during spring snow melt and heavy rainfall. • Manage and monitor water withdrawal and wastewater
Release: release site fence construction; holding caribou at release site	Caribou behavior including trampling can cause soil compaction, expose new soil, and may cause release of sediment and nutrients into adjacent wetlands, streams and rivers.	• Implement regular release site rotation scheme, particularly in spring, summer and fall.
Decommissioning and restoration	Potential for water contamination from accidental fuel/oil spill or leak, hazardous material or sediment release	• Develop and implement erosion control and sedimentation plan. • Develop and implement spill response plan for any potential contaminant release.

Breeding facility design
Breeding facility design is anticipated to have positive impacts on wetlands as it considers the breeding facility setting and prioritizes caribou welfare. The geotechnical investigation identified site conditions, which informed the breeding facility layout.

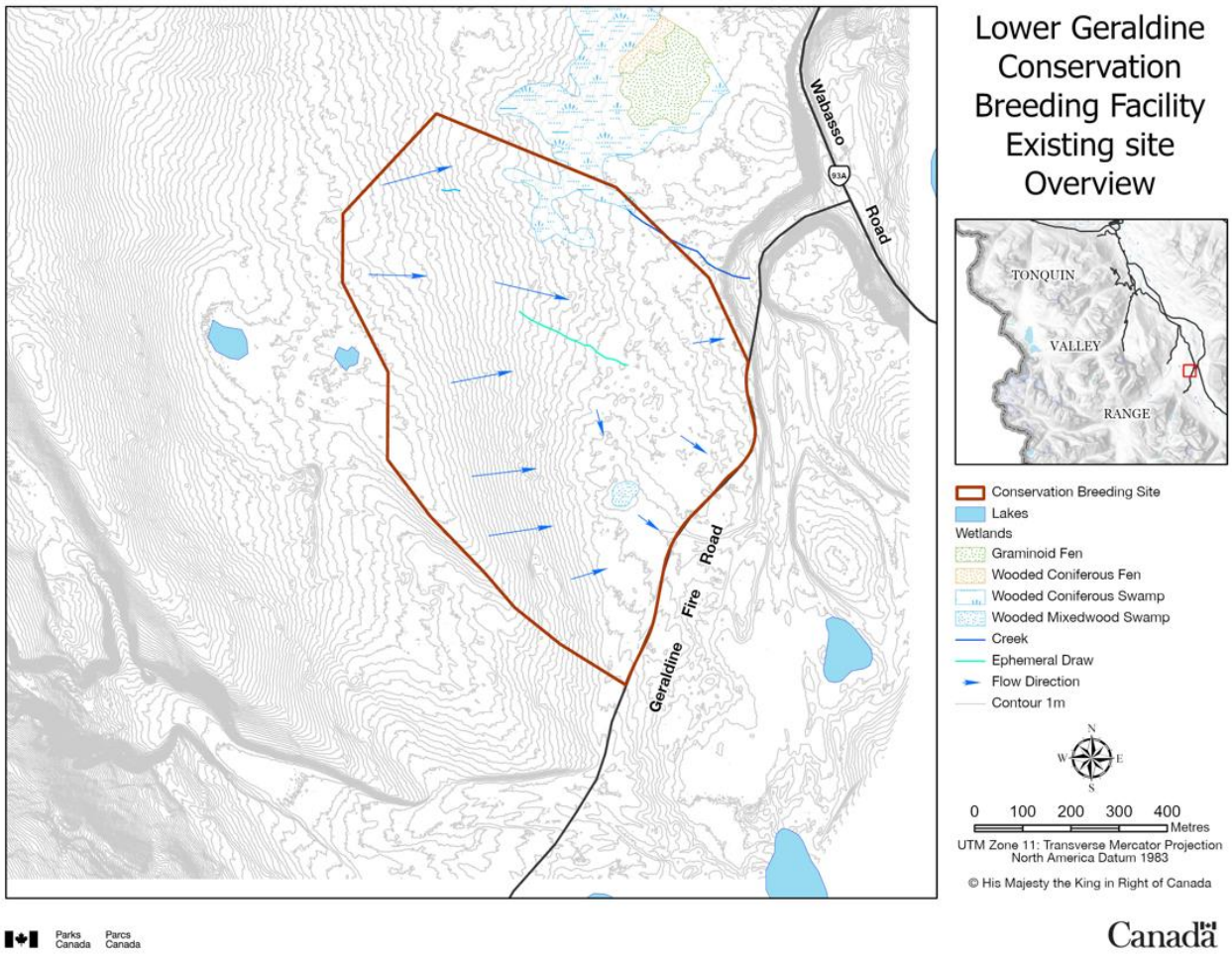

Figure 15: Breeding facility existing site overview

Wetlands ringing the breeding facility site will form the alignment of the perimeter and will be excluded from the interior of the facility (Figure 15). The wet areas in the southern portion of the site extended beyond the delineated limits of the wetlands and the whole southern area was deemed not suitable habitat for caribou. Within the wet areas, the rest of the area was found to contain no major topographic features that are hazardous to caribou. The site gently slopes mainly to the east at a consistent slope and tree cover. The eastern edge along the road is the flattest area on the site and most suitable for the location of the centre buildings and parking lot.

Construction

Breeding facility construction has the potential to result in an increase in suspended sediment, due to erosion of adjacent disturbed areas caused by surface run-off. Breeding facility construction activities also have the potential to introduce deleterious substances into water bodies and watercourses, which could adversely affect water quality. Certain activities during construction may affect groundwater on a short-term basis. Subsurface activities including breeding facility foundations, utility lines, wells and other infrastructure that require burial, and terrain modification required to support the project, could alter shallow groundwater flows in and near the breeding facility and other developments, on a short-term basis. These disturbances would be near surface (shallow) and limited in areal extent. Long-term production well-pumping has the potential to impact aquifer sustainability.

The production well for the facility was installed approximately 200 metres south of the southernmost point of the facility, outside of the facility perimeter fence. The well is up-gradient of all caribou pens, mitigating any risk of contamination of the water source from surface sources. The well is drilled to a depth of 183 m and completed in a confined aquifer, primarily in siltstone and sandstone across the depth interval 73.1 to 167.6 m below ground surface (McElhanney Ltd. 2019).

Overall, determining run-off patterns during spring snow melt and heavy rainfall provides excellent information on where and where not to construct roads, driveways, alleyways, pens and buildings. Additionally, the protection of groundwater supply can be accomplished by establishing a wellhead protection area, where the capture zone or region of the aquifer around the production well that is captured under pumping conditions is free of contaminants.

As the proposed work camp and equipment laydown/staging area is situated in an existing disturbed area with no significant water courses, and the accommodation trailers will be fully self-contained with no water removal or disposal on-site, impacts are expected to be minimal. Potential effects of the establishment of the work camp and yard in Kerkeslin Borrow Pit include water contamination from accidental spills and leaks, or from equipment washing and handling. Development and implementation of a spill response plan, proper storage of equipment and materials, and implementation of appropriate washing measures will reduce these potential impacts.

Breeding and release phases
One of the most important features to ensure the health and welfare of animals housed in any farm or captive animal facility is proper drainage. Poorly drained soils, standing water and improperly directed drainage will rapidly lead to environmental contamination, and is one of the biggest risk factors for calf morbidity and mortality. Putting caribou in a pen creates disturbance. Overuse of specific areas will likely occur even if there are only a few animals in a large pen. Caribou behavior, including trampling, can cause soil compaction and exposed soils, and may cause the release of sediment and nutrients into adjacent wetlands. During spring run-off, pulses of nutrients and fecal-coliforms are possible into wetlands as manure is mobilized.

Following baseline water quality establishment for the production well, and subsequent to development of the breeding facility, it is important to establish a groundwater monitoring schedule. Pathogenic contaminant loading to the area, and potentially the upper water-bearing unit, will obviously increase over time, as caribou populate the area. Using many smaller pens with implementation of a regular pen rotation scheme, particularly in spring, summer and fall, is planned. Groundwater quality results should be assessed against the Guidelines for Canadian Drinking Water Quality (GCDWQ). A multi-barrier approach, including source protection, treatment as required, and distribution monitoring, will ensure water quality objectives are met for both animal and human consumption over the duration of the project.

Efforts to minimize disease are paramount to caribou calf survival, and thus it will be prudent to maintain as clean a source of raw water for animal consumption as possible. Groundwater under the direct influence of surface water (GWUDI) is defined as “groundwater that is hydraulically connected to nearby surface water (or precipitation) and is susceptible to contamination from pathogens.” During the breeding phase, water withdrawal and wastewater will be monitored and managed.

Decommissioning and restoration
Decommissioning and restoration activities will result, overall, in positive impacts; however, potential water contamination could occur from accidental fuel/oil spill or leak, hazardous material handling and sediment release. A spill response plan for potential contaminant releases, as well as an erosion control and sedimentation plan, will be developed and implemented to reduce possible adverse impacts.

8.5.3 Residual effects and significance

Residual adverse effects are anticipated to occur after mitigations, but none are expected to cause significant adverse impacts (Table 15). Choice of best location for wellhead protection, combined with water monitoring, will further minimize residual adverse effects on surface water quality and subsurface drainage.

Table 15: Significance of project's residual impacts on surface water quality and subsurface drainage

Activities	Residual impacts	Magnitude
Breeding facility construction	Water quality impacted by tree clearance, soil erosion and sedimentation	**Negligible** due to vegetation and soil disturbance limited to areas required for well installation and implementation of an erosion control and spill response plan
	Vulnerability of well and aquifer	**Negligible** due to well location up-gradient from any surficial contamination
Breeding: animal husbandry and care	Pulses of nutrients and fecal-coliforms in wetlands are avoided during spring run-off.	**Negligible** due to determination of run-off patterns and well drainage
Release	Trampling causes exposure of new soil and release of sediment and nutrients into adjacent wetlands, streams and rivers.	**Negligible** due to implementation of regular release site rotation scheme, particularly in spring, summer and fall

Summary: There is a good understanding of activities related to the facility breeding construction, breeding and release phases that could increase soil erosion and sedimentation and cause contamination of surface water and groundwater. Taking into account the implementation of the above mitigations, significant adverse impacts on surface water quality and subsurface drainage from the 10 to 20-year project are unlikely to occur.

