Caribou Conservation Breeding and Augmentation Project in Jasper National Park

Detailed Impact Assessment

J19-018

Table of Contents

EXECUTIVE SUMMARY 5

Acronyms and Abbreviations 7

1. Introduction 10

2. Scope of the project 10

2.1 Current situation/background 10

2.2 Need and purpose 11

2.3 Alternatives/options considered 12
- **2.3.1 Status quo (no intervention)** 12
- **2.3.2 Wolf control** 12
- **2.3.3 Maternity penning** 13
- **2.3.4 Direct caribou translocation** 13

2.4 Detailed project description 13
- **2.4.1 Build: breeding facility design and construction** 13
- **2.4.2 Capture: securing source caribou** 16
- **2.4.3 Breeding: animal husbandry and care** 18
- **2.4.4 Release: augmentation of recipient herds** 19
- **2.4.5 Adapt: research, monitoring and adaptive management** 22
- **2.4.6 End: decommissioning and restoration** 22

3. Project Execution and Detailed Impact Assessment Timelines 22

4. Site location and characteristics 24

4.1 Caribou critical habitat 24

4.2 Caribou Local Population Units 25
- **4.2.1 À la Pêche herd range** 27
- **4.2.2 Brazeau herd range** 28
- **4.2.3 Tonquin herd range** 29

4.3 Caribou breeding facility 30

4.4 Caribou release sites in Tonquin Valley 32
- **4.4.1 Cavell release site** 33
- **4.4.2 Tonquin Valley release site** 34

5. Scope of the Detailed Impact Assessment 35

6. Alignment with Canada's conservation priorities and Parks Canada's policies 39

6.1 Canada's conservation priorities 39

6.2 Parks Canada's legislation and policies 39

6.3 Parks Canada zoning 41

6.4 Critical habitat and assessing impacts 42

7. Indigenous and public consultation 43

7.1 Indigenous consultation 43

7.2 Public consultation 44

8. Impact assessment 45

8.1 Preliminary caribou source modelling 45

8.2 Caribou augmentation modelling 46

8.3 Minimum counts 46

8.4 Vegetation and soils 47
8.4.1 Existing environment 47
8.4.2 Impacts and mitigation measures 51
8.4.3 Residual effects and significance 58

8.5 Surface water quality and subsurface drainage 59
8.5.1 Existing environment 59
8.5.2 Impacts and mitigation measures 59

8.5.3 Residual effects and significance 63

8.6 Heritage sites and Cultural resources 64
8.6.1 Existing environment 64
8.6.2 Impacts and mitigation measures 65
8.6.3 Residual effects and significance 67

8.7 Brazeau caribou herd 67
8.7.1 Existing environment 67
8.7.2 Impacts and mitigation measures 68
8.7.3 Residual effects and significance – Brazeau caribou herd 73

8.8 À la Pêche caribou herd 74
8.8.1 Existing environment 74
8.8.2 Impacts and mitigation measures 75
8.8.3 Residual effects and significance – À la Pêche caribou herd 77

8.9 Tonquin caribou herd 78
8.9.1 Existing environment 78
8.9.2 Impacts and mitigation measures 78
8.9.3 Residual effects and significance – Tonquin caribou herd 81

8.10 Wildlife and predator habitat security 82
8.10.1 Existing environment 82
8.10.2 Impacts and mitigation measures 82
8.10.3 Residual effects and significance 86

8.11 Species at Risk 87
8.11.1 Existing environment 87
8.11.2 Impacts and mitigation measures 88
8.11.3 Residual effects and significance 90

8.12 Indigenous values and connection to caribou 91
8.12.1 Existing environment 91
8.12.2 Impacts and mitigation measures 92
8.12.3 Residual effects and significance 93

8.13 Wilderness character and visitor experience opportunities 94
8.13.1 Existing environment 94
8.13.2 Impacts and mitigation measures 95
8.13.3 Residual effects and significance 97

9. Cumulative effects 98

9.1 Vegetation and soils 99

9.2 Water quality and subsurface drainage 99

9.3 Wildlife and predator habitat security and wilderness 99

10. Monitoring and environmental management requirements 100

10.1 Management objectives and desired end results 100

10.2 Environmental management system 104

11. Knowledge deficiencies – information gaps 105

12. Conclusion 105

13. References 107

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, and vehicle/equipment storage spaces. 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 herds with the closest genetic and behavioural match to the wild herds where the animals will be released while not affecting the source herds' long-term viability. Following expert guidance and standard caribou capture techniques, capture of source animals would occur between December and February (First capture: by February 2025; second capture: by February 2026)

3. Breed - Animal husbandry and care: By managing risks, captive breeding has the potential to supply enough caribou to reach self-sustaining herd sizes in wild herds in the Jasper/Banff Local Population Unit (LPU). The project aims to produce 14-18 female yearlings annually, with most (11-15) available for release. Research indicates that producing 10-20 females per year is possible but actual numbers 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 herds: Selecting the right recipient herds, supporting the best ecological conditions in those recipient herds, and timing the release of captive-bred animals is crucial to achieving the project's objectives and minimizing mortality after release. The Tonquin herd, which is part of the Jasper/Banff LPU will be the only herd within this LPU with extant animals and will therefore be prioritized for augmentation. 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 herd. 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, as needed, by various experts in conservation from around the world and local Indigenous partners. 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.

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. Vegetation and soils;
2. Surface and groundwater quality and subsurface drainage;
3. Heritage sites and cultural resources;
4. Brazeau caribou herd;
5. À la Pêche caribou herd;
6. Tonquin caribou herd;
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 herd VCs will rely on previously accomplished population modelling. The Brazeau caribou herd is too small to use statistical modelling and will be depopulated and brought into the facility, in order to preserve their genetics.

During early dialogue, 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 will continue to be undertaken in the following months. 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
'the 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
EIMP – Ecological Integrity Monitoring Program
EMS – Environmental Management System
EPP – Environmental Protection Plan
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
RFP – Request for Proposal
SARA – Species at Risk Act
'the Directive' – Parks Canada Directive on Impact Assessment, 2019
'the Project' – Caribou Conservation Breeding and Augmentation Project
UNESCO – United Nations Educational, Scientific and Cultural Organization
UNDRIP – United Nations Declaration on the Rights of Indigenous Peoples
VC – Valued Component
WWP – Wilmore Wilderness Park

List of Figures

Figure 1: Breeding facility concept diagram 14
Figure 2: Critical habitat for southern mountain caribou in JNP 25
Figure 3: Caribou ranges within boundaries of JNP 26
Figure 4: Range of À la Pêche caribou herd in JNP. 27
Figure 5: Caribou regions within Brazeau Valley, Jasper National Park 28
Figure 6: Caribou regions within Tonquin Valley, JNP 29
Figure 7: Breeding facility and release site locations 30
Figure 8: Characteristics of the breeding facility site 31
Figure 9: Proposed Cavell release site 33
Figure 10: Proposed Tonquin Valley release site 34
Figure 11: Jasper/Banff LPU 2007–2020 47
Figure 12: Rare plant communities 49
Figure 13: Tree clearing diagram 55
Figure 14: Existing site overview 61
Figure 15: Overall breeding facility design layout 71

List of Tables

Table 1: Project execution and DIA milestones 22
Table 2: Breeding facility site vegetation, soils and wildlife characteristics 32
Table 3: High- and medium-risk valued components and rationale 36
Table 4: Summary of potential impacts to vegetation and soils and mitigation measures..... 51
Table 5: Significance of residual impacts to soils and vegetation 58
Table 6: Summary of potential effects on surface water quality and mitigation measures 59
Table 7: Significance of residual impacts on surface water quality and subsurface drainage..... 63
Table 8: Summary of potential effects on heritage sites..... 65
Table 9: Significance of residual impacts on heritage sites 67
Table 10: Summary of potential effects to Brazeau caribou herd, and mitigation measures..... 68
Table 11: Significance of residual impacts of the project to Brazeau caribou herd 73
Table 12: Summary of potential effects to À la Pêche caribou herd and mitigation measures 75
Table 13: Significance of residual impacts of the project to À la Pêche caribou herd 77
Table 14: Summary of potential effects to Tonquin caribou herd, and mitigation measures 78
Table 15: Significance of residual impacts to Tonquin herd..... 81
Table 16: Summary of potential effects on wildlife and habitat security and mitigations 83
Table 17: Significance of residual impacts of the project on wildlife and habitat security..... 86
Table 18: Summary of potential effects on species at risk, and mitigation measures..... 88
Table 19: Significance of residual impacts of Breeding facility construction on species at risk .. 90
Table 20: Summary of potential effects on Indigenous values and mitigations 92
Table 21: Significance of residual impacts on Indigenous values and connection to caribou 93
Table 22: Potential effects on wilderness character and visitor experience, and mitigations 95
Table 23: Significance of residual impacts on wilderness character and visitor experience 97
Table 24: Monitoring plan to assess the project and help determine population targets..... 102

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 will continue to be undertaken for the project.

Parks Canada's legal accountability under the *Impact Assessment Act, 2019 (*IAA 2019*)* is to ensure that projects and activities undertaken on the lands it manages do not result in significant adverse environmental effects (IAA 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 will likely be made to this first version of the DIA following feedback from consultation with Indigenous partners, stakeholders and the public. A final determination of impacts will be made based on the final version of the DIA, and will be considered by Parks Canada senior management in their decision as to whether the project will proceed.

2. Scope of the project

2.1 Current situation/background

Caribou herds in JNP are at risk.

Research and monitoring of woodland caribou (*Rangifer tarandus caribou)* in JNP show that, over many years, caribou herds 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 herds 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 herds.

The project described here is the proposed approach for preventing the extirpation of southern mountain caribou in the Jasper/Banff LPU, and for rebuilding herds 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

herds of caribou in JNP will help to ensure the continued existence of some of the world's southernmost caribou.

Only two herds remain within JNP and they are facing imminent extirpation.
Of the four original caribou herds in the Jasper/Banff LPU, which once contained hundreds of caribou, only two herds are left—the Tonquin and the Brazeau. The Banff herd was extirpated in 2009, and the Maligne herd was determined to be extirpated in March 2020. The Brazeau herd has only approximately 3 adult females, and the Tonquin herd has approximately 10 adult females. At current population levels, the Brazeau and Tonquin herds 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 herd'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 herds in JNP. These measures reduced the severity of threats but were insufficient to recover these small herds while wolf density remained high until recently (above three wolves per 1,000 km^2). Wolf density is now low (1.85 wolves per 1,000 km^2 from 2016-2020), and conditions for caribou survival are much improved, but herds 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.

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.

Current conditions in JNP support rebuilding caribou populations.
Wolf density has declined to a level far below that identified as the threshold at which caribou herds can persist, indicating that the current wolf population is favourable for caribou survival (1.85 wolves per 1,000 km^2) (Environment Canada 2014). Overall, the threats to caribou in JNP have decreased, and current conditions support rebuilding caribou populations through a conservation breeding and augmentation program.

Through this project, Parks Canada will:

- capture wild caribou, using sources that maximize genetic diversity and minimize demographic impacts on the source herds;
- breed these animals in a temporary facility protected from predators and other health risks;
- release young animals born in the facility into existing wild herds to augment and strengthen those herds 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 herds 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 herd within 5-10 years after the first caribou are released. If this first goal is successful, then the possibility of reintroducing caribou in the Brazeau and Maligne herds 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 herds 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 herds, with currently less than 10 reproductive females each, have been determined to be too small to recover without intervention. These smalls herds may persist for a long time but are unlikely to recover.

2.3.2 Wolf control
Wolf control is a short-term tool that is unlikely to help recover herds in the long term and is insufficient to recover herds 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 is now sufficiently low to support self-sustaining caribou herds and further reduction is not warranted (Hebblewhite 2018). Parks Canada continues to monitor wolf density and habitat use as well as wolf prey populations (elk, deer, moose).

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 herds.
- 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 herd to another. Translocation of woodland caribou has been used since the 1930s for several boreal and mountain herds 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 herds (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 herds 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. The detailed planning and design of the facility include Parks Canada engaging an external engineering consultant, and partnering with specialists experienced in the planning and construction of similar facilities dedicated to the handling and husbandry of caribou and other ungulate species. 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;
- 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 as the highest priority of engineers, planners and decision-makers. Substantial infrastructure investment and improvements in JNP in recent years demonstrate Parks Canada's ability to execute a project of this scale and Parks Canada's sensitivity in such matters.

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 herd 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 herd 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). For instance, calving pens will hold cows and their calves for roughly 10 days after birth since limiting use and density of the calving pens will be critical to minimizing calf mortality.

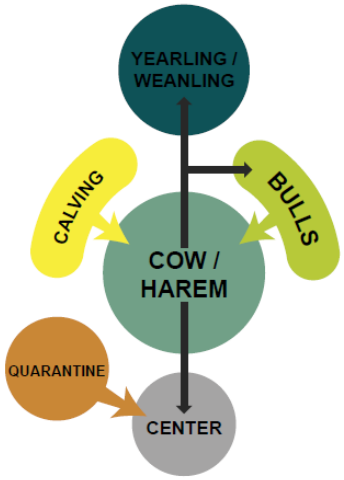

Figure 1: Breeding facility concept diagram

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 center 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 should be farthest from the center and associated disturbance.
- The quarantine pens should be close to the perimeter and center.

Because the breeding facility will handle caribou at a higher density than found in nature, facility personnel will minimize the associated risks using strict handling, herd management and 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. Feedback from early dialogue with Indigenous partners is summarized in Section 7.1.1.

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.

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; Bisaillon et al. 2016; 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 2014; 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 need to 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 herds with the closest genetic and behavioural match to the wild herds 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 herds) 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 herd options are limited, given the precarious state of most herds. Genetic and behavioural differences between herds must be considered.
Details on how many caribou will be captured, and from which herds, 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 herds, and based on discussions with provincial and Indigenous partners. Initial population modelling to identify impacts to source herds (Neufeld and Calvert 2019) will be further developed in conjunction with provincial partners, Indigenous partners and conservation organizations in the following months.

It is recommended that founding source animals be captured over two or more years depending on source herds availability, anticipated impacts, and discussion with provincial 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 short-term conservation of genetic retention and animal rescue while minimizing risks (for example, cost, transport, animal health and welfare) and potentially reducing the impact on source herds. A multi-year process 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.

Genetic diversity of the breeding herd 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 herd (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 herd 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 possible;
- minimize genetic relatedness among wild-caught animals (that is, capture from several source herds, sample spatially, temporally, or both within a single large-source herd);
- 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;
- select captive-born males that are the fewest generations removed from the wild source caribou;
- 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 herd and animals from regional herds are proposed to form the founding breeding herd.
The Brazeau herd is functionally extirpated. Parks Canada will capture this herd first and relocate the animals to the conservation breeding facility (Hebblewhite 2018; McShea et al. 2018; Slater 2017). In addition, the project proposes capturing a few male and potentially a few females from the Tonquin herd. This approach will preserve regional genetics within the captive population that would otherwise disappear.

In addition to the Brazeau and Tonquin animals, Parks Canada is proposing to capture 25 to 35 additional caribou from a mix of regional populations, including the À la Pêche herd, to help populate the founding herd. Caribou from these source herds would be primarily females, plus calves if they are still at the heel, and a few males, biasing toward younger animals (Hebblewhite 2018; Neufeld 2019). Obtaining small numbers of caribou from several wild or captive sources would increase genetic diversity and decrease the impact on any one herd. There has been no final decision on source herds and additional work with Indigenous partners and the provinces of British Columbia and Alberta 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 herds of the Jasper/Banff LPU, including the South Jasper herds (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). Research indicates that obtaining 10–20 females per year is possible but actual numbers 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 2019; Whittington 2014). Without high adult female survival in the breeding facility, more calves would need to be kept in facility to continue breeding. Maintaining an annual survival greater than 96% would 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).

Managing health and disease risks will maximize the project's productivity.
Managing caribou health is essential to the project and to achieving recovery objectives faster. 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 should 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 herd will have ~40 adult breeding females and 8–10 adult males. 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.

2.4.4 Release: augmentation of recipient herds

Starting in 2026, caribou yearlings will be available annually for herd augmentation and will be released into the Tonquin until the herd 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 and release of sufficient young animals into the wild.

Two population models were used to evaluate scenarios of captive herd 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 herd 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 herd model estimates production (number of yearlings available for augmentation annually) while maintaining a herd 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 herd given release of yearling caribou into the wild herd, while varying number and survival depression of those released animals.

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

Some key influential factors in models that resulted in higher success were: capturing a larger number of females in year one, capturing a younger age distribution of founder females, decreasing post-survival augmentation depression to $\geq$40% (i.e. if released animals experience at least 40% of the survival rate of their wild counterparts) by maximizing released yearling survival, and maximizing captive female survival in the facility. Notwithstanding further forthcoming work, recovery of the Tonquin herd appears to be feasible and likely, while simultaneously retaining yearlings each year to maintain captive herd size.

External reviewers (Hebblewhite 2018; Johnson 2017; Schmiegelow 2017) have identified the benefit of augmenting herds that have existing animals in order to maximize success of reintroduction of naïve animals. The Tonquin herd, which is currently at quasi-extinction threshold with only ~10 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 herds 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 herd, 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 herd of 100 (i.e., 100 is insufficient).

As recently as 2008, the Tonquin herd was >100 animals, yet it declined rapidly to a quasi-extinction low of 35–41 in 2016. Choosing a target herd size at which to stop augmentation must take into account this recent lack of resilience at 100 animals, historical herd sizes and distribution of the herd, recommendations from the Recovery Strategy, and inputs from Indigenous partners. Other herds in the region have experienced sudden and significant drops in population size when total herd size is <150–200 (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 herd sizes, expansion of caribou into these formerly used areas, and a return to the ecological processes of dispersal, emigration and immigration between adjacent herds will be perceivable. Ideally, connections with other local herds in British Columbia and Alberta will be re-established as the herd becomes more widely and contiguously distributed.

Release into the wild herds

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 herd will be the only herd with extant animals and will therefore be prioritized for augmentation (Hebblewhite 2018; McShea et al. 2018). Selecting the right recipient herds 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 herd of caribou. However, this approach can result in high post-release mortality where either the released animals have no herd to join, or it is unlikely that they will join a (small) extant herd 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 herd 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 herd translocation, where all but 2 of 19 translocated caribou died after hard release, Parks Canada proposes soft release option, despite the added cost and associated logistical complications. Soft release provides better group cohesion, especially if caribou from the extant herd are present in the pen. A strong herd instinct keeps caribou together, and developing this among released captive animals and wild recipient herds is thought to increase integration of released animals into extant herds (Blake and Rowell, personal communication, April 2020).

Based on the timing of release, seasonal herd movements, and existing infrastructure required to support a soft release strategy in the Tonquin, the release pen for female calves will be close to the Tonquin Warden Station, 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).

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. Based on this timing, capacity for 100–120 animals in the facility is required to ensure that animal density is kept low and resources are not strained (Blake and Rowell 2017). Any overflow capacity requirements could be met with extra unassigned pens or building more within the footprint of the site.

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. The project will include two release sites – Cavell and Tonquin Valley, each with its own environmental and access conditions, (for example: snow, predator densities, extant caribou and road/infrastructure availability).

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 may be guided as needed by scientific and Indigenous advisory committees composed of experts in conservation from around the world. 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 (L. Shepherd, personal communication, June 19, 2018). 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
Phase 1 - <u>Build - Breeding facility design, construction & operations</u>		
Site assessment (breeding facility)	Hydrogeological, site survey, vegetation community & rare plants, archaeology	2019-07
RFP advertisement (breeding facility)	Public advertisement of RFP for professional services to design the Caribou Breeding Facility	2021-07

Project Milestone	Description	Date
Consultant contract award (breeding facility)	Award design contract upon evaluation of RFP	2021-10
Preliminary design report (breeding facility)	Completion of preliminary design report	2021-11
Public notice for Detailed Impact Assessment (DIA)	Posting of the public notice for the Detailed Impact Assessment on Canada Impact Assessment Registry	2022-03
Schematic design report (breeding facility)	Completion of schematic design report	2022-03
Indigenous and public consultations on project proposal and DIA	Most of Indigenous and public consultation will be completed by August to support the conclusion of the DIA, but additional consultation and engagement activities may be finalized in Fall 2022. Important to note that there will be opportunities for Indigenous inclusion and collaboration throughout the duration of the project	2022-08
Detailed Impact Assessment	Completion of DIA and inclusion in tender documents	2022-08
Issue for Tender package (breeding facility)	Issuance of stamped Issue for Tender construction package	2022-09
Construction contract award (breeding facility)	Site construction contract awarded	2022-10
Substantial performance (breeding facility)	99% of all work complete, and site can be granted occupancy	2024-08
Final completion (breeding facility)	Final acceptance of all work	2024-11
Phase 2- <u>Capture - Securing source caribou</u>		
Operational protocols finalized	Husbandry, health and other operational protocols	2025-01
Capture and transport protocols finalized	Planning for caribou capture and transport completed	2025-01
First capture	Capture of caribou from Brazeau and/or other identified source herds.	2025-02
Second capture	Capture of caribou from Brazeau and/or other identified source herds.	2026-02
Phase 3 - <u>Breed - Animal husbandry and care</u>		
First caribou born in captivity		2025-06
Phase 4 - <u>Release - Augmentation of recipient herd (Tonquin)</u>		
Final completion of release pens	Exact timing to be confirmed	2025-09
First male augmentation	Exact timing to be confirmed	2026-03

Project Milestone	Description	Date
First female augmentation	Exact timing to be confirmed	2026-09
Last augmentation	Exact timing to be confirmed	TBD
Phase 5 - Adapt - Research, Monitoring, and Adaptive Management		
Research, monitoring, and adaptive management	Research, monitoring and adaptation	ongoing
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

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 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 2014).

4.1 Caribou critical habitat

The Recovery Strategy provides details on critical habitat designation for LPUs (one or more caribou herds 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 2014, p. 43), 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 (Appendix C, Environment 2014).

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

- all of the area of high elevation winter and/or summer range;
- 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 2 depicts critical habitat for southern mountain caribou in JNP.