8.6 Heritage sites and cultural resources

A few archaeological surveys and assessments have been carried out within the broader area associated with Athabasca Falls and the confluence of the Athabasca and Whirlpool river valleys. These surveys were broad in scale, focusing on the initial inventory of JNP's archaeological resources (Elliot 1970; Pickard 1989; Wilson 1987), or focused very specifically on individual sites and/or project footprints (Head 1983; Langemann 2016; Turney 2017). A Historical Overview Assessment (HOA, Stanley 2019) and an Archaeological Impact Assessment of the conservation breeding facility footprint (AIA, Osicki, 2019) were completed.

8.6.1 Existing environment

No archaeological sites have been identified within the footprint of the proposed breeding facility or within the footprint of the proposed work camp and equipment staging/laydown facility in Kerkeslin Pit. Some sites have been recorded in the area:

The closest survey was carried out in 1983 along the Highway 93A alignment between the Whirlpool River and Athabasca Falls, as part of a Historical Resources Impact Assessment for a highway resurfacing project (Head 1983). Methodology employed during this survey consisted of driving the alignment and examining selected locations for archaeological resources. Targeted locations for foot reconnaissance consisted of the high bluffs above Athabasca Falls and the area adjacent to Leach Lake.

Two new archaeological sites were recorded in the general area as a result of this 1983 survey (181R – pre-contact lithic scatter, and 201R – historic structural remains), the closest and most relevant being 181R – located approximately 250 m east of the proposed breeding facility boundary. In association with the recording and assessment of 181R, approximately 18 shovel tests were dug (including the one positive test tied to 181R), and approximately 250 m of the associated landform edge (the bluff) was examined – all of which was still located outside the proposed project footprint. Site 201R was identified as part of a targeted pedestrian survey of the Leach Lake area in association with the 1983 Highway 93A resurfacing project. This site is located over 3 km north of the project area, and therefore well outside immediate impact concerns.

Site 181R (FdQl-2)
This site consists of a small subsurface lithic scatter, on the high bluff, approximately 400 m northwest of Athabasca Falls (past, or on the downstream side of, the falls), on the west side of the Athabasca River. Artifacts consist of four flakes (3 chert, 1 quartzite) found within a 3 enlarged shovel test ("three shovels wide"), located approximately 10 m back from the edge of the landform. Within 500–800 m of this site, on the east side of the river, and upstream from the falls, are other pre-contact sites (89R, 2505R, 2506R), with higher density of lithic debitage. These sites together (181R, 89R, 2505R, and 2506R) identify a notable pre-contact presence and use of the greater Athabasca Falls area (both upstream and downstream of the falls, and both sides of the river).

201R – Historic structural remains
Within proximity to Athabasca Falls are historic archaeological sites associated with the old Icefields Parkway (2561R – historic wooden benchmark), Athabasca Falls Bungalow Camp, and Lodge (2899R). These historic sites, along with the historic Icefields Parkway grade (Highway 93A), and the old Geraldine Fire Road and lookout, identify a number of historic activities occurring within the immediate area of the proposed project development, which in turn suggests the potential for the existence of additional archaeological resources in the area that have not yet been identified and/or recorded.

Numerous archaeological sites also exist within the Whirlpool Valley, associated with pre-contact presence and land-use, and historical activities (including the fur trade, railway tie camps and timber harvesting). With the proposed breeding facility footprint being located on a relatively low and flat bench between the Athabasca and Whirlpool rivers, some of this pre-contact and historical human activity could have easily spilled over between the Whirlpool and Athabasca valleys.

8.6.2 Impacts and mitigation measures

Potential effects on heritage sites could occur predominantly during construction of the breeding facility. Table 16 presents potential effects on heritage sites and corresponding mitigations proposed to avoid or reduce these potential effects.

Table 16: Summary of potential effects on heritage sites

Activities	Potential impacts	Mitigations
Design	Positive impacts by considering the project setting	Positive – no mitigation required
Breeding facility construction: topsoil harvesting, utility construction, work camp and laydown/staging facility, earthworks, grade preparation and road construction; animal treatment lab, handling barn, site office, short-term accommodation space and vehicle/equipment storage spaces, site fences, animal feeders, waterers, and site security infrastructure	Damage or destruction of cultural values due to ground disturbance activities (e.g., brushing/clearing, excavation and backfilling, well installation, grading, etc.)	• Identify and record old sawn stumps and axed tree blazes within project footprint. • Identify generalized past human use of project area. • Develop, implement and adhere to the Accidental Find Protocol. • Apply Change of Scope to any footprint changes that result in an expansion to any portion of project footprint. • If any significant cultural resources are observed, work will stop in the immediate area, and the Project Manager, Parks Canada Archaeologist, Parks Canada Cultural Resource Advisor or Parks Canada Environmental Surveillance Offer will be contacted to discuss protective measures that may be required.
	No archaeological issues were identified with water well location #2.	• Apply Change of Scope to any footprint changes that result in an expansion of the well footprint.

Breeding facility construction, operations and decommissioning
Cultural resources and heritage sites are non-renewable resources that may be located at or near ground level or may be deeply buried. Alteration of the landscape can result in the damage or complete destruction of all or portions of heritage sites. These alterations often involve the displacement of artifacts and features, resulting in the loss of valuable contextual information, and may involve the destruction of the artifacts and features themselves, resulting in complete information loss. These losses are permanent and irreversible.

Construction of the breeding facility will involve various levels of ground disturbance, including but not limited to clearing, topsoil stripping and grading, and therefore has the potential to negatively impact cultural resources. More specifically:

- Findings from the AIA included the identification and recording of some old sawn stumps and axed tree blazes within the project footprint of the proposed breeding facility, identifying generalized past human use of the area. Heritage and interpretive value of these resources is limited, although their general location, concentration/alignment and age may help determine their function and historical association. As a result, impact mitigation of these resources primarily consists of generalized recording and photography, which was completed as individual examples were identified during the AIA. If key examples of the blazed trees are to be cut and cleared, it is suggested that sample cookies be taken from the trees for tree-ring dating and blaze-scar analysis. This sampling should be done in consultation with, and under the direction of, terrestrial archaeology, so that the appropriate samples and methods are used. In addition, positive confirmation of historical use of the area warrants continued adherence to the Accidental Finds Protocol, as other as of yet unidentified resources may be discovered during future development and implementation of the project.

- The well location for the breeding facility was assessed (approximate location UTM NAD83 Zone 11U 439175E 5834212N). Results from this assessment identified no archaeological issues with water well location; therefore, no additional archaeological work is required in association with this well.

- The identification of moderate-to-high potential for both historic and pre-contact archaeological resources existing outside the project footprint requires that the Change of Scope caveat be applied to any footprint changes that result in an expansion to any portion of the project footprint.

- Cultural resources: There may be cultural resources present in the breeding facility area or work camp that have not yet been discovered. If project workers observe any significant cultural resources while working, they must stop work in the immediate area and contact the Project Manager, Parks Canada Archaeologist, Parks Canada Cultural Resource Advisor or Parks Canada Environmental Surveillance Offer to discuss any protective measures that might be needed. Significant resources that could be considered grounds for work stoppage include, but are not limited to, human remains, unique or diagnostic artifacts and/or artifacts directly associated with known sites and/or unidentified sites in the area.

8.6.3 Residual effects and significance

Residual adverse effects on heritage sites and cultural resources are presented in Table 17. Residual impacts are expected to occur, but none are anticipated to cause significant adverse impacts, through mitigations including identifying cultural artifacts and values, adhering to the Accidental Find Protocol and applying change of scope. Although no archaeological sites currently exist within the proposed project footprint, archaeological potential for this area should be considered moderate to high for both historic and pre-contact archaeological resources, especially closer to Athabasca Falls and/or the Geraldine Fire Road and Icefields Parkway (Highway 93).

Table 17: Significance of residual impacts on heritage sites and cultural resources

Activities	Residual impacts	Magnitude
Breeding facility construction, operations and decommissioning	Accidental damage or destruction of cultural artifacts and values	**Negligible** due to adherence to the Accidental Find Protocol and application of Change of Scope

Summary: Taking into account the implementation of the above mitigations, significant adverse impacts on heritage sites and cultural resources from the 10 to 20-year project are unlikely to occur.

8.7 Wildlife habitat security

8.7.1 Existing environment

Mountain national parks provide key areas of habitat security and connectivity for many carnivore species, including wolf (*Canis lupus*), cougar (*Puma concolor*), Canada lynx (*Lynx canadensis*), wolverine (*Gulo gulo*), black bear (*Ursus americanus)* and grizzly bear (*Ursus arctos)* within a regional landscape facing increasing development and human disturbance pressures. Habitat security in JNP is modelled for grizzly bears, with a broad assumption that if grizzly bear security is maintained throughout the park, other species will benefit. Carnivore habitat is assessed in JNP using occupancy and habitat security in landscape management units. The multi-species mammal occupancy that is measured as part of the Ecological Integrity Monitoring Program (EIMP) is used to monitor changes in the spatial distribution or range of wildlife populations. It is rated as "good and stable" in JNP (Parks Canada Agency 2018), indicating that there are not changes in predator distributions across the park.

Grizzly bears are widely accepted as an indication of the health and diversity of mountain ecosystems. They require large areas of secure habitat in order to thrive. Research has shown that wary grizzly bears will avoid areas within 500 m of high-use human trails or development. This distance is used to calculate "grizzly bear habitat security." Secure grizzly bear habitat is also used as a proxy for ensuring secure habitat for other wary wildlife, such as caribou. As outlined in Objective 1.1 of the Management Plan, JNP aims to maintain or improve grizzly bear habitat security within the park. Bear management units are approximately the size of a female grizzly bear's home range. If the proportion of secure habitat in a grizzly bear management unit is greater than 78 %, that unit is considered to be secure, with high ecological integrity, from a grizzly bear management perspective. If the proportion of secure habitat in a grizzly bear management unit is between 68-78 %, then that unit is considered to be secure, but *of concern.* The Tonquin Valley is at 72% secure while the grizzly bear management unit containing the breeding facility is at 75%. The grizzly bear habitat model incorporates visitor use in an area; if there are more than 100 users on a trail in a month, the trail is considered to be not secure and the surrounding area of the trail is detracted from the bear management units tally of secure habitat.

The proposed conservation breeding facility footprint is important to wolf, coyote and cougar. It is highly important to ungulates, especially deer and elk, to small mammals (red squirrel and red-backed voles) and to the survival of bats (big brown, little brown, and long-legged). It is also highly important to birds (Sharp-shinned Hawk, Common Raven, Solitary Vireo, Yellow-rumped Warbler, Olive-sided Flycatcher, American Robin, Western Tanager and Dark-eyed Junco) (Holland and Coen 1982).