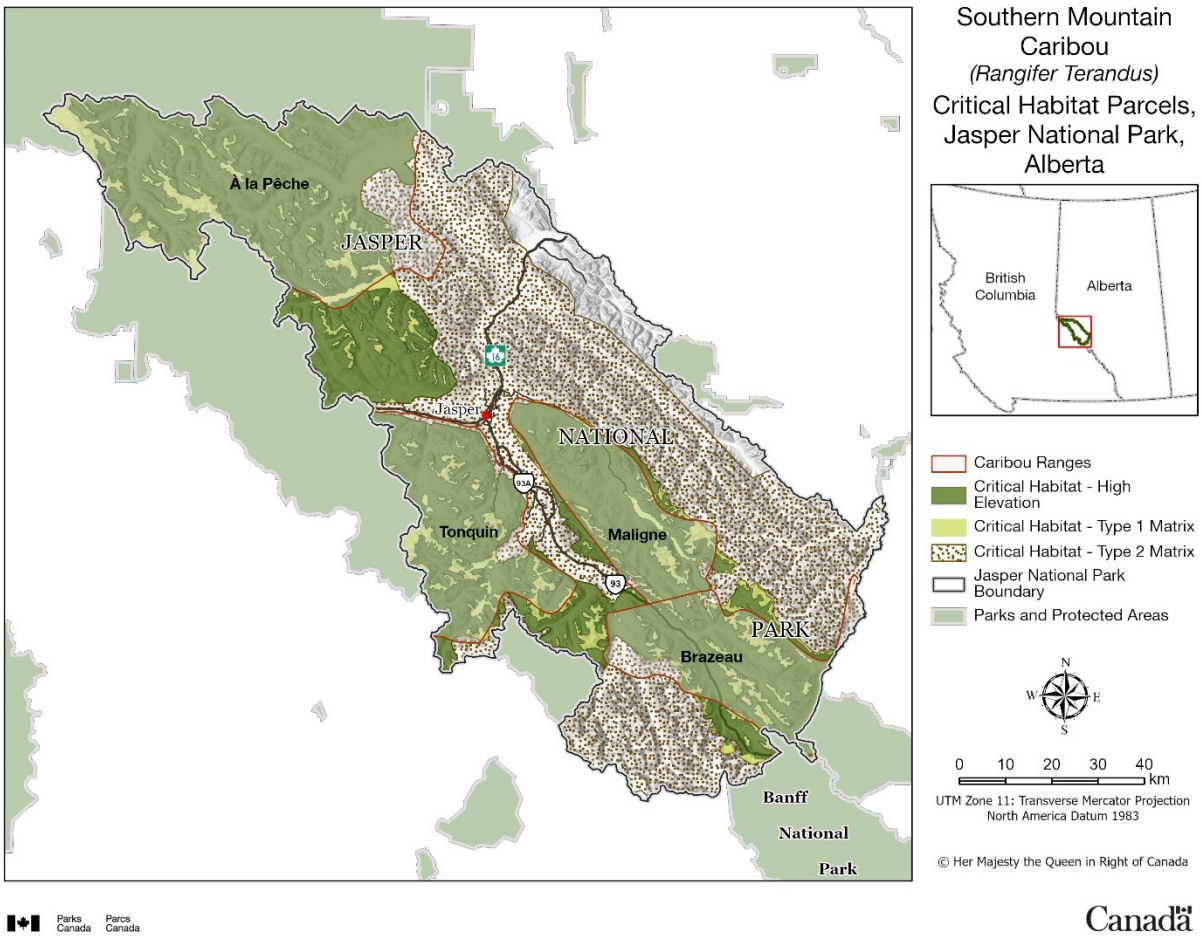

Figure 2: Critical habitat for southern mountain caribou in JNP

Caribou in JNP are part of the Central Group of southern mountain caribou (Environment 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 2014: Appendix C, Table C-2). 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 2014: Appendix C, Table C-2). In summer, they are mostly at higher elevations in the mountains and will eat a variety for 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 3). The Tonquin, Maligne and Brazeau herds, are all part of the Jasper/Banff LPU, while the À la Pêche herd is transboundary, and responsibility for the herd is shared with the Government of Alberta.

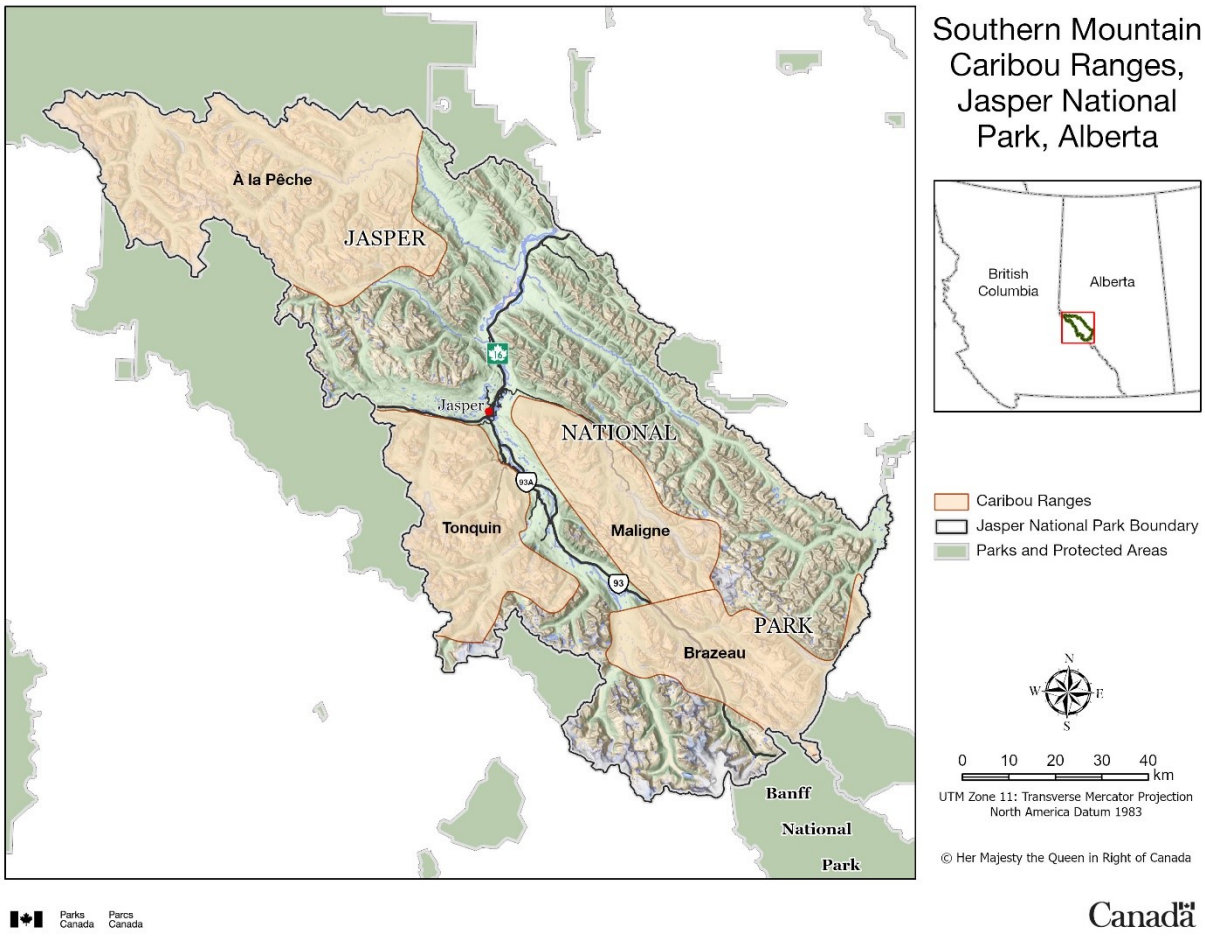

Figure 3: Caribou ranges within boundaries of JNP

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 herd is now considered to be extirpated. The Brazeau herd has fewer than 15 individuals. Parks Canada documented a period of steep decline from 2008–2014 in the Tonquin Valley herd, 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 herds are at or below the quasi-extinction threshold and at a level that is unlikely to recover without additional measures.

The À la Pêche herd 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 herd (Manseau, personal communication, 2019).

4.2.1 À la Pêche herd range

The À la Pêche herd 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 4).

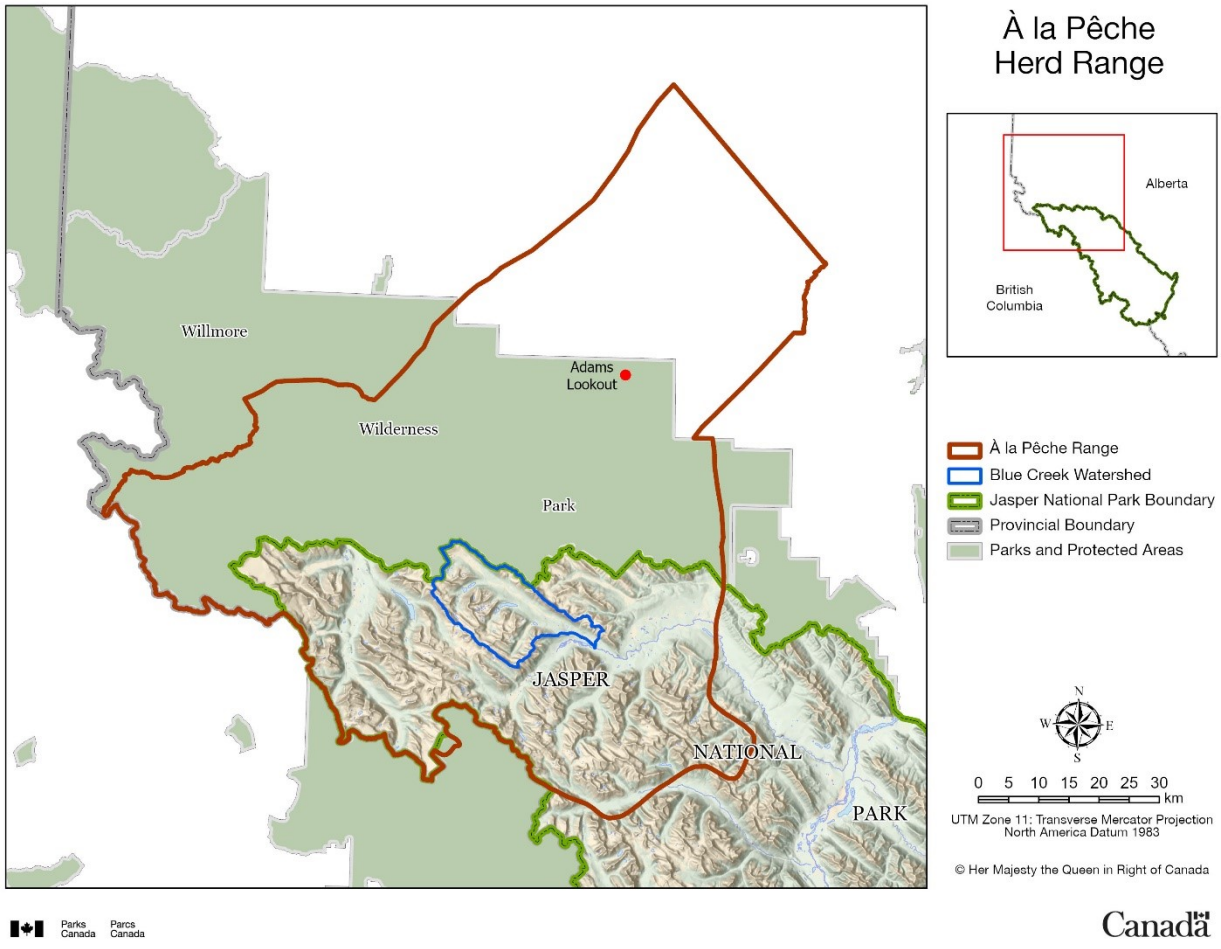

Figure 4: Range of À la Pêche caribou herd in JNP, Willmore Wilderness Park (depicted as the large Provincial Park north of JNP), and adjacent foothills regions. Red dot indicates location of Adams Lookout at eastern edge of Rocky Mountain Foothills National Park. Blue outline is Blue Creek Watershed, a very important valley for caribou in JNP.

The À la Pêche herd is considered partially migratory (Brown et al. 1994; Edmonds and Bloomfield 1984). Monitoring data show that caribou in the À la Pêche herd 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 herd 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 herd residing year-round within north JNP. Forty-seven caribou were observed in 2019 and 40 caribou were observed in 2020.

4.2.2 Brazeau herd range

Caribou of the Brazeau herd 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 herd's east boundary (Figure 5). 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 herd have been documented using habitat as far south as the Cloister Mountains in the White Goat Wilderness Area, south of JNP.

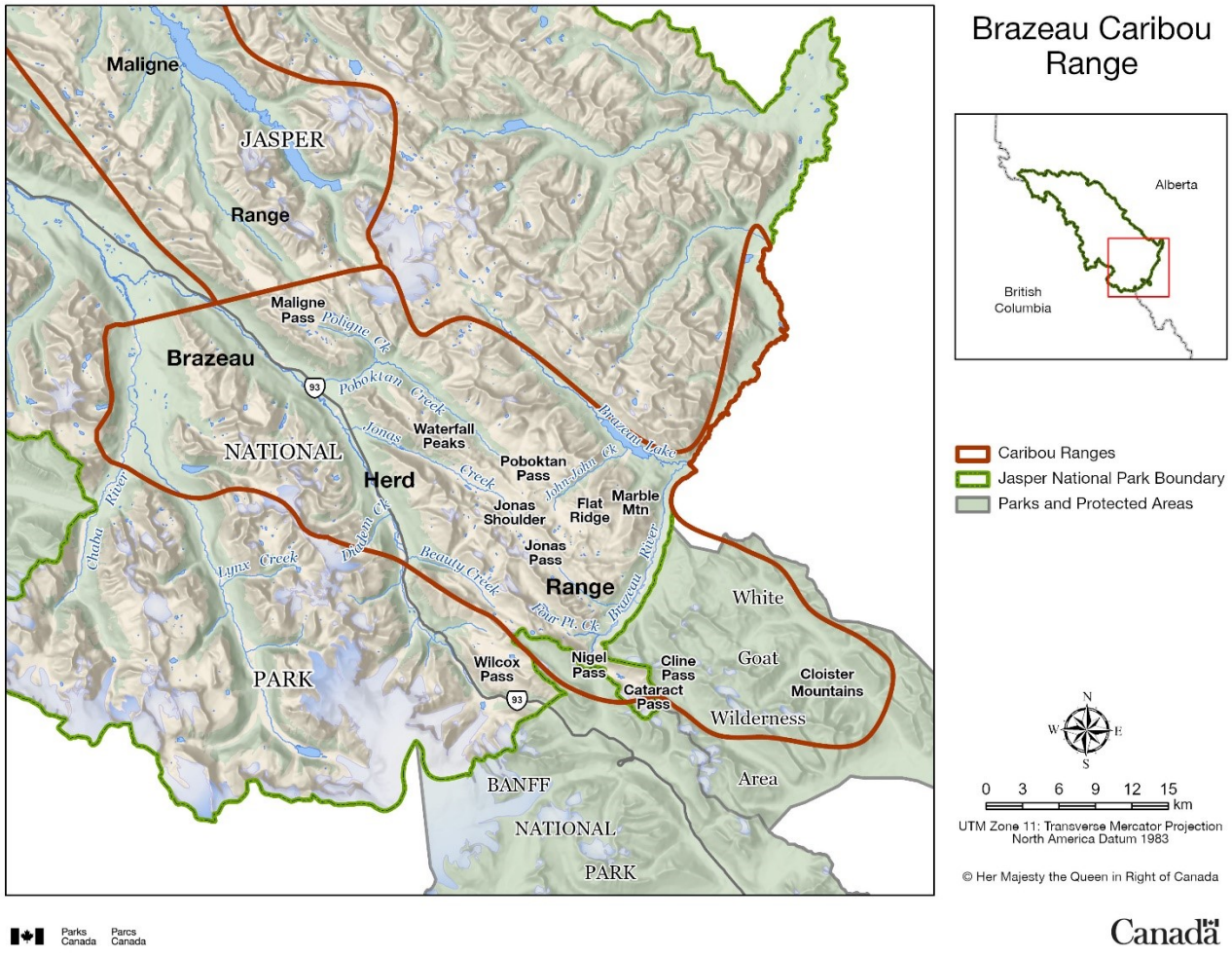

Figure 5: Caribou regions within Brazeau Valley, Jasper National Park

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 5). 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 herd 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 6). 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 6).

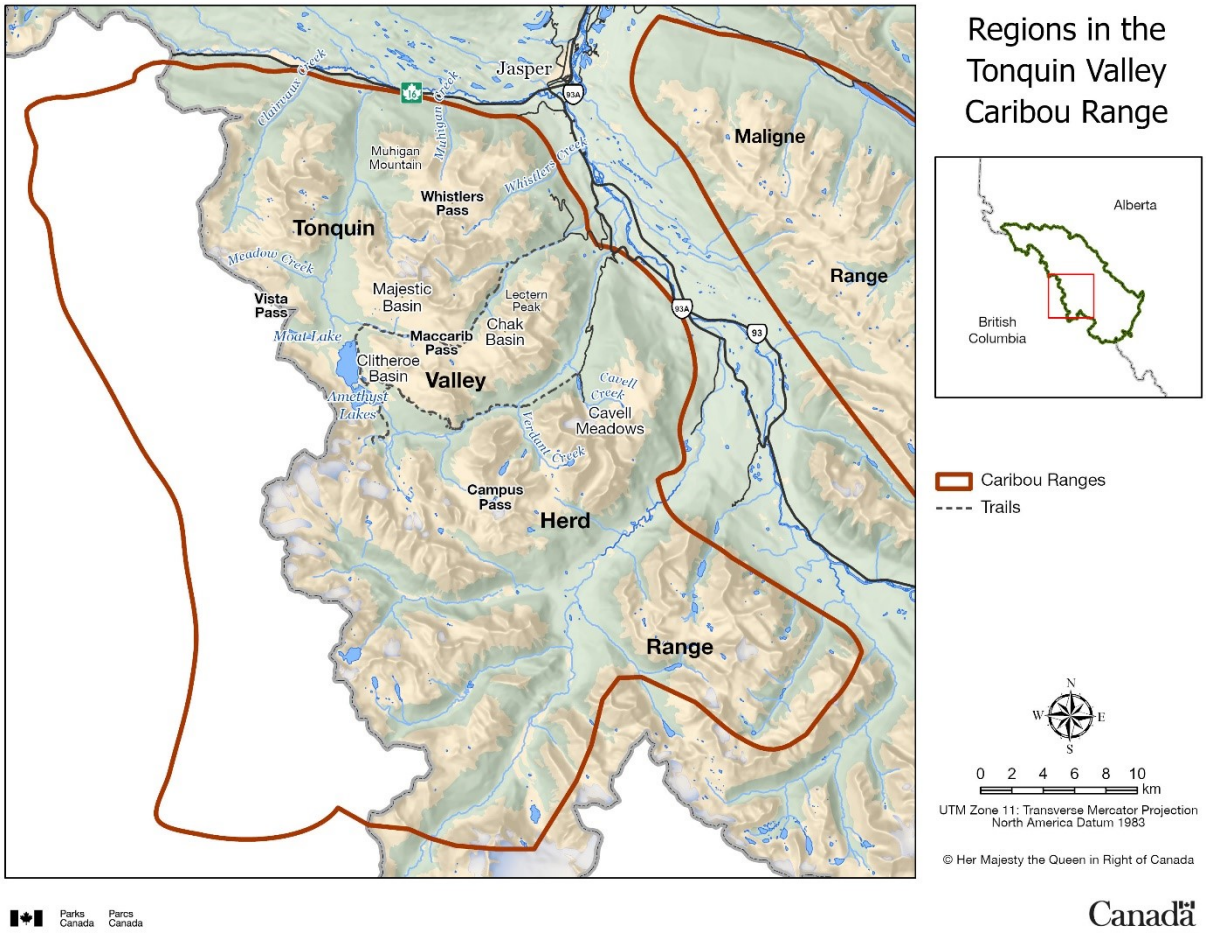

Figure 6: Caribou regions within Tonquin Valley, JNP

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 entire project area (breeding facility and release sites) is declared to be wilderness under the *Canada National Parks Act* (Figure 7). This zoning 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.

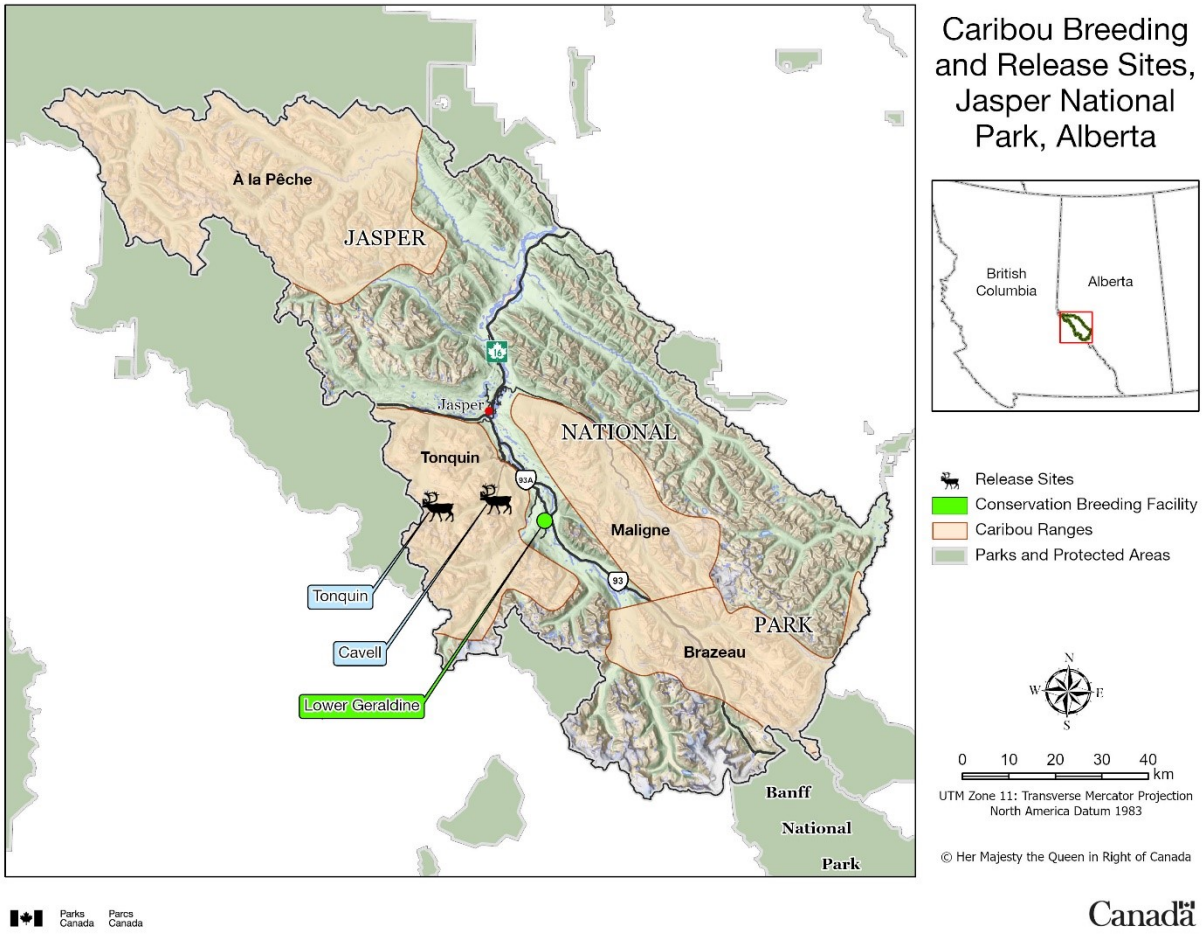

Figure 7: Breeding facility and release site locations

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 8).