8.7.2 Impacts and mitigation measures

Potential adverse effects on wildlife habitat security VCs could occur due to breeding facility construction and the capture, breeding, release and monitoring phases of the project. Table 18 presents the summary of potential effects on wildlife and predator habitat security, along with mitigation measures proposed to avoid or reduce these potential effects.

Table 18: Summary of potential effects on wildlife habitat security, and mitigation measures

Activities	Potential impacts	Mitigations
Construction: topsoil harvesting, utility construction, earthworks, grade preparation, road construction; animal treatment lab, handling barn, site office, short-term accommodation space, vehicle/equipment storage spaces; site fences, animal feeders, waterers, site security infrastructure; contractor work camp and equipment laydown/staging facility	Habitat change and loss with potential disturbance to ground-nesting bird nests and passerine birds, and displacement of small mammals due to construction activities	• Plan ahead to complete tree removal and clearing activities outside bird nesting and bat roosting season. • If vegetation removal during the migratory bird nesting and bat roosting window is unavoidable, a thorough sweep will be conducted to identify occupied nesting behavior, bird nests, eggs, or nests of species protected under the *Migratory Bird Convention Act* (MBCA) or the *Species at Risk Act* (SARA). If an active nest or roost activity is found during the pre-work surveys, consultation with the Parks Canada environmental surveillance officer is required. In most cases, the vegetated area will be left intact with a suitable sized buffer of shrubs/trees around it until the young have fledged and left the nest. Size of buffer is species dependent, to be determined in consultation with the Parks Canada environmental surveillance officer. • If dens, litters or nests are encountered, work must cease in the immediate area and the Parks Canada Environmental Surveillance Offer will be contacted to discuss protective measures that may be required. • Ensure temporary laydowns are free of bird nests and small

Activities	Potential impacts	Mitigations
		mammals. Relocate laydowns if necessary
	Potential displacement or alteration of wildlife movement patterns from sensory disturbance	• Conduct construction activity according to project hours. • Minimize noise and light from the work camp at night to the extent possible.
	Potential wildlife attraction to food and/or food odours, garbage or human presence	• Keep wildlife attractants such as food and garbage in wildlife-proof containers. • Maintain construction site, adjacent areas and the work camp in tidy condition, free from the accumulation of construction waste products, debris and garbage.
	Decreased grizzly bear habitat security around the breeding facility due to increased staff use of trails and roads to access and egress breeding facility area	• Limit number of workers to minimum required for construction and safety. • Conduct construction activity according to project hours.
Capture, handling and transport by helicopter	Wildlife disturbance from helicopter flights when caribou are being captured and translocated	• Please refer to Brazeau caribou population mitigation measures (Section 8.7.2 Impacts and mitigation measures)

Activities	Potential impacts	Mitigations
	Wildlife are likely to be stressed by sound of helicopter during the capture of caribou and are at risk of injuring themselves.	• Follow best practices established in other wildlife capture, captive-rearing and translocation programs
Breeding: good animal husbandry; care and expertise with facility management and captive conditions	Change in wildlife movement patterns and avoidance of breeding facility due to breeding facility fence and presence of workers	• Limit number of workers to minimum required for animal husbandry and care.
Release: Release site fence construction; transport by helicopter; hold translocated caribou at release site in temporary pen for about three weeks	Avoidance of release sites due to presence of humans during fence construction	• Ideally, work outside of bird nesting and bat roosting season. • If dens, litters or nests are encountered, work must cease in the immediate area and the Parks Canada Environmental Surveillance Offer will be contacted to discuss protective measures that may be required.
	Wildlife disturbance from helicopter flights when caribou are translocated from the breeding facility to release sites	• Follow approved animal care protocols. • Follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground.
	Change in wildlife abundance: more caribou might attract more predators.	• Monitor and address predator response.
Research, monitoring and adaptive management	Changes to grizzly bear habitat security due to on-the-ground caribou monitoring and management activities of staff and contractors	• Limit number of people conducting monitoring activities to minimum required. • Follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground. • Do not allow public groups around or within release sites.

Breeding facility construction

Breeding facility construction and operations activities have potential to disturb ground-nesting bird nests and passerine birds, displace small mammals, alter wildlife movement patterns of large mammals, and attract wildlife due to food and/or food odours, garbage or human presence. The breeding facility footprint is likely to result in 65 ha of habitat alteration and there

will be increased project worker use of trails or roads to access and egress the breeding facility area during the facility construction.

Vegetation clearing associated with the breeding facility construction will be scheduled outside the bird nesting season, to the extent possible, to avoid mortality from incidental take. If vegetation clearing during the migratory bird nesting season cannot be avoided, pre-clearance surveys will be conducted to identify any active nests or nesting behaviour protected under the *Migratory Birds Convention Act* (MBCA), *1994* and to establish appropriate mitigations, such as exclusion zones. Small mammals are highly mobile and can avoid interactions with construction activities such as vegetation and ground-clearing, that could result in direct mortality. Breeding facility construction activities may cause direct mortality due to removal of burrows. If dens, litters or nests are encountered, work must cease in the immediate area and the Parks Canada Environmental Surveillance Offer will be contacted to discuss protective measures that may be required. For ground-dwelling squirrel species, the *Best Management Practices for Mitigating Ground Disturbance Impacts to Columbian Ground Squirrels* will be followed. The number of workers will be limited to the minimum required for conducting construction activities safely and according to project hours.

The proposed contractor work camp and equipment staging/laydown yard in Kerkeslin Pit has potential to attract wildlife if food and garbage are not carefully managed. All food and waste will be required to be stored in wildlife-proof containers to manage this risk. The camp and laydown complex represents an increase in human use of the pit relative to current uses, particularly at night. This could result in a temporary increased displacement and disturbance of wildlife.

Capture, handling and transport by helicopter
Wildlife will be disturbed from helicopter flights when caribou are being captured and translocated from source populations to the breeding facility. Best practices established in other caribou capture, captive-rearing and translocation programs will be followed. Wildlife flight guidelines will also be followed, including maintaining minimum flight elevations of 500 m above ground to mitigate disturbance to other animals.

Breeding: animal husbandry and care
The entire footprint of the breeding facility will be fenced with a secure electrified perimeter fence comprised of a physical barrier (high tensile mesh wire) with underground skirt, a visual barrier (cloth, geotextile) and an electric fence to prevent predators from accessing the pens. The fence will be patrolled by staff at least on a daily basis to ensure physical integrity. Potential effects of fencing on wildlife include changes in wildlife movement patterns and avoidance of the breeding facility due to breeding facility fence and presence of workers. As such, the number of workers will be limited to the minimum required for animal husbandry and care.

Release: including fence construction and holding translocated caribou at release sites
During the release phase, key potential effects include wildlife disturbance from helicopter flights when caribou are translocated from the breeding facility to release sites; wildlife avoidance of the release areas due to presence of humans during and after fence construction; exclusion of large mammals from soft-release sites; and change in wildlife abundance, as more caribou may attract more predators.

Fences in general have the potential to disrupt the daily and seasonal movements of wildlife, reduce access to key habitat patches and resources, increase injury risk, and potentially separate young animals from their mothers (Gates 2006; Paige 2015). However, the enclosures for the

release pens will be a relatively small footprint on the landscape, approximately 1 – 2 ha in size, therefore it is anticipated that wildlife will be able to navigate around without issue and the impact is likely negligible.

It is difficult to foresee whether wolves may learn to exploit captive-born and released caribou in JNP. Once they do, their effect on captive caribou numbers within the Tonquin population may still be limited, but continued monitoring of wolves throughout the implementation of conservation breeding will be imperative. A predator management strategy will be developed, which will establish thresholds and conditions under which targeted and specific predator management actions (relocation or removal) will be used, if required, to support augmentation of caribou in the Tonquin caribou range. Regardless of the extent to which predators kill caribou, large carnivores of JNP will benefit from the return of large, primary consumers that convert plant biomass into resources available to secondary consumers. Whether they die by predation, accident, disease or old age, caribou will eventually die and contribute to food resources for predators in the project area. Predator response, however, is one of the issues and measures to be monitored for the project so as to better inform holistic wildlife management in JNP. Parks Canada's goal is to have a healthy, self-regulating ecosystem where human intervention is minimal.

Research, monitoring and adaptive management
Ground observation of caribou, investigation of injured or dead caribou, and deployment of fences between wildlife-permeable and caribou-holding modes will also be necessary, and will require staff and contractors to travel on and off trails within and outside the release sites. Given the current low level of human use and existing room below thresholds, impacts on grizzly bear habitat security are not expected. Nonetheless, the number of people conducting monitoring activities will be limited to minimum required, wildlife flight guidelines will be followed, and permits for public groups will not be granted around or within release sites during the course of the project.

8.7.3 Residual effects and significance

Residual adverse effects on wildlife and predator habitat security are anticipated to occur after mitigations, but none are expected to cause significant adverse impacts (Table 19). With a combination of pre-construction surveys; application of established best practices from other wildlife capture, captive-rearing and translocation programs; monitoring and addressing of predator response; and following wildlife flight guidelines, these residual effects are expected to be negligible.

Table 19: Significance of residual impacts of the project on wildlife habitat security

Activities	Residual impacts	Magnitude
Breeding facility construction	Disturbance of nesting birds and small mammals	**Negligible** due to pre-construction sweeps to determine presence or absence of bird nests and small mammal dwellings and avoidance of exclusion zones for breeding facility.
	Displacement of wildlife due to sensory disturbance from work camp / equipment staging facility in Kerkeslin Pit	**Negligible** as camp location is proximate to the Icefields Parkway, Kerkeslin Campground, and other sources of human disturbance.

Activities	Residual impacts	Magnitude
	Changes to grizzly bear habitat security	**Negligible** due to limitation of the number of workers to minimum required for construction and safety
Capture, handling, and transport by helicopter	Wildlife stress during caribou capture and translocation	**Negligible** due to application of established best practices in wildlife capture, captive-rearing and translocation programs
Breeding: animal husbandry and care	Changes to grizzly bear habitat security	
Release: release site fence construction; holding caribou at the release site	Temporary exclusion of large mammals from soft-release sites	**Negligible** due to local geographic extent and small area
	Alteration of predator-prey relationships	**Negligible** due to the fact that predatory-prey relationships will be monitored and addressed
	Changes to grizzly bear habitat security	**Negligible** due to application of established best practices
Research, monitoring and adaptive management	Changes to grizzly bear habitat security	**Negligible** due to limitation of the number of personnel required and application of wildlife flight guidelines

Summary: Taking into account the implementation of the above mitigations, significant adverse impacts on wildlife habitat security from the 10 to 20-year project are unlikely to occur.