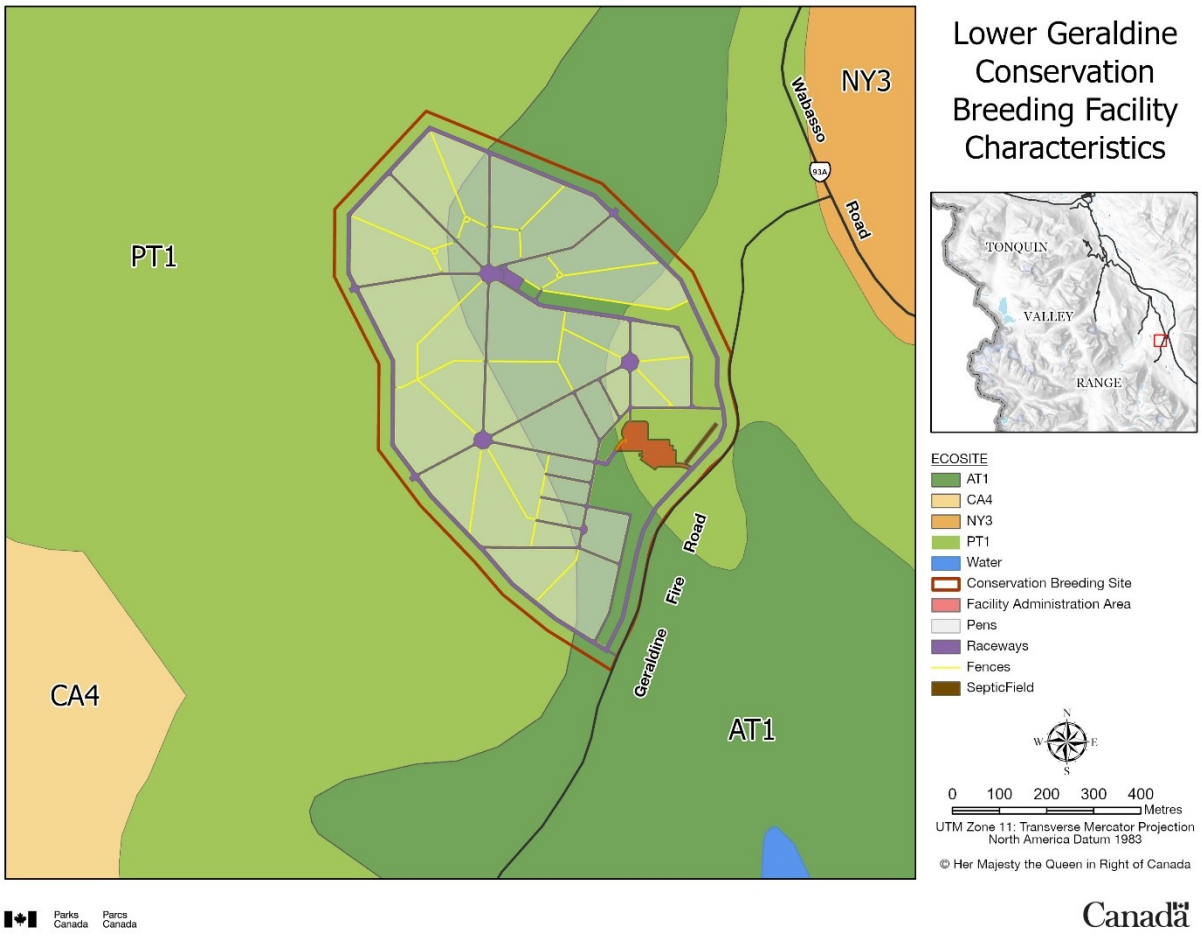

Figure 8: Characteristics of the breeding facility site

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, 2013b). 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, 2013b).

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 10 Imperial gallons per minutes (IGPM). 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 6.6 IGPM or 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 meters above sea level with the elevation at Athabasca River estimated at 1,200 meters 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, and the Tonquin Valley release site 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 6) while the Tonquin Valley release site is comprised of both SX1 (Sphinx 1) Ecosite (8.6%) and SX2 Ecosite (91.4%) (Figure 8).

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)

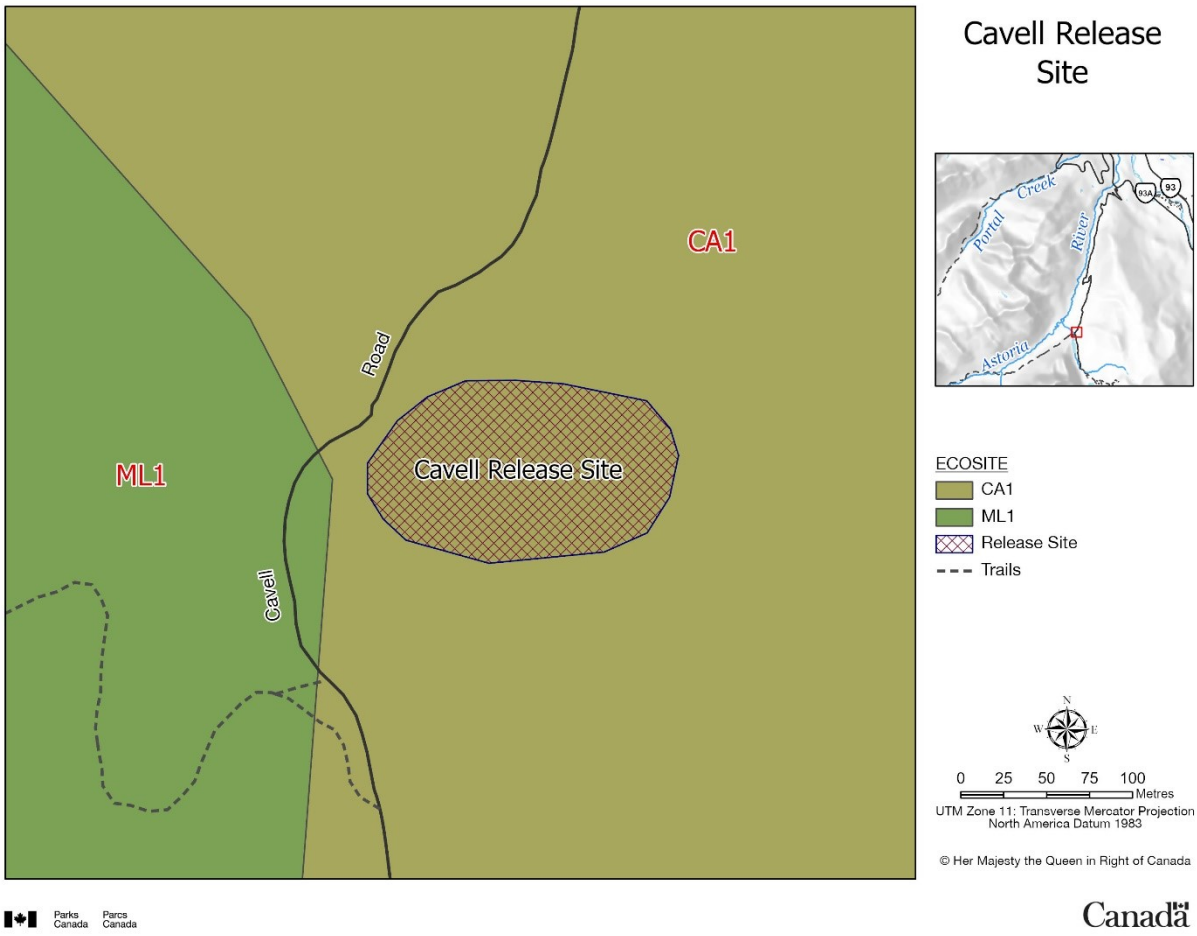

Figure 9: Proposed Cavell release site

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 10).

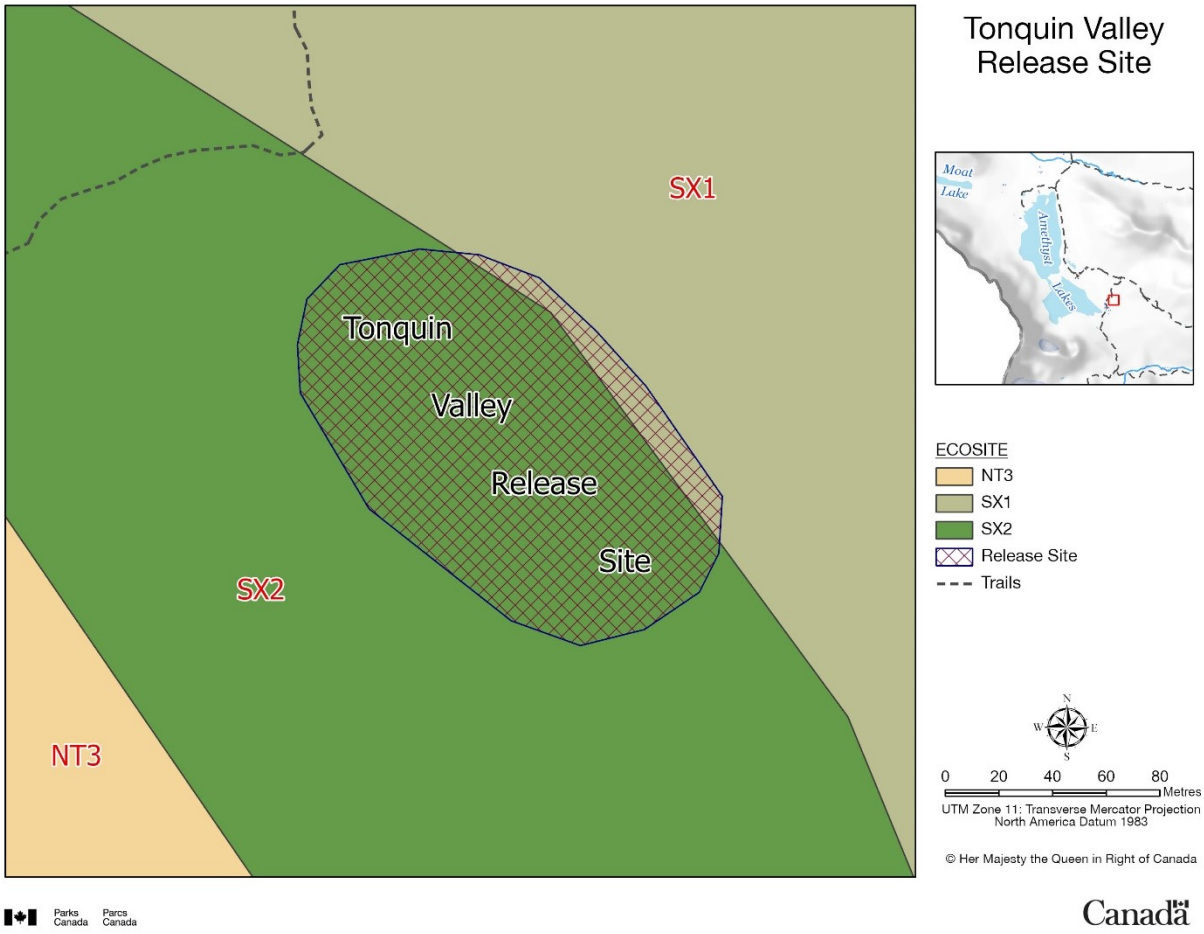

Figure 10: Proposed Tonquin Valley release site

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.

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 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 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 Herd	Impacts of capture and relocation to the conservation breeding facility of all animals of this herd on the herd-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 Herd (Sourcing caribou from the À la Pêche herd is dependent on ongoing discussions with the Government of Alberta)	Potential impacts of limited caribou removal on long term viability of the herd. Uncertainty about the exact number of caribou that can be removed safely to support the project	The size of the À la Pêche caribou herd has grown in the past decade due to wolf control by the Government of Alberta. This herd is genetically and behaviourally appropriate for augmentation into south Jasper recipient herds (Neufeld and Calvert 2020). It has sufficient genetic diversity to act as founder for a captive herd. Parks Canada will work with the Government of Alberta and Indigenous partners to determine acceptable numbers to avoid jeopardizing the herd. 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 herd without affecting its long term viability (Neufeld and Calvert 2020). Additional work will be completed to determine the safe and acceptable	Long term viability of the À la Pêche herd ensured.

Valued Components (VCs)	Rationale	Measurement indicators	Assessment endpoints
		number of animals that could be removed from the herd.	
Tonquin Caribou Herd	Potential impacts of limited caribou removal and addition of captive-bred caribou to the herd, range and LPU	The intent is to augment the herd to at least 200, based on the recent decline from 100 and historical values of the herd's size (Neufeld 2019). This herd 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 2019).	Tonquin Caribou Herd consists of a number of animals that are available now or in the foreseeable future to sustain the herd or improve its abundance while having safe access to sufficient suitable habitat.
Vegetation, and soils (primarily during the breeding facility construction and operation of the facility)	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 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 representative 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 the Tonquin Caribou herd, 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 for wilderness experience 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 herd 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 caribou herd.