8.8 Species at Risk

There are three Species at Risk that are currently listed as Endangered or Threatened under Schedule 1 of the *Species at Risk Act* (2002) that occur or may occur in the breeding facility footprint, including Olive-sided Flycatcher (*Contopus cooperi*, Threatened), Common Nighthawk (*Chordeiles minor*, Threatened), and Little Brown Myotis (*Myotis lucifugus*, Endangered). The proposed conservation breeding facility footprint is within habitat that is potentially used by bats (e.g., little brown myotis) and birds (e.g., Olive-sided Flycatcher) (Holland and Coen 1982).

Whitebark Pine critical habitat is defined at the *Ecological Land Classification* (ELC) scale of landscape inventory polygons (e.g., density of cone-bearing and/or non-terminally infected individuals greater than 2 m2/ha across an ELC polygon, and regeneration areas within a 2 km zone surrounding the polygon; ECCC 2017). Existing anthropogenic features, including trails, infrastructure, and utility corridors, are considered not to have ecological attributes required by Whitebark Pine and have not been identified as critical habitat (ECCC 2017). Whitebark Pine critical and regeneration habitat has been mapped within JNP. The proposed conservation breeding facility footprint and work camp in Kerkeslin Pit are not considered to be critical habitat. No further assessment of this species will be included in this DIA.

The work and equipment storage/laydown facility is proposed to be fully within Kerkeslin Borrow Pit. The pit is currently used intermittently as an equipment storage facility, and

represents an actively disturbed area with minimal vegetation on the pit floor. As such, no impacts to species at risk are anticipated.

8.8.1 Existing environment

Olive-sided Flycatcher
The Olive-Sided Flycatcher is provincially listed as May Be at Risk (MULTISAR 2021) and federally listed as Threatened under Schedule 1 of the *Species at Risk Act* (2002). They are seasonal residents, where most individuals arrive between mid- and late-May and depart between mid-August and early-September. Tall trees or snags for perching are essential for foraging. Olive-Sided Flycatchers sit in these tall perches and quickly dart out to capture insects (COSEWIC 2018).

They generally favour forested habitats with foraging perches in proximity to open areas including forest openings, forest edges, rivers, muskegs, bogs, swamps, logged areas, burned forests, or open to semi-open mature forest stands (Campbell *et al.* 1990; Altman and Sallabanks 2012; Schieck and Song 2006). While they occur in natural and anthropogenic caused openings (e.g., cut-lines), there is evidence that breeding success is higher in natural openings such as those created by forest fires (Robertson and Hutto 2007). Olive-Sided Flycatchers generally build nests in coniferous trees (Peck and James 1987) and raise one brood of an average of three nestlings (Altman and Sallabanks 2012). No critical habitat has been identified in JNP.

Common Nighthawk
The Common Nighthawk nests in a wide range of open, vegetation-free habitats, including burnt-over areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks, and can also inhabit mixed and coniferous forests. The Common Nighthawk is an aerial insectivore that feeds on a wide variety of insects at dusk or dawn, sometimes in groups. It is listed as Threatened under Schedule 1 of the *Species at Risk Act* (2002).

The causes of the decline of Common Nighthawk populations are unknown. Widespread declines for other insectivorous birds suggests global use of pesticides may be a contributing factor. The population trend in JNP is unknown, no critical habitat has been identified, and the conservation focus is on protecting nests and birds from direct disturbance when they are identified.

Little Brown Myotis
Little Brown Myotis (Little Brown Bat) are insectivorous bats that range across North America (COSEWIC 2013). Aside from winter hibernacula, bat species also require foraging habitat, summer roost habitat and maternity colony structures (COSEWIC 2013). In addition to foraging over both still water and rivers, the Little Brown Myotis forage in forest gaps/edges, and along trails (COSEWIC 2013). Little Brown typically select summer roosting habitat in old-growth forest stands with a high density of snags. Little Brown Myotis will also use anthropogenic structures (e.g., bridges or buildings) for roosting (COSEWIC 2013).

Little Brown Myotis were listed as Endangered under Schedule 1 of the *Species at Risk Act* (2002) in 2014 because of the sudden decline in populations across eastern Canada as the result of white-nose syndrome, although the disease has not been detected in Alberta to date (Environment Canada 2015). Suitable wintering habitat is essential for the overwinter survival of bats.

Critical Habitat for Little Brown Myotis includes sites where bats have been observed hibernating during the winter at least once since 1995, and potential hibernacula where bats have been observed swarming but hibernation could not be verified (Environment Canada 2015). Critical habitat for Little Brown Myotis was identified in JNP near the Miette area, northeast of Jasper (Environment Canada 2015).

8.8.2 Impacts and mitigation measures

Potential adverse effects on Species at Risk could occur predominantly during the breeding facility construction phase of the project. Table 20 presents the summary of potential effects on Species at Risk, along with mitigation measures proposed to avoid or reduce these potential effects.

Table 20: Summary of potential effects on species at risk, and mitigation measures

Activities	Potential impacts	Mitigations
Breeding facility construction: topsoil harvesting, utility construction, earthworks, grade preparation and road construction; animal treatment lab, handling barn, site office, short-term accommodation space and vehicle/equipment storage spaces; site fences, animal feeders, waterers and site security infrastructure	Accidental mortality (Olive-sided Flycatcher and Common Nighthawk) during the breeding facility construction resulting in a change in abundance	• Follow the Species at Risk Guidance for Bats and Birds (December 2021). • Schedule vegetation clearing outside of the migratory bird nesting period (April 19 - August 13) • If vegetation clearing during the migratory bird nesting and bat roosting period cannot be avoided, a thorough sweep will be conducted to identify occupied nesting behavior, bird nests, eggs, or nests of species protected under the *Migratory Bird Convention Act* (MBCA) or the *Species at Risk Act* (SARA). If an active nest or roost activity is found during the pre-work surveys, consultation with the Parks Canada environmental surveillance officer is required. In most cases, the vegetated area will be left intact with a suitable sized buffer of shrubs/trees around it until the young have fledged and left the nest. Size of buffer is species dependent, to be determined in consultation with the PCA environmental surveillance officer.

Activities	Potential impacts	Mitigations
		• Avoid felling trees with obvious signs of wildlife use such as stick, or cavity nests wherever possible. • If felling trees with obvious signs of wildlife is unavoidable, designated Parks Canada approval is required.
	Accidental mortality (Little Brown Myotis) during the breeding facility construction	• Follow the Species at Risk Guidance for Bats and Birds (December 2021). • Schedule vegetation clearing outside of the bat active season in JNP (April 15 to October 15). • Large diameter tree removal (>25 cm dbh) during the time after bat pups are born, and prior to when they can fly and leave the area on their own (June 15 to September 1) can only occur after a bat roost survey has been conducted.
	Sensory disturbance (Olive-sided Flycatcher , Common Nighthawk and Little Brown Myotis) resulting in loss of habitat and displacement	• Design the project to minimize traffic and sensory disturbance within Zone II –Wilderness area.

Breeding Facility Construction

<u>Olive-sided Flycatcher and Common Nighthawk</u>
The breeding facility construction is unlikely to adversely affect Common Nighthawk and Olive-Sided Flycatchers (SARA listed migratory birds) through habitat fragmentation. Olive-Sided Flycatchers are generally associated with forest edges and are tolerant of anthropogenic footprint (Altman and Sallabanks 2012). Common Nighthawk is highly mobile and forages over large areas including anthropogenic clearings. Vegetation clearing within the breeding facility footprint may result in mortality through incidental take of individuals and nests with young or eggs. Common Nighthawk may be less impacted by this potential effect because they are likely distributed patchily and in low density. Noise levels greater than 50 dB can negatively affect birds (Environment Canada 2016), where sensory disturbance during construction can cause displacement from otherwise suitable adjacent habitat. Sensory effects were not identified as an important factor in the federal recovery strategy for Olive-Sided Flycatcher (Environment Canada 2016).

The Species at Risk Guidance for birds (December 2021) will be followed. Vegetation clearing will ideally be scheduled outside of the migratory bird nesting period (April 19 - August 24) to

avoid any accidental mortality during the breeding facility construction. If vegetation clearing during the migratory bird nesting period cannot be avoided, pre-clearance surveys will be conducted by a qualified professional biologist to identify any active nests or nesting behaviour protected under the *Migratory Birds Convention Act* (MBCA) and the *Species at Risk Act* (SARA) and establish appropriate mitigation such as exclusion zones wherever possible. The Breeding facility will be designed to minimize traffic and sensory disturbance within Zone II – Wilderness area.

Little Brown Myotis

There are no known bat hibernacula identified in the breeding facility footprint. However, the guidance for protecting and managing bats in Parks Canada administered places (Parks Canada 2022e)will be followed. To avoid any accidental mortality during the breeding facility construction, vegetation clearing will ideally be scheduled outside of the bat active season (April 15 to October 15). If vegetation clearing during the bat active season cannot be avoided, the time after pups are born, and prior to when they can fly and leave the area on their own (June 15 to September 1) will be avoided. If vegetation clearing can only be conducted during this window (June 15 to September 1), this would require a SARA permit for bat individuals. For maternity roosts (residence) in trees, a SARA permit is not required; large diameter tree removal (>25 cm dbh) during this window (June 15 to September 1) can only occur after a bat roost survey has been conducted. In addition, the breeding facility will be designed to minimize traffic and sensory disturbance within Zone II –Wilderness area.

8.8.3 Residual effects and significance

Residual adverse effects on Species at Risk are presented in Table 21. Residual impacts are expected to occur, but none are anticipated to cause significant adverse impacts.

Table 21: Significance of residual impacts of Breeding facility construction on species at risk

Activities	Residual impacts	Magnitude
Breeding facility construction	Accidental mortality or disturbance of nesting birds and bats	**Negligible** due to application of the Species at Risk Guidance for birds and bats.

Summary: Taking into account the implementation of the above mitigations, adverse impacts to Species at Risk are unlikely to occur and are expected to be insignificant during the 10 to 20-year caribou conservation breeding and augmentation project. It is also highly unlikely that any SARA-listed individuals will be harmed or killed and no critical habitat is expected to be destroyed. The SARA-Compliant Authorization Decision Tool will be used for SARA species, but no authorizations are required.

8.9 Indigenous values and connection to caribou

8.9.1 Existing environment

JNP is located in Treaty 6 and Treaty 8 territories, as well as the traditional territories of the Anishinabe, Dene-zaa, Nehiyawak, Secwépemc, Stoney Nakoda, and Métis (Parks Canada Agency 2022a). Long before Jasper was established as a national park, a diversity of First Nations and Métis peoples lived and made their home on these lands. Some Indigenous groups lived in the region year-round, while others came to the area on a seasonal basis for harvest, ceremony, travel or trade.

The park was established in 1907. Shortly thereafter, Indigenous peoples were removed and excluded from park boundaries, as colonial government policies at the time considered Indigenous peoples to be incompatible with park establishment. Other Government of Canada policies—including restrictions on hunting and gathering, restrictions on leaving reserves, prohibitions on cultural practices and ceremonies and removal of children to residential schools—further prevented Indigenous peoples from travelling through, harvesting and exercising cultural practices in what is now the park. These government practices and policies disconnected Indigenous peoples from their traditionally used lands and waters and caused significant negative impacts to their communities that persist to this day. (Parks Canada Agency 2022a).

Where they were once excluded, JNP now works together with First Nation and Métis peoples to facilitate reconnection to their traditional lands in a spirit of reconciliation (Parks Canada Agency 2022a). Parks Canada is currently working with more than 20 First Nation and Métis communities and organizations with connections to JNP. The main park mechanism for engagement with Indigenous communities is through the interest-based Jasper Indigenous Forum, which has met bi-annually since 2006 (Parks Canada Agency 2022a).

Since the forum was created, access to traditional lands and activities has improved with the development of a designated area for traditional activities, the introduction of free park entry for partner communities and the issuance of cultural use permits for harvesting of plants and medicines. Indigenous peoples are important partners in the stewardship of JNP, with connections to the lands and waters. Going forward, they would like to be more involved in park management and operations, see the weaving of Indigenous knowledge and languages into park initiatives, and have more employment and economic opportunities for local Indigenous communities (Parks Canada Agency 2022a).

Throughout consultations for the project in 2022, Indigenous partners requested ongoing collaboration with Indigenous partners, including contracting, employment and other partnering opportunities and impressed the importance for Indigenous knowledge, ceremony and spirituality to inform the project.

8.9.2 Impacts and mitigation measures

Table 22 presents potential effects on Indigenous values and connection to caribou and corresponding mitigations proposed to avoid or reduce these potential effects.

Table 22: Summary of potential effects on Indigenous values and connection to caribou, and corresponding mitigations

Activities	Potential impacts	Mitigations
Capture: securing source caribou	Impacts to traditional territories and ancestral lands of local and regional Indigenous communities with changes in access to an important animal to Indigenous communities	• Work with Indigenous partners to determine the best ways to have meaningful representation, involvement and consultation throughout the course of the project. • Respect Indigenous cultural and spiritual protocols surrounding
Breeding: animal husbandry and care		
Release: augmentation of recipient populations		

Activities	Potential impacts	Mitigations
		Indigenous relationships with caribou and the land. • Consider relationship between the presence (and/or absence) of caribou and Indigenous peoples to adapting approaches to capturing, breeding and augmentation. • Ensure ongoing dialogue and engagement to identify and address potential impacts to intangible Indigenous values. • Facilitate opportunities for Indigenous partner participation in project advisory and technical committees. • Develop an Indigenous Inclusion Plan in collaboration with Indigenous partners to ensure concerns, interests and participation are effectively incorporated into all phases of project. This plan will include details regarding opportunities such as, but not limited to: o economic participation; o employment; o education and outreach; o knowledge sharing; o traditional plant harvest; o establishment of lichen harvesting programs; and o antler collection and sharing. • Create an Indigenous working group to collaborate on the development and implementation of the Indigenous Inclusion Plan.

Capture, breeding and release

The project has potential to impact traditional territories and ancestral lands of local and regional Indigenous partners. While potential effects on Indigenous values and connection to caribou, including changes in access to an important animal will be discussed to the extent possible with Indigenous partners, it is known that caribou are a cornerstone of Indigenous culture and history. Caribou are among the most important cultural resources for many Indigenous groups, and Indigenous peoples possess deep traditional ecological knowledge of

caribou (Polfus *et al.* 2013; Schramm 2005; Sharp and Sharp 2015). Indigenous perspectives on caribou, including the cultural and spiritual protocols governing their relationships with caribou, must be respected.

It is important to note that Indigenous cultural values must be evaluated through a combination of economic and descriptive methods in order to avoid underestimating or excluding intangible values (David Suzuki Foundation 2013). Caribou present many intangible values which are difficult to define, and to which it is difficult to ascribe economic value; these include the opportunity for traditional learning, building relationships, recreation, and as a resource for future generations (David Suzuki Foundation 2013).

Through initial engagement initiatives and throughout the consultation period, Indigenous partners have indicated that they have strong cultural and spiritual connection to caribou. Indigenous partners have identified the importance and challenges of raising caribou to be wild. They not only want to be involved early in the planning stages of the project, but also in decisions and operations. Indigenous partners have indicated that their traditional knowledge should be weighted in the same way as western scientific knowledge and that their connection to caribou and experience with wild animals is beneficial to adapting approaches to capturing, breeding and augmentation.

Parks Canada acknowledges the vital roles that First Nation and Métis peoples have within the landscape and the extensive knowledges that they hold. Local and regional Indigenous communities are important partners for ensuring the success of the project. Indigenous partners will be given additional opportunities to raise their concerns and share their knowledge. Parks Canada will work with Indigenous partners to determine the best ways to have meaningful representation and consultation, and will continue to engage with them throughout the course of the project to ensure their knowledge, perspectives and concerns are respectfully taken into consideration.

Parks Canada is committed to working together with Indigenous peoples, whose histories and cultures are linked with the caribou and who have been stewards of caribou and the land for millennia, and to increasing their participation throughout the course of the project (Parks Canada Agency 2022a). Parks Canada will initiate an Indigenous working group within 6 months of project approval to co-develop an Indigenous Inclusion Plan to further outline details regarding ongoing collaboration opportunities on topics such as, but not limited to, economic participation, employment, traditional plan harvest, establishment of a lichen harvesting program, education and outreach, knowledge sharing and antler collection and sharing opportunities. The Indigenous working group will meet on an ongoing basis throughout the project and will provide advice and direction on the interpretation and weaving of Indigenous knowledge into the project.

Indigenous partners will also be invited to participate in the external advisory committee and technical committees that are set up for the project. Examples of joint technical committees include a source population committee and other topics as required such as animal husbandry and caribou release strategies.

8.9.3 Residual effects and significance

Residual adverse effects on Indigenous values and connection to caribou are presented in Table 23. Throughout consultations in 2022, Indigenous partners expressed overall support for the proposed conservation breeding project. Some concerns were shared with the approach selected to recover the Tonquin caribou population, including concerns with being involved with the project, its benefits and alignment with their values. Additional details are outlined in Section 7 and Appendix A.

Table 23: Significance of residual impacts on Indigenous values and connection to caribou

Activities	Residual impacts	Magnitude
Capture, breeding and release	Some Indigenous partners may have concerns with the approach selected to recover the Tonquin caribou population.	Work collaboratively with Indigenous partners to determine the best ways to have meaningful representation, consultation and collaboration throughout the course of the project.

Summary: Parks Canada will continue to work collaboratively with Indigenous partners to determine the best ways to have meaningful representation and consultation throughout the course of the project. This representation will be used to help identify and implement opportunities for Indigenous involvement. Parks Canada will continue to work closely with Indigenous partners throughout the life of the project to ensure residual adverse effects of the project on Indigenous values and connection to caribou are well understood and can be addressed adequately.

8.10 Wilderness character and visitor experience opportunities

It is important to note that assessment of potential effects of the project on wilderness character and visitor experience opportunities is not focused on winter area closures and other measures already implemented to mitigate threats to caribou survival and recovery. These measures will continue to be implemented regardless of if the breeding program is approved and implemented. The assessment of the impacts to wilderness character and visitor experience of this project focuses on the general area where the breeding facility and release sites will be located. To ensure the success of the project, localized and short duration closures in the project area could be implemented. At this time, there is no plan to expand the winter closures or implement summer use restrictions in the Tonquin Valley in addition to what is currently implemented.

The proposed breeding facility and soft-release sites are located in declared wilderness area under the *National Parks of Canada Wilderness Area Declaration Regulations*. The intent of legally designating an area in a national park as "wilderness" is to maintain its character in perpetuity. Only limited development required for park administration, public safety and the provision of basic visitor facilities such as trails, backcountry campgrounds, alpine huts, trail shelters and patrol cabins, is allowed in designated wilderness.

No public access is permitted to Kerkeslin Pit, the proposed location for the contractor work camp and equipment laydown/staging facility. Access to the pit, which is an existing disturbed area, is controlled through a locked gate. As such, the facility will not have impacts on wilderness character or visitor experience.

8.10.1 Existing environment

One of the defining features of the breeding facility and soft-release sites are their remoteness. The current land use of the breeding facility site is natural (forested) and is bordered by forested land in all directions (Section 4.3) while the release sites in the Tonquin Valley are located in sub-alpine/alpine environment (Section 4.4). Most visitors using the Geraldine Lake Fire Road and the Tonquin Valley expect and are attracted by a wilderness experience.

Tonquin Valley (release sites)
Visitor infrastructure in the Tonquin Valley includes a 47-kilometre point-to-point trail following the Astoria River to Amethyst Lake, then along Maccarib Pass and Portal Creek to Marmot Road. Wet conditions in the Tonquin Valley's alpine meadows and frequent rock slides on Astoria Mountain have made trail maintenance a challenge; however, significant investment in trails as part of a federal infrastructure program has resulted in improvements, as have changes to the way horse use is managed in the valley (Parks Canada 2022a).

There are seven backcountry campgrounds, an Alpine Club of Canada hut near Chrome Lake, and a Parks Canada patrol cabin (Parks Canada 2022a). Two commercial lodges (Tonquin Valley Adventures on the east side of Amethyst Lake, and Tonquin Valley Pack and Ski Trips on the north end of the lake) ceased operations in 2022; their facilities remain present and unoccupied within the Tonquin Valley. A recent upsurge in backcountry use in the Tonquin Valley mirrors park-wide increases in backcountry use.

No motorized access is permitted in the Tonquin Valley. Summer access in the Tonquin Valley is by foot. Mountain biking and horse use are not permitted in the Tonquin Valley. Trails are typically cleared of deadfall by JNP staff. Access to the Tonquin Valley is currently prohibited in the winter from November 1 to May 15. There are no track-set ski trails in the area.