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* (Environment and Climate Change Canada 2018a). 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 will help meet 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 2010, Draft Management Plan; Parks Canada Agency 2022), the Recovery Strategy, the Multi-Species Action Plan and the Government of Canada's commitment to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) 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 2010 Jasper National Park of Canada Management Plan (Management Plan) and the 2022 Jasper National Park of Canada Draft Management Plan (Draft Management Plan) make several mentions of the importance of caribou for JNP, and the need to protect and implement conservation measures. In the Management Plan's Situation Analysis, the status of woodland caribou was listed as "one of the most important ecological challenges" facing JNP:

> Long-term monitoring of the three herds in the southern part of the park indicates they are in decline. The factors believed to be contributing to this decline include high numbers of elk and deer, human-facilitated predation by wolves, human disturbance, and habitat loss and fragmentation inside and outside the park. Reversing the current trend by addressing these threats is a priority. (Parks Canada 2010, Section 3.2.1 Resource Protection)

The Management Plan also indicates that JNP should (Section 4.4.1 Direction), ensure that the park "has the full complement of native species and communities that are characteristic of the Rocky Mountain Natural Region," and (Section 4.4.1 Direction):

> Prepare and implement a conservation strategy for woodland caribou in JNP that will:
> - identify important caribou habitat;
> - set conservation goals and objectives;
> - identify approaches for the park, and provide for coordination with Banff, Yoho, Glacier and Mt Revelstoke; and
> - support the broader recovery plan led by Environment Canada (Parks Canada 2010).

The Draft Management Plan indicates that caribou herds have continued to declined over the last decades but the two remaining herds are now stable. Most threats are now mitigated, however the herds are now too small to recover. The draft plan includes a number of actions to address these issues, including the proposal for caribou conservation breeding and herd augmentation, subject to review and approval through Parks Canada's impact assessment processes and consultation with Indigenous partners, the public and stakeholders.

- The Recovery Strategy considers an 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 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 herds 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 Government of Canada's commitment to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Specifically, Article 25 of UNDRIP 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* report (Parks Canada 2013b) 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 2013b). Development and motorized access within Zone I areas are strictly prohibited (Parks Canada 2013b). 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 2013b). 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 2013b). 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 2013b). 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. The Jasper SkyTram is located in Zone IV – Outdoor Recreation.

- Zone V – The **Park Services** zone represents areas with the highest density of visitor services and facilities (Parks Canada 2013b). 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 declared wilderness – Zone II, and as such, motorized access and development is prohibited, save under certain exceptions, outlined in *Canada National Parks Act* (14)(3)(a), 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.

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; 2003) and supporting policies guide the assessment process. 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 alignment with items likely to destroy critical habitat. 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* (1994), the Parks Canada Departmental Plan (2020–21) 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 also a novel approach in North America. For these reasons, it is critical that Parks Canada provides opportunities for participation and conversation if this project is to be successful.

A Detailed Impact Assessment (DIA) is Parks Canada's most comprehensive level of impact assessment. It requires the most thorough Indigenous and public consultation related to the potential for the project to cause adverse environmental effects. As such, a consultation plan is required to ensure that Parks Canada communicates to Indigenous partners, stakeholders and the public about consultation and engagement opportunities in Jasper's caribou recovery in a timely, clear, inclusive and responsive manner. Consultation will occur over three phases: Phase 1 early dialogue and project development (largely complete); Phase 2 consultation and the Detailed Impact Assessment; and Phase 3 project implementation and engagement.

7.1 Indigenous consultation

Indigenous consultation is a separate and distinct process from stakeholder and public consultation. Parks Canada has important obligations under policy, law and good governance that will guide Indigenous consultations and accommodations with respect to the proposed caribou conservation breeding and augmentation project. Additionally, as the original and ongoing stewards of the lands that now form Jasper National Park, Indigenous partners have distinct knowledges and perspectives about the land and caribou. Consultation with Indigenous partners will be important to adapt the project based on Indigenous knowledge.

The Jasper Field Unit has longstanding relationships with multiple different Indigenous communities. These relationships, as well as previous and ongoing consultation with Indigenous partners, will guide and influence consultation activities related to the project.

7.1.1 Feedback from early dialogue with some 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.

More specifically, some Indigenous partners shared that they should be involved in every aspect of the project, from start to finish. Some Indigenous communities have experience working with caribou and can help the project be successful if they are involved. Some Indigenous partners also noted that oral history can be an important source of information about the historical ranges and movement of caribou. They emphasized that traditional ways of knowing should be balanced with western science. Spirituality cannot be measured or quantified, but is key to the success of a project like this and should not be left as an afterthought. Some Indigenous partners noted that ceremony should take place throughout the project to ask the grandfathers for guidance and ask the caribou for how to proceed and what should be done.

A number of Indigenous partners stated that Parks Canada must ensure that caribou be kept as wild as possible. Parks Canada should consider the number and size of pens in the facility, how many animals are kept together, and minimize disturbances to the caribou in the facility. Caribou risk losing their wildness in a farm environment. Some Indigenous partners suggested that Parks Canada consider how caribou raised in a pen will move and adapt in the wild. Consideration should be given to the caribou's natural home range, their desire to return to their home range, and how to help the caribou accept their release area as their new home. Some Indigenous partners also suggested that Parks Canada consider releasing caribou from the facility by herding them to the wild rather than using a helicopter.

Finally, some Indigenous partners provided specific comments about the vegetation at the proposed site for the breeding facility. They noted that medicinal plants grow in the area. Some Indigenous partners requested that Parks Canada take care of the vegetation when removing trees, and manage the pens in a way that avoids disturbing the soil too much.

7.1.2 Indigenous consultation and the Detailed Impact Assessment

An Indigenous consultation plan has been developed and will be followed to ensure Parks Canada communicates to Indigenous partners about engagement opportunities in the project and the DIA in a timely, clear, inclusive and responsive manner. A variety of tactics, including in-person and/or virtual meetings, in-person and/or virtual small group discussions, in-person and/or virtual workshops and site visits will be considered to ensure a meaningful consultation on this project. From Indigenous partners, Parks Canada expects both support and concern with respect to depopulating small herds, using source animals from the À la Pêche herd, holding wild animals in captivity and releasing captive animals into the wild.

7.2 Public consultation

Parks Canada expects a high level of interest and largely broad-based support for the project from the public and other partners and stakeholders. The project is the product of years of information gathering, observation and research written by people who care deeply about the survival of caribou herds in the park. Key to moving forward with the project will be seeking feedback from other partners and stakeholders.

Parks Canada engaged a variety of government and environmental organizations, academic institutions, and other experts in conservation breeding in a scientific review of the project. In addition, a public consultation plan has been developed and will be implemented. A public notice of the Scope the DIA was posted on the Canadian Impact Assessment Registry (Reference Number: 83456) for 30 days (March 10th to April 8th 2022) and included the following information in both French and English:

- project summary;
- overview of the VCs to be assessed;
- outline of planned review;
- engagement opportunities; and
- information regarding how to obtain a draft of the DIA.

A few comments on the Scope the DIA received from the public are addressed in this draft DIA report. Additionally, a variety of tactics, including in-person and/or virtual town hall meetings, in-person and/or virtual small group discussions, and in-person and/or virtual workshops will be considered to ensure that engagement needs and objectives are met. From the public, Parks Canada expects both support and concern with respect to depopulating small herds, using source animals from the À la Pêche herd, holding wild animals in captivity, releasing captive

animals into the wild, and additional caribou recovery actions, such as expanded seasonal closures and restrictions to activities in critical caribou habitat.

8. Impact assessment

This DIA describes baseline conditions (existing environment), environmental impacts, mitigations, residual impacts and cumulative effects for ten (10) 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 herds;
5. Adapt: research, monitoring and adaptive management; and
6. Decommissioning and restoration.

The 10 VCs are:

1. Vegetation and soils;
2. Surface and groundwater quality and subsurface drainage;
3. Heritage sites and cultural resources;
4. Brazeau caribou herd;
5. À la Pêche caribou herd;
6. Tonquin caribou herd;
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 herd VCs will rely on previously accomplished population modelling. The Brazeau caribou herd is too small to use statistical modelling and will be depopulated.

8.1 Preliminary caribou source modelling

Preliminary modelling to assess impacts of removing females of the À la Pêche herd used scenarios to examine impacts to different portions of the herd, depending on the behavioural/migratory strategy included. Two initial starting populations were contrasted in the scenarios: the mountain-resident component of the herd; and the broader mountain-experienced component (including both migratory and mountain-resident individuals, and including all animals that would be exposed to mountain environments) (Neufeld and Calvert 2020). The process did not assess impacts to abundance on the total herd (including foothills-resident animals), as the target was to ensure impact analysis was constrained to the most suitable behaviour type for removals, and then assess impacts on that specific behavioural subtype (Neufeld and Calvert 2020).

In summary, the preliminary caribou source modelling employed three steps in assessing impacts to these two portions of the herd:

1. Identified a starting population in 2017–18 (based on population estimate) and projected the population to 2023–24 based on a random set of matrices that were informed by population parameters from the À la Pêche herd;
2. From this projected population, examined five removal scenarios (removing x animals for 2 consecutive years) and projected a 'status quo' scenario for comparison; and
3. Projected the population to 2030 to look at 5-year post-removal population impacts (Neufeld and Calvert 2020).

8.2 Caribou augmentation modelling

Two models were developed for the respective captive and wild populations:

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

Both models work together to project recovery potential of the Tonquin caribou herd (Neufeld 2019).

In the captive herd 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 herd (Moeller et al. 2021). Built-in assumptions of that model include, for example, that previously experienced ecological conditions in the Tonquin 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 (from a small radio-collar sample) in JNP has demonstrated that predation risk from wolves continues to decline, and density is at its lowest value ever recorded (Neufeld 2019). Additionally, mitigations such as winter closures continue to be implemented.

8.3 Minimum counts

The Brazeau caribou herd is too small to generate meaningful population estimates, or to use statistical modelling. Only minimum counts are used for this VC.

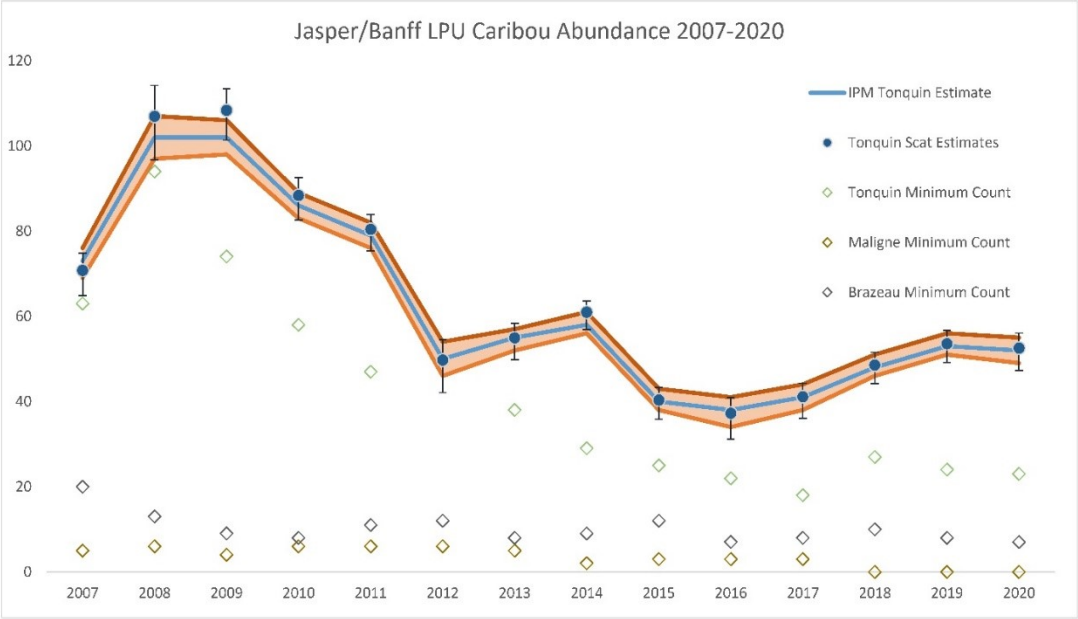

Figure 11: Jasper/Banff LPU 2007–2020

Figure 10 shows population abundance and trends expressed as counts for and population estimates from an integrated population model (IPM) for the Brazeau, Maligne and Tonquin caribou herds in JNP 2007–2020. It also shows scat estimates for the Tonquin. (Error bars are 95% confidence intervals and orange region 95% credible intervals for IPM estimate.)