Project area (Breeding facility)
No motorized access is permitted to the proposed breeding facility area, except along the Geraldine Fire Road during a few months of the summer. Backcountry camping is not permitted in the breeding facility area. However, the Geraldine Fire Road is used to access the Fryatt Valley trail system and is an important access point for backcountry users and for day trips as well. There are no track-set ski trails on the Geraldine Fire Road, but a short section of the road is often used by recreationalists for cross-country skiing andsnowshoeing.

8.10.2 Impacts and mitigation measures

Potential effects on wilderness character and visitor experience opportunities could primarily occur during the breeding facility construction, operation and release phases of the project. Table 24 presents potential effects on wilderness character and visitor experience opportunities, and corresponding mitigations proposed to avoid and/or reduce these potential effects.

Table 24: Potential effects on wilderness character and visitor experience opportunities, and mitigations

Activities	Potential impacts	Mitigations
Breeding facility construction and operations	The meaningful backcountry experience visitors are seeking in wilderness areas may temporarily be impacted	• Decommission and restore breeding facility site as soon as feasible.

Activities	Potential impacts	Mitigations
		• Maintain a vegetated buffer between the facility and the Geraldine Fire road. • Minimize noise and light disturbance to the extent possible. • Work with the contractors to minimize traffic and impacts to visitors using the Geraldine Fire road.
	Impact to users who use the Geraldine Fire Road, which will be plowed in winter during project operations, for cross-country skiing/snowshoeing. Impact to non-motorized users (cyclists) as only motorized access is allowed during the summer months.	• Access to the Geraldine Fire Road will be closed to visitors throughout the winter and shoulder seasons during the construction period. Winter users (skiing and snowshoeing) will be re-routed to a trail along the Athabasca River throughout the construction period. Access to the Fryatt Valley can be achieved via the river trail in winter months. • The contractor will maintain safe motorized visitor access along the Geraldine Fire Road during the summer months (June – September), non-motorized access will be prohibited, ensuring safety for visitors, staff and contractors as a top priority. • Explore potential for a permanent trail reroute or plow narrower section of the road during the operational period of the facility.
Release: augmentation of recipient populations	Potential to see caribou in the wild may lead to an increase in the number of backcountry visitors, thereby reducing wilderness experience.	• Maintain current backcountry overnight capacity. • Communicate overnight permit requirements on the website, at trailheads, etc. • Locate the release sites away from visitor infrastructure (trails, campgrounds) as much as possible.

Activities	Potential impacts	Mitigations
		• Consider visitor needs when locating the release sites and when releasing caribou. • Keep gates open when fences are in wildlife-permeable mode and close only when caribou are in adjoining grazing area. • Post explanatory signs at release sites explaining their necessity for caribou augmentation.
	Project worker presence and helicopter use may undermine wilderness experience for visitors.	• Use helicopters only when necessary. • Abide by the Helicopter Flights Guidelines.

Breeding facility construction and operations
In terms of potential adverse effects on wilderness character and visitor experience opportunities, the breeding facility construction and operations may impact the backcountry experiences that visitors are seeking. Large/heavy equipment will use the Geraldine Fire Road regularly and access will be limited during construction. In addition to traffic, noise should be expected at the site during the construction period. Access to the Geraldine Fire Road will be closed to visitors throughout the winter and shoulder seasons during the construction period. Winter users (skiing and snowshoeing) will be re-routed to a trail along the Athabasca River throughout the construction period to maintain access to the Fryatt Valley. The contractor will maintain safe motorized visitor access along the Geraldine Fire Road during the summer months (June – September), ensuring safety for visitors, staff and contractors as a top priority.

During the operation of the facility, project staff will travel and use Geraldine Fire Road to access the breeding facility, which will also be visible from the road when visitors are using it to access the trailhead. During winter project operations, the Geraldine Fire Road, currently used for cross-country skiing and snowshoeing, will be plowed. To minimize impact on winter users, mitigation measures such as plowing a narrower section of Geraldine Fire Road or exploring a trail reroute will be considered. Parking in the winter in the vicinity of the site may be prohibited. Skiing on Highway 93A will be staged from the Whirlpool Winter Hub.

No public visitation will be permitted within the breeding facility in order to ensure biosecurity and reduce stress levels in caribou. Biosecurity protocols will be developed and implemented. No domestic animals will be allowed on site. To minimize long-term potential adverse effects of the project on wilderness character and visitor experience opportunities, the breeding facility will be decommissioned and the site restored once the project ends.

Release: augmentation of recipient populations
The potential to see caribou in the wild may lead to an increase in the number of backcountry visitors, thereby reducing wilderness experience, although improving the experience of the

visitors who will be able to experience caribou. Project worker presence and helicopter use may also undermine the wilderness experience for visitors. Current backcountry overnight capacity will be maintained and overnight permit requirements will continue to be communicated in various forms on the website and at trailheads. The project will also serve to remind visitors about the overnight permit requirements and how managing visitor numbers is necessary for a whole range of wilderness outputs, including caribou recovery. In addition, the release sites will be located away from visitor infrastructure (trails, campgrounds) as much as possible. Gates will be kept open when fences are in wildlife-permeable mode and closed only when caribou are in the adjoining grazing area Signs explaining the necessity of the release sites for caribou augmentation will be posted at each gate. No permits for public visitation will be granted in the release sites and backcountry users can expect some limited and temporary restrictions in accessible areas during soft-penning. As much as possible, helicopters will only be used when absolutely necessary and limited during high visitation periods, and the Helicopter Flights Guidelines will be followed.

8.10.3 Residual effects and significance

Residual adverse effects on public and visitor experience opportunities are presented in Table 25. Residual impacts are expected to occur, but none are anticipated to cause significant adverse impacts.

Table 25: Significance of residual impacts on wilderness character and visitor experience opportunities

Activities	Residual impacts	Magnitude
Breeding facility construction and operations	Temporary impact to backcountry experience in wilderness area	**Minor** due to decommissioning and restoration of the breeding facility site although impacts on snowshoers and skiers using the Geraldine Lakes Fire Road might be long-lasting and a small geographic extent.
Release: augmentation of recipient populations	Curiosity to see caribou in the wild	**Minor** due to remoteness of release sites, timing of release and clear and effective communication to potential visitors about the goals of this unique conservation project. Small and localized closures will be required to ensure the success of augmentation.

Summary: The Tonquin Valley is an iconic and premier backcountry destination for visitors seeking a wilderness experience in JNP. There is infrastructure in the valley to enhance visitor experience, including a backcountry trail, seven backcountry campgrounds and an Alpine Club of Canada hut. There is currently no plan to change existing winter access restrictions or to implement futher access restrictions in the summer in the Tonquin Valley although localized (breeding facility, release sites) and time limited restrictions (release sites) might be required to ensure the success of the project. Measures will continue to be implemented to maintain the wilderness character of the project area and to avoid conflict with humans. Parks Canada will continue to work with backcountry users and other stakeholders to achieve ecological goals and ensure the Tonquin Valley will always offer world-class backcountry experiences in summer months. Taking into account the implementation of the above mitigations, adverse impacts on

visitor experience opportunities from the 10 to 20-year project are anticipated to be low in magnitude.

9. Cumulative effects

Cumulative impacts are changes to the environment that are caused by an action or project in combination with other past, present and future human actions and projects. Cumulative effects include environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out. Where there is likelihood for the project to contribute to existing cumulative effects on one or more VCs, further evaluation and discussion of the cumulative effects and of the project's expected contribution to the cumulative effects is required.

Parks Canada uses a tiered approach to cumulative effects assessment. The management of grizzly bears in JNP is a good example, as follows:

1. The Park Management Plan identifies grizzly bears as an indicator species for the assessment of ecological integrity.
2. Management objectives for grizzly bears focus on facilitating safe access for grizzly bears to available high-quality habitat throughout the landscape.
3. Land use planning tools include securing habitat thresholds by bear management units, area concepts, land use zoning and declared wilderness areas.

This project is unique in that it exists in an area where wilderness zoning, along with a reduction in motorized use and other management actions such as seasonal closures, has resulted in fewer human impacts now than what existed over the last 80 years Nonetheless, past, present and future projects in and around this project footprint that need to be assessed in the context of cumulative effects for this 10 to 20-year project in JNP are as follows:

- Past projects and actions:
    - predator control in the 1940s and 50s;
    - fire suppression from the 1940s to 80s;
    - fire road construction and subsequent motorized access for staff inside the park (Stanley 2019);
    - use of trail network by commercial and private horse users; and
    - Cavell Road/Parking Protection (2015).

- Present projects and actions:
    - use of existing trail network by visitors.

- Future actions and projects:
    - caribou augmentation beyond the 10-20-year project (should it occur);
    - other activities/developments are unlikely, given the wilderness zoning and grizzly bear habitat security goals and the non-motorized access policies;
    - in collaboration with commercial and not-for-profit operators, opportunities to integrate caribou conservation measures into operations and client experiences will be explored; and
    - impact of recreational use, especially horse use, on vegetation, species at risk, visitor experience and assets in the Tonquin Valley and associated trails will be reviewed (Parks Canada Agency 2022a).

Cumulative impacts are assessed for the following project area VCs:

- vegetation and soils;
- water quality and subsurface drainage;
- wildlife and predator habitat security; and
- wilderness.

9.1 Vegetation and soils

The residual effects of the project on vegetation and soils include the potential to introduce new non-native seeds and forest pests through work camp and breeding facility management; the potential to spread existing non-native vegetation; the potential for soil contamination from accidental fuel/oil spill or leakage; as well as potential soil erosion and compaction resulting from equipment and reintroduced caribou.

Although non-native vegetation was observed during a fall survey of the breeding facility footprint, the past practice of importing hay to feed Parks Canada's and outfitters' horses may also have led to the non-native plant infestations in the project area and into the backcountry. Future introduction of such non-native plants is not expected to occur, as weed-free alfalfa cubes and/or processed pellets are now used in lieu of hay to feed Parks Canada's and outfitters' horses in the backcountry.

Long-term caribou augmentation is not expected to introduce non-native plants as supplementary feed will not be used beyond the 10 to 20-year project. The project is expected to have a minor impact on non-native vegetation and will continue to be monitored and managed. Vegetation and soil disturbance will be minimized following the principle of prevention before decommissioning and restoration.

9.2 Water quality and subsurface drainage

Expected residual impacts of the project on water quality and subsurface drainage are expected to be low, and confined to the breeding facility and release sites. These include: release of sediment into the wetlands, streams and rivers; trail building and trampling actions of caribou; and increased nutrient load in wetlands, due to the concentrated deposition of feces in the same area. No past or future activities in and around the project area are known or are expected to affect the water quality, as the breeding facility area is wilderness with no development beyond a small network of non-motorized trails, and the work camp area is within an existing disturbed gravel pit. Proposed mitigations (e.g., selection of the best location for the production well installation) mean the project will create a negligible contribution to already extremely low cumulative effects on aquatic resources in the area.

9.3 Wildlife habitat security and wilderness

Carnivores that have been identified as particularly vulnerable to cumulative effects in JNP include wolf, cougar, Canada lynx, wolverine, black bear and grizzly bear (Parks Canada Agency 2022c). The primary factors contributing to cumulative effects in relation to carnivores in Jasper are: human-caused mortality and conflict, reduced connectivity, and removal of and displacement from habitat. Potential residual wildlife impacts from the project are anticipated to be negligible. They include temporary displacement of small and large mammals and passerine birds in the breeding facility and release sites; temporary disturbance of wildlife due

to helicopter flights for caribou translocation; transport of staff; disruption of large animal movements due to breeding facility construction and operations; and occasions when fences are in caribou-holding mode.

No past or future projects in the breeding facility area of JNP are expected to further negatively affect habitat availability, as the area has no human development save for the existing network of park patrol cabins and horse and hiking trails. No past or future activities are expected to affect wildlife movement within the breeding facility area except for the possible continuation of the breeding facility, should longer-term caribou augmentation proceed. The work camp is expected to have negligible impacts as it is situated within an existing disturbed gravel pit.

The 10 to 20-year project is expected to have a negligible contribution to existing impacts. The loss of habitat for other wildlife due to the breeding facility and the soft-release pasture will be small and temporary. Disturbance from helicopter activity will be temporary and of limited duration. Impacts of fencing on wildlife movement will be for short and infrequent periods. The breeding facility area will continue to be managed as wilderness, where minimal facilities and low levels of human use will contribute to providing the habitat requirements of wide-ranging species like wolverine, caribou and grizzly bear.

10. Monitoring and environmental management requirements

Monitoring and environmental management requirements will be created and finalized in response to knowledge gaps and Indigenous partners and stakeholder concerns and suggestions. They will be used to minimize impacts of the project and to help determine if it should be reversed and/or should proceed. All monitoring and environmental management requirements are integral parts of the research, monitoring and adaptative management component of the project, which will be guided by *Open Standards for the Practice of Conservation*.

10.1 Management objectives and desired end results

Management objectives and desired end results (MO/DERs) include specific consideration for the monitoring, protection and maintenance of vegetation diversity; soil, surface and subsurface flow regimes; water quality; wilderness character; sensitive or unique ecosystem features; cultural resources; woodland caribou; and visitor experience in the project area. MO/DERs are expected to be primarily achieved through application of mitigations and best management practices identified in the DIA, and through the implementation of the project-specific Environmental Protection Plan, to be developed by the contractor for the construction of the conservation breeding facility.

Many of the environmental protection issues identified in the MO/DERs can be managed through development and implementation of an appropriate mitigation strategy for the project. These MO/DERs were therefore considered in the mitigation lists identified in the DIA for relevant VCs (i.e., vegetation and soils, water quality and subsurface drainage, wilderness character, wildlife and predator habitat security, cultural values, woodland caribou and visitor experience). Additional mitigations may be identified during the implementation phase of the project.

Based on Parks Canada's experience with small, medium, large and major projects in JNP, the MO/DERs identified for the project are as follows:

1. **Vegetation general**: That disturbance be minimized, following the principle of prevention, before decommissioning and restoration. If disturbance is necessary, all disturbed areas are to be restored to conditions that reflect the historic range of variability in terrestrial and riparian areas regarding composition, structure and dynamics of native plant communities as closely as possible.

2. **Vegetation composition**: That active prevention and control measures be taken such that moderate and high priority (i.e., more invasive) non-native plant species do not become established or set seed on disturbed areas or temporary work areas, or spread off of disturbed or temporary work areas.

3. **Vegetation composition**: That active prevention and control measures be taken such that low priority non-native plant species do not occupy more than 2% of ground cover on disturbed and temporary work areas.

4. **Vegetation structure**: That mitigation measures achieve revegetation success on disturbed and temporary work areas as follows:

   a) The ground cover of native herbaceous vegetation meets the density requirement of 10 plants (native) per m^2 in 90% of the square metres in any area measuring 10 by 10 metres.
   b) The combined cover of mulch (plant litter) and live native plants is greater than or equal to 90% ground cover of disturbed and temporary work areas.
   c) Vegetation is capable of maintaining cover and density without the aid of applied fertilizers beyond the time when residual effects have ceased.

5. **Vegetation structure**: That the canopy of forested areas in the temporary work areas and immediately adjacent to disturbed areas reflects the species composition, horizontal strata, and open canopy densities expected of fire-maintained plant communities where this is supported by current knowledge of historic fire regimes.

6. **Vegetation structure**: That the vegetation canopy of riparian areas and the woody content of streams be restored to reflect the species composition, function and structure of pre-disturbance conditions.

7. **Vegetation processes**: That native plant species recolonize (natural revegetation) such that there is at least a 70% overlap in total plant species composition between the disturbed and temporary work areas and the adjacent plant communities within three years of decommissioning.

8. **Vegetation processes**: That future land disturbance for maintenance purposes is minimized and does not affect the functioning, structure or dynamics of restored areas.

9. **Vegetation processes**: That expected fire intensity is within the historic range of variability (i.e., low-to-moderate surface fire in grassland or open forest vegetation types).

10. **Riparian vegetation structure**: That the vegetation canopy of riparian areas and the woody content of wetlands and streams reflect the species composition, structure, quantity and function of pre-disturbance conditions.

11. **Aquatic ecosystems**: That natural levels and patterns of surface and subsurface hydrologic flow, natural composition, structure, quantity and dynamics of wetland vegetation and growing conditions be maintained, and that there is no alteration or loss of wetland function for a period greater than five years.

12. **Soil and terrain ecological functions**: That soils of disturbed and temporary work areas provide historic natural undisturbed growing conditions and continue the natural rates and patterns of cycling of biomass and nutrients and other ecological functions.

13. **Soil and terrain flow features**: That proposed development does not modify terrain and does not alter natural flow rates or earth and rock flow features. That locally sensitive and valued terrain features continue to persist. That terrestrial and aquatic ecosystem processes function within the natural range of variation.

14. **Surface and subsurface flow regimes**: That proposed development does not compromise natural surface and subsurface connectivity and drainage, flooding and seasonal flow patterns are maintained, and in-stream flows support aquatic wildlife, taking seasonal variability into account.

15. **Water quality**: That water quality in wetlands and streams is maintained, and that water withdrawal and wastewater management are managed and monitored. That establishment of appropriate effluent standards takes into consideration the area and timing of wastewater release.

16. **Wildlife habitat**: That habitat and browsing or grazing relationships between vegetation and native wildlife be perpetuated on disturbed areas in a manner that replicates the natural range of variability, and that nests or dens on disturbed areas are not impacted.

17. **Wildlife populations**: That restoration does not alter predator-prey relationships such that herbivore populations do not increase as a result of the vegetation restored, and predator populations do artificially increase. Restoration to be conducted such that a wildlife attractant is not created.

18. **Woodland caribou**: That modifications to vegetation, soils and water quality do not affect the availability of caribou lichen outside of disturbed areas. That project activities do not displace caribou from habitat important to the regional population, nor do project activities increase access for predators or the density of prey in important caribou habitat in and near the project area. That caribou mortality does not increase, directly or indirectly, as a result of human contact and activity. Specific details are presented in Table 26.

Table 26: Monitoring plan to assess the project and help determine population targets

Issue	10 to 20-year monitoring measures	10 to 20-year project performance measures	Longer-term monitoring measures
Caribou may leave Tonquin Valley (augmentation zone)	• Number and duration of excursions outside pre-determined augmentation zone	• No caribou excursions outside pre-determined augmentation zone	Ongoing monitoring of all 10 to 20-year measures

Issue	10 to 20-year monitoring measures	10 to 20-year project performance measures	Longer-term monitoring measures
Fences for caribou may affect the movement of other wildlife	• Safe movement around fences by other wildlife as evidenced by GPS-collared migratory elk and continued monitoring of fences with remote cameras at select sites	• Movements of other species are not negatively affected by fences. • No wildlife are seriously injured by fences.	Ongoing monitoring of wildlife movement around the fences
Augmentation of caribou may lead to higher numbers of wolves, which will affect caribou and other prey species.	• Investigate all caribou mortalities. • Continue monitoring wolves with radio collars and remote cameras. • Respond to individual wolves that are targeting caribou.	• Assess response of predators to caribou during 10 to 20-year project (absence/presence of predation) • Use results of wolf monitoring to set caribou population target so as not to support increased wolves.	Ongoing monitoring of wolf pack numbers and sizes with new and existing network of remote cameras
Increased helicopter use for caribou management as well as greater human presence could lead to reduced grizzly bear habitat security and sense of wilderness.	• Helicopter hours in the augmentation zone (hours per month) • Staff and visitor presence in wilderness zone (days/yr) • Number of people on trails or roads in the breeding facility area (remote camera database)	• Reduction in helicopter use and staff presence in wilderness area when caribou in and outside release sites • No net decrease in grizzly bear habitat security as a result of this project	• Continue to monitor helicopter use. • No net decrease in grizzly bear habitat security as a result of this project
Breeding facility construction and operation may introduce and spread	• Number and area of non-native vegetation infestations assessed annually	• No net increase in number and extent of infestations	• Continue annual monitoring.

Issue	10 to 20-year monitoring measures	10 to 20-year project performance measures	Longer-term monitoring measures
non-native vegetation.			

19. **Grizzly bear**: That project activities do not displace grizzly bears and other animals from habitat essential to the regional population, or from travel routes essential to the regional population. That grizzly bears are not habituated through human contact and activity , and that grizzly bear mortality does not increase, directly or indirectly, as a result of human contact and activity.

20. **Potential leaks or spills**: That during construction and operation of the breeding facility and helicopter flights, there are no leaks or spills. The threshold is that no leaks or spills occur in sensitive or uncontained areas that cannot be fully cleaned up and remediated in the short-term. This threshold shall not be exceeded. That during operation, there is negligible risk of leaks or spills from any infrastructures in sensitive or uncontained areas, and low risk in other areas.

21. **Archaeological/cultural/historical resources**: That archaeological/cultural/historical resources as manifested by their profiles, grades, sizes, scales, compositions, locations, relationships to one another and to the linear viewscape are respected, protected and maintained.