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 is 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 [*Shepherdia 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 12).

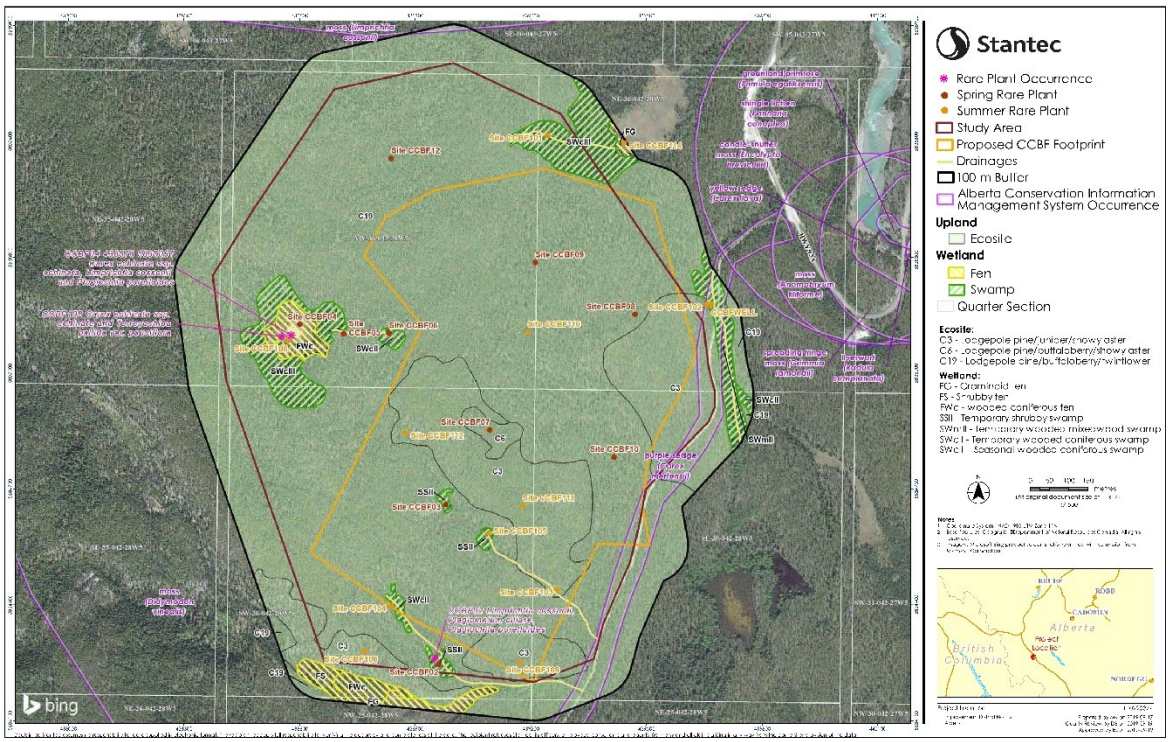

Figure 12: Breeding facility rare plant communities

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 12). 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.

Rare 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* (Government of Alberta 2015), seven wetland types were identified within the breeding facility study area and 100 m buffer (Figure 12), 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 (Government of Alberta 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 (Government of Alberta 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 (Government of Alberta 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 (Government of Alberta 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 (Government of Alberta 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 (Government of Alberta 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 (Government of Alberta

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 12, 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. No noxious or prohibited noxious weeds were observed during field surveys of the breeding facility study area.

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 4 presents a summary of potential effects on vegetation and soils, along with information about key mitigation measures.

Table 4: 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 in 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.
Breeding facility construction: topsoil harvesting, utility construction, earthworks, grade preparation and road construction; animal	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 13).

Activities	Potential impacts	Mitigations
treatment lab, handling barn, site office, short-term accommodation space and vehicle/equipment storage spaces; site fences, animal feeders, waterers and site security infrastructure		• 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. • Pressure-wash or steam-clean construction equipment 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 regulated weeds where required, including use of cultural control of weeds on topsoil and subsoil stockpiles, use of mechanical control along access roads, hand-picking and disposal of weeds at approved site, and use of non-residual herbicides.

Activities	Potential impacts	Mitigations
	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 (EPP) 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 where vegetation is required.
	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.
Breeding: animal husbandry and care: good husbandry, facility management, captive conditions and expertise	Introduction of new non-native plants	• Use of 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 weeds 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.

Activities	Potential impacts	Mitigations
		• Locate septic fields inside the perimeter. • Direct wastewater produced at the handling barn and the administration buildings into one (or two) septic tanks. • Clean the septic tanks at least once a year with a hydro vac truck. • Ensure Parks Canada wastewater effluent standards (established standards correct) and/or applicable provincial standards are met by following the most stringent.
Release: augmentation of recipient herds	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. • Conduct post-project vegetation monitoring to eliminate any chance for non-native vegetation getting established.

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 reduction risk reduction Figure 13), and soil disturbance to the breeding facility footprint.

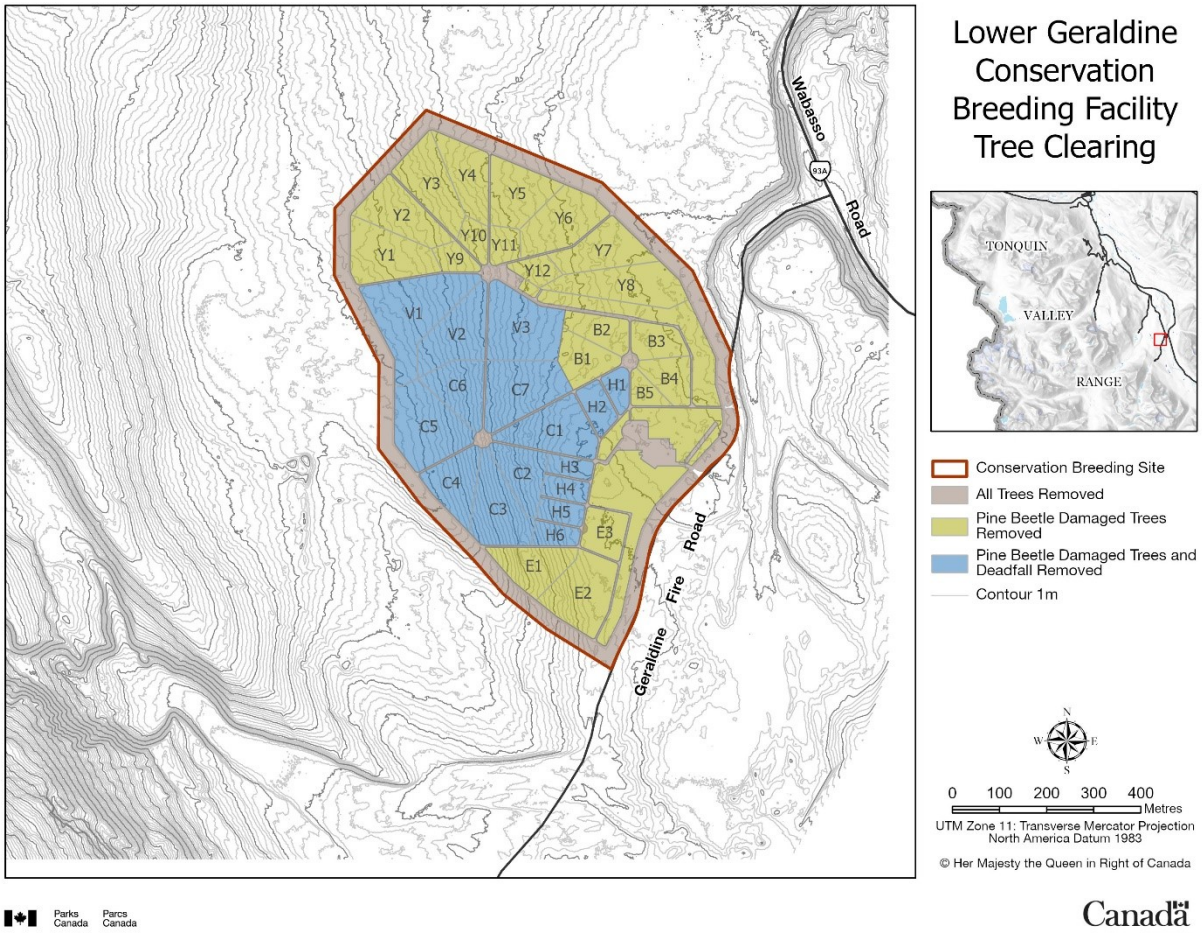

Figure 13: Breeding facility tree clearing diagram

The tree clearing diagram (Figure 13) 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 tree 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 center to create a fire guard.

Breeding facility 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 EPP will be developed and implemented to direct vegetation clearing, soil salvage and handling, 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, there is potential for regulated weeds 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 weeds (Stantec Consulting Ltd. 2019):

- use cultural control of weeds (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 weeds at an approved site; and
- use non-residual herbicides as necessary for control of prohibited noxious and noxious weeds.

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 plants/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 weeds 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. Due to the remoteness of the facility, it is critical to verify that the location and ground conditions are suitable for onsite septic fields. The final location of the field depends on site topography and local soil conditions. Septic fields will be located inside the perimeter (see Figure 8).

It is anticipated that wastewater produced at the handling barn and the administration buildings will be directed into one (or 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 dosing tank 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 center parking lot or access road. Parks Canada will ensure that Parks Canada wastewater effluent standards (established standards correct) and/or applicable provincial standards are met. The most stringent standards will be followed.

Release: augmentation of recipient herds
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. Post-project vegetation monitoring needs to occur.

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 5), due to mitigation, use of appropriate construction methods, and adherence to applicable best management practices and related industry guidance.

Table 5: Significance of residual impacts to soils and vegetation

Activities	Potential impacts	Magnitude
Breeding facility Construction	Disturbance of native vegetation	**Minor** as vegetation disturbance will be limited to those areas required for construction and maintenance activities and will be fully restored at the end of the project
	Potential introduction and spread of non-native vegetation	**Negligible** given low probability of occurrence with clean equipment
	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
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 herds	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. 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 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. The reported yield ranged up to 82 litres/minute (L/min) which satisfies the Parks Canada objective of 30 L/min. 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.

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 6 presents the summary of potential effects on surface water quality and subsurface drainage, along with information about key mitigation measures.

Table 6: 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.	P**ositive** - 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
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 or cross-gradient from surficial contamination • Establish wellhead protection area where the capture zone of the aquifer around the well is free of contaminants
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.