22. **Indigenous cultural values and connection to caribou**: That Indigenous cultural values and connection to caribou are recognized and preserved.

23. **Visual and other sensory-human**: That there is no additional notable visual anthropogenic scar on the landscape.

24. **Monitoring**: That future conditions can be conclusively (including quantification as appropriate) shown (either directly or through reasonable surrogate) to have accomplished all desired end results stated above.

10.2 Environmental management system

An environmental management system (EMS) will be developed for the project, which will be designed to assess and control potential environmental impacts related to construction and operation of the breeding facility. Several environmental guidance documents will be developed and implemented as part of the EMS for the project; these are described at a high level below. At the current stage of planning, this list of guidance documents is conceptual and will be further developed during the detailed design phase. Parks Canada will work collaboratively with partners and stakeholders to ensure that the strategies and plans identified will be effective in addressing the Management objectives and desired end results defined for the project.

The following environmental guidance documents are expected to form the basis of the EMS for the project:

- A comprehensive project-specific Environmental Protection Plan will be developed before construction and operation of the breeding facility begins, and will describe the environmental performance standards and responsibilities expected of those working on

the project. An Environmental Protection Plan is typically completed by the selected contractor. The project-specific Environmental Protection Plan will include guidance and management actions related to, but not limited to, erosion and sediment control, emergency response, spill response, sod and topsoil salvage, wildlife, waste management, equipment maintenance, fuel management, noxious weed control and protection of work limits.

- A spill response plan will be prepared and will be designed in consideration of the MO/DER identified for potential leaks or spills. The spill response plan will include a finalized list of products and materials to be used at the site that are hazardous or toxic. It will be implemented during all phases of the project. The spill response plan will include detailed containment, storage, security, handling, use and disposal of empty containers, surplus product or waste generated through use of products, in accordance with all applicable Federal and Provincial legislation.

- A site inspection program will be developed in collaboration with the project manager and contractor. It will document considerations of the need for site inspections during any proposed construction, operation, decommissioning, monitoring, reclamation, and restoration, or any other undertakings related to the project. It will indicate requirements for supervision, by both the contractor and Parks Canada, to ensure appropriate implementation of mitigation and environmental protection measures.

- Interpretive signage will be prepared by Parks Canada in collaboration with partners and stakeholders to orient and explain to potential visitors the necessity for caribou augmentation.

- A restoration plan, including a vegetation management strategy will be developed and implemented to help minimize impacts of the breeding facility and release sites. In general, in JNP, restoration (reclamation) is anticipated to be completed over a 3-year monitoring period following construction/project completion.

11. Knowledge deficiencies – information gaps

Adaptive Management
Captive breeding of caribou is a near-unprecedented conservation project for Parks Canada. In order to maximise the chance of success, it must embrace principles of adaptive management in its design and implementation. Adaptive management means that ongoing research and monitoring become an important component of conservation action. The integration of science, management, and monitoring allows for systematic testing of hypotheses and assumptions, and ultimately provides feedback in the form of recommendations for adaptation of management strategies based on learned information. Adaptive management allows for the flexibility and nimbleness required to quickly respond to on-the-ground happenings.

A detailed Science and Monitoring Plan is under development for the project. It is designed to measure and report on all aspects of conservation breeding, from veterinary science in the facility to caribou ecology in the wild. Dedicated and informed technical committees will be established as required to assist Parks Canada in identifying caribou research and monitoring needs within an adaptive management framework. They will interpret findings and make informed recommendations as part of the project cycle in areas such as veterinary science, animal husbandry, genetics, behaviour and ecology.

In parallel to the technical committees, an Indigenous Working Group will be established to collaborate on the development of the Indigenous Inclusion Plan. Part of the work of this group will be to provide advice and direction on the interpretation and weaving of Indigenous knowledge, culture and ceremony into the project in a meaningful and respectful way. This group will monitor the implementation and results of the Indigenous Inclusion Plan and provide advice on possible adjustments as the project proceeds.

Indigenous partners noted the importance of ceremony to guide the program at key milestones or events throughout the lifecycle of the program (e.g. before any ground-breaking during construction of the facility; before any capture and translocation of caribou; before caribou are released). The Indigenous Working Group can provide advice on how Parks Canada can facilitate these ceremonies. This Working Group can also provide advice and share their experiences of monitoring caribou, other wildlife and habitat in their traditional territories, as well as stewardship activities in which they currently engaged (e.g. Caribou Patrol; lichen gathering programs). The Working Group can provide advice on how the knowledge and experience of Indigenous partners can guide the project.

Some components of the project are currently at a conceptual level, including the soft-release strategy, fence design, caribou translocation methods, on-site management and caribou food supplementation. At this time, the DIA makes predictions of the likely effects of the project based on assumptions, including application of mitigations. It is expected that as project planning proceeds, an improved understanding and greater certainty in project effects will be possible.

Climate Change
The effects of climate change are high on the list of threats for many of the species at risk in Jasper National Park. While scientists are trying to predict the effects of climate change, it is difficult to anticipate every detail of how species will adapt to these changes, or how these changes will ripple throughout the ecosystems. In collaboration with Indigenous peoples and academics, Parks Canada is conducting important research within protected areas that will contribute to the understanding of current and future climate change impacts. While protected areas tend to be more resilient to climate change, it has the potential to affect caribou and their habitat.

There is no evidence that the current habitat in Jasper National Park has been made unsustainable to caribou by climate change. While Parks Canada does not know the future effects of climate change, we do know that not taking action to augment caribou populations now will lead to their eventual extirpation in the park. Parks Canada has not observed significant changes to how caribou use habitat in the park. Caribou prefer old growth forests, which change very slowly. The ecological integrity monitoring program is actively monitoring the impacts of climate change on alpine habitat. Parks Canada has also nearly completed a fine-scale vegetation map, which will allow greater understanding of changes to habitat over time in more detail. Ongoing monitoring and research will inform the project as it proceeds.

12. DIA Determination

This notice of determination is being issued by Parks Canada under the *Impact Assessment Act*. Parks Canada has determined that the project is not likely to cause significant adverse impacts.

The augmentation of woodland caribou to a site within their historic range in Jasper National Park (JNP) is a significant and positive step for their conservation. There are challenges and constraints that make this 10 to 20-year project complex, not the least of which is undertaking it

in a remote, backcountry and wilderness area. Doing so results in potential environmental impacts, including the disturbance associated with construction and operations of the conservation breeding facility, associated infrastructures and release sites.

This Detailed Impact Assessment (DIA) assessed potential impacts of the project in the context of potential biodiversity and future ecological gains. Caribou populations in JNP have significantly declined over the years to populations that currently have too few animals to sustain themselves. While declines have stabilized, maintaining the status quo will result in the extirpation of all caribou populations within Jasper/Banff Local Population Unit (Jasper/Banff LPU). Parks Canada, having explored several alternatives including maintaining the status quo, determined that a conservation breeding and augmentation project is the only viable option to reverse caribou decline, prevent the extirpation of caribou, and meet the goals and objectives of the *Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada* (Environment Canada 2014).

Feedback on the proposed project and the draft DIA was received from Indigenous partners, stakeholders, the public, and government partners from April to September 2022. Much of the feedback received was supportive of the proposed project and recognized the importance and urgent need to act quickly to save caribou in Jasper National Park. However, some concerns about the proposed project and recommendations were also shared. Details on the feedback received and the ways in which it shaped the DIA are outlined in Section 7 and Appendix A.

Mitigation measures will be implemented for the following Value Components during the Project: Brazeau, À la Pêche and Tonquin caribou populations, vegetation and soils including non-native vegetation management, surface water quality, heritage sites and cultural resources, wildlife and predator habitat security, species at risk, Indigenous values and connection to caribou, and wilderness character and visitor experience opportunities. Mitigations will include the development of the following:

- Indigenous inclusion plan;
- Science and monitoring plan;
- Animal husbandry plan;
- Predator management strategy;
- Caribou release strategy;
- Contractor Environmental Protection Plan that will include:
    - Non-native vegetation management;
    - Spill response;
    - Erosion and sediment control;
    - Work camp management; and
- Restoration and reclamation plan.

Parks Canada will employ an adaptive management framework for the project, establishing an external advisory committee and joint technical committees with Indigenous partners, government partners and other external experts in caribou conservation to provide advice and guidance as the project proceeds. The development of additional mitigations will be the subject of ongoing discussion with these committees.

Should the Tonquin caribou population augmentation be successful, the ecosystem will be shaped by the return of caribou; for example, caribou grazing and rut behaviour may result in maintaining forest openings for upper subalpine-loving birds and small mammals, and more conversion of grass into protein when caribou die and are consumed by predators like wolverines and grizzly bears.

Such benefits to biodiversity and future ecological gains have the potential to restore a native animal to its native range in JNP. If done in a collaborative manner, the project has the potential to foster reconnection between Indigenous people and these lands. Parks Canada expects that the overall impacts of this project are ones that will help the natural ecosystem return to "normal" state by returning caribou to its native range. The lack of caribou in the past decades has had impacts that the return of caribou will help mitigate. Restoring caribou is therefore a benefit to both JNP's ecological integrity and cultural heritage and Parks Canada's mandate.

Taking into account implementation of mitigation measures outlined in the DIA, and the significant benefit anticipated for southern mountain caribou in JNP, the project is not likely to cause significant adverse environmental effects.

Recommendation and Approval

Prepared by Mabaye Dia, Senior Impact Assessment Scientist, with input and collaboration from the JNP Resource Conservation, Visitor Experience and Land Use Policy and Planning teams.

Recommended by:  Amy Cairns, Integrated Land Use Policy and Planning Manager	Date: 2022-12-22
Recommended by:  Digitally signed by Bisaillon, JeanFrancois Reason: I am approving this document Location: Jasper Date: 2022.12.22 15:47:42-07'00' Jean- François Bisaillon, Caribou Project Manager	Date: 2022-12-22
Recommended by: Argument, David Digitally signed by Argument, David Reason: I am approving this document Location: Jasper, Alberta Date: 2022.12.22 15:10:01-07'00' David Argument, Resource Conservation Manager	Date: 2022-12-22
Approved by: Fehr, Alan Digitally signed by Fehr, Alan DN: C=CA, O=GC, OU=PCA-APC, CN="Fehr, Alan" Reason: I am the author of this document Location: your signing location here Date: 2022.12.23 12:41:52-07'00' Foxit PDF Editor Version: 11.2.2 Alan Fehr, Jasper Field Unit Superintendent	Date:

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