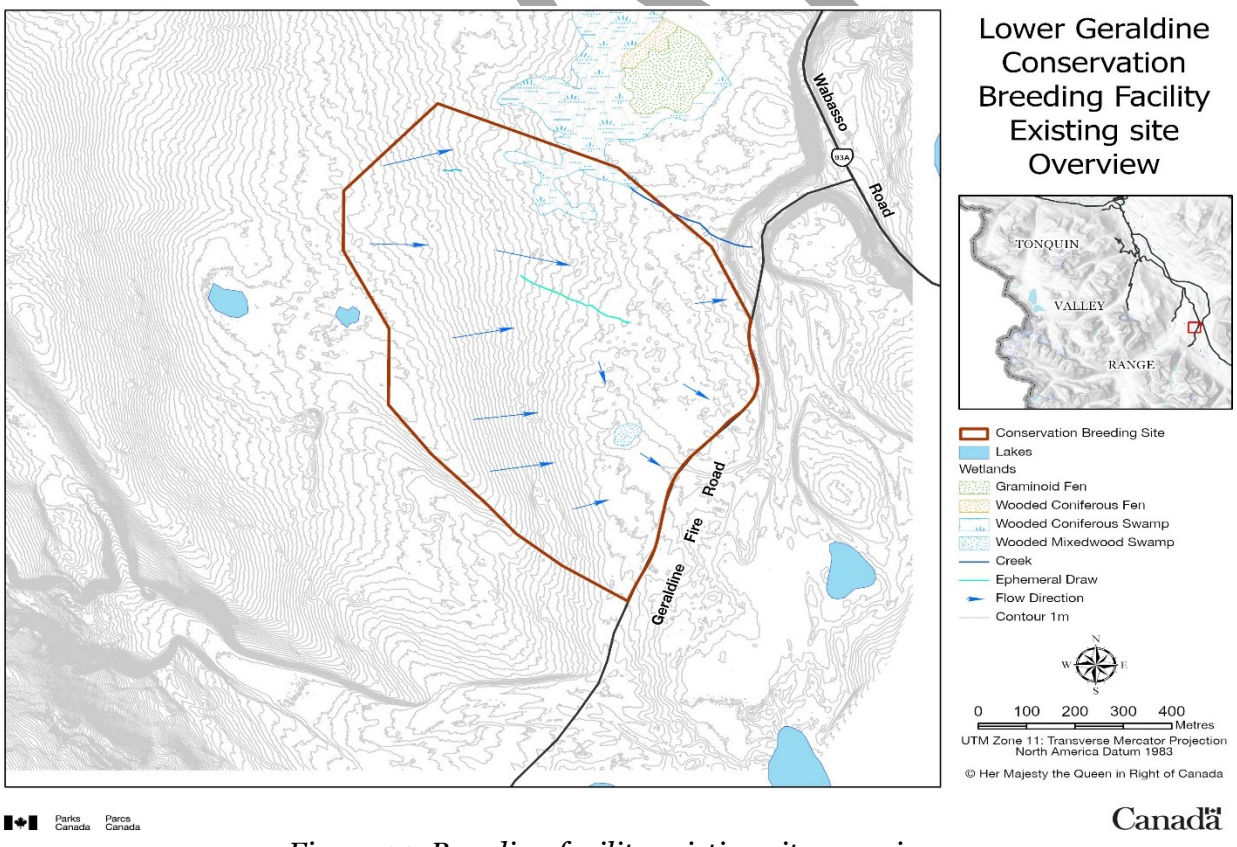

Figure 14: Breeding facility existing site overview

Wetlands ringing the breeding facility site will form the alignment of the perimeter and will be excluded from the interior of the facility (Figure 14). 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 center buildings and parking lot.

Breeding facility 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 preferred location for the production well is within the vicinity of the proposed handling building, which will be centrally located within the breeding facility. This area will be located hydraulically down-gradient of the cow pens, which are likely to see the highest caribou traffic during operation of the facility. The potential exists that the water well may be completed in an unconfined aquifer and thus, the well and aquifer may be vulnerable to surface contamination sources. Specifically, the accumulation of caribou feces on the ground surface presents the possibility for downward migration and loading of bacteriological contamination to the upper water-bearing aquifer.

Although disinfection of groundwater can be accomplished through treatment, consideration should be given to locating the well away from anticipated future known sources of potential contamination in order to: reduce the risk of health issues to water well users for both human and caribou consumption; and reduce the cost of water treatment or potentially eliminate the need for treatment altogether.

Locating the water well up-gradient or cross-gradient from surficial contamination will reduce the risk of contamination entering the capture zone of the well, should it be completed in unconfined sediments with limited barriers to infiltration from surface features. It should be noted that capture zones cannot be strictly determined until aquifer properties have been established; however, siting wells in low-risk areas is best industry practice. As such, three production well locations have been proposed as the best areas for wellhead protection (McElhanney Ltd. 2019). The production well located at 50 m south of the southeast corner isolation pen (ID# 18, 19) was selected. Thus, the production well (PW19-01) was drilled to a depth of 183 m (600 feet) 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.

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. 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. Using many smaller pens with implementation of a regular pen rotation scheme, particularly in spring, summer and fall, is planned.

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 7). 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 7: 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

Activities	Residual impacts	Magnitude
		implementation of an erosion control and spill response plan
	Vulnerability of well and aquifer	**Negligible** due to well being located away and 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 (AOA, Osicki, 2019) were completed.

8.6.1 Existing environment

The most proximal 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 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.

To add to this potential, 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 project 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 8 presents potential effects on heritage sites and corresponding mitigations proposed to avoid or reduce these potential effects.

Table 8: 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, earthworks, grade preparation and road construction; animal treatment lab, handling barn, site office, short-term accommodation	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

Activities	Potential impacts	Mitigations
space and vehicle/equipment storage spaces; site fences, animal feeders, waterers, and site security infrastructure		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, 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.

- A proposed well location was assessed (approximate proposed location #2 – UTM NAD83 Zone 11U 439175E 5834212N). Results from this assessment identified no archaeological issues with water well location #2; therefore, no additional archaeological work is required in association with this well (although the Accidental Finds Protocol and Project Scope Change caveat still apply).

- 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 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 9. 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 breeding facility 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 9: 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 Brazeau caribou herd

8.7.1 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). 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. The Brazeau herd has been at or below the quasi-extinction threshold since the mid-2000s. In 2007 and 2008, 20 and 13 caribou were observed, respectively (Neufeld and Bradley 2009).

It is estimated that the Brazeau herd currently has 10 - 15 individuals, with very few females (Neufeld and Bisaillon 2017 and 2021). This number is not self-sustaining and puts the herd at imminent risk of extirpation (DeCesare et al. 2010; Hebblewhite 2018; Johnson 2017; Schmiegelow 2017). The Brazeau herd is functionally extirpated, but contains genetics that would be of value to the captive breeding population. The risk of mortality during capture and transport for these animals is less than the high risk of mortality in the wild (Hebblewhite 2018), and there is no ecological reason to leave the remaining animals in the wild (Slater 2017; McShea et al. 2018).

8.7.2 Impacts and mitigation measures

Potential impacts of the project to the Brazeau caribou herd will occur primarily during the capture phase, to secure source caribou, and during the breeding phase, for animal husbandry and care. All caribou will be captured, the herd depopulated, and non-existent, but individuals and genetics will be protected and passed along to the next generations. Table 10 outlines the potential effects to the Brazeau caribou herd, as well as mitigation measures.

Table 10: Summary of potential effects to Brazeau caribou herd, and mitigation measures

Activities	Potential Impacts	Mitigations
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 Animal Care Committee, and SARA permits (SARA Permit Decision Tool will be filled in 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*. • Avoid aggressive capture if possible. • Use the fastest and most efficient of available helicopters. • Use expert contractors with multiple years of experience and low capture mortality records (< 2%). • 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.

Activities	Potential Impacts	Mitigations
		• 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, where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou.
	Impacts to the Brazeau herd's abundance and ecology (relocating all animals to breeding facility) in the short term.	• Work collaboratively with Indigenous partners in determining the approach for depopulating a small herd.
	Other animals could be disturbed by helicopter flights when caribou are translocated from the Brazeau to the breeding facility.	• Follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground.
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 herds.	• 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. • 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.
Research, monitoring and adaptive management	Will generate positive impacts	• Positive - no mitigation required

Capture, handling and transport by helicopter
Securing source caribou will involve capturing all animals of the Brazeau caribou herd, 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. Other animals could be disturbed by helicopter flights when caribou are translocated from the Brazeau to the breeding facility.

Relocating all animals of the Brazeau herd to the breeding facility will have effects on the Brazeau herd's abundance and ecology. Working collaboratively with Indigenous partners to determine the approach to depopulating a small herd will be crucial.

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 be filled in 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, avoiding aggressive capture; using, if possible, the quietest helicopter to transfer caribou to the breeding facility; 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 2014; 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.

Based on site conditions, the location of the yearling/weaning 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.

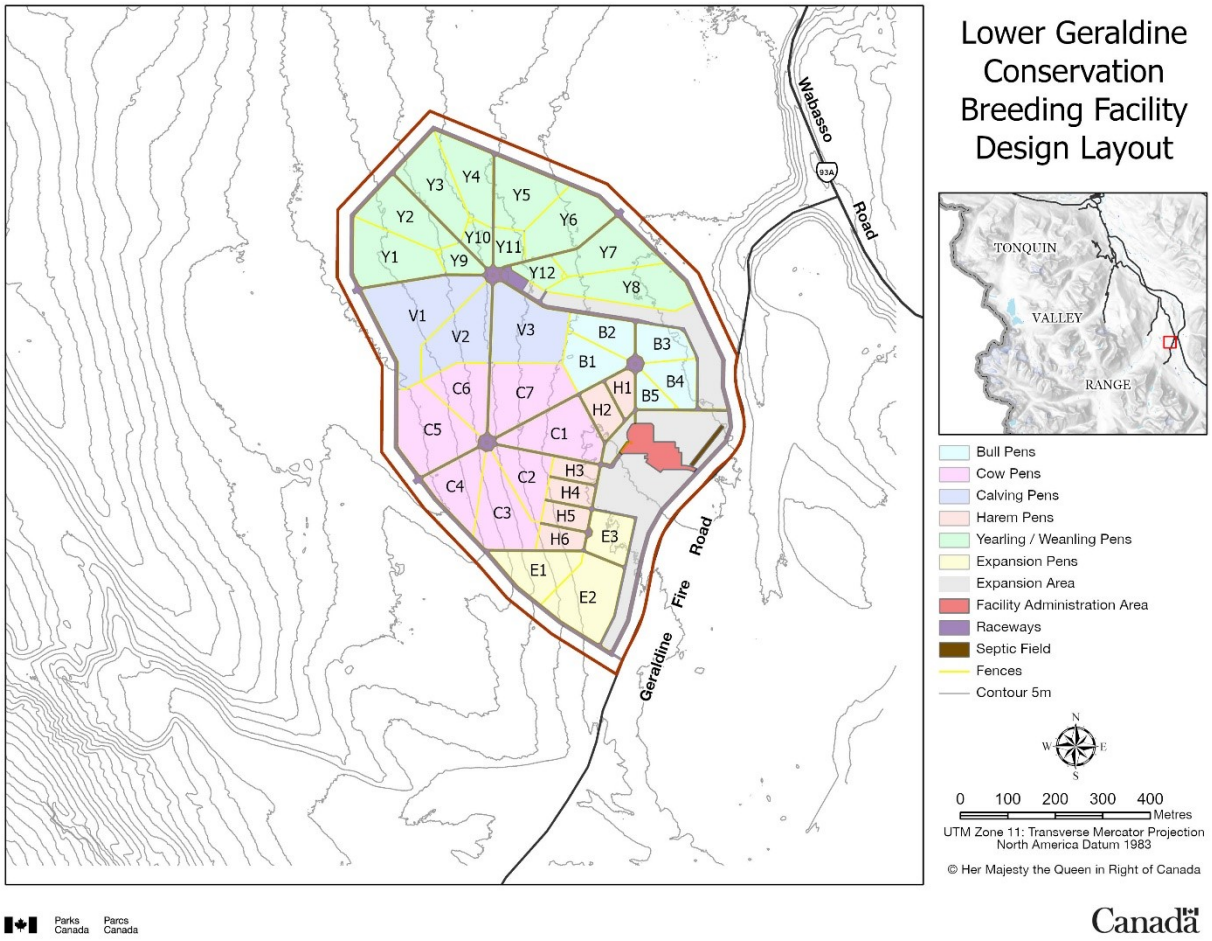

Figure 15: Overall breeding facility design layout

The yearling/weaning pens are arranged into four rows that meet at a point on the eastern end where a handling system is located for animal sorting, veterinary care, and release activities. From the yearling/weaning handling center is a road that leads to the helicopter staging area located outside of the perimeter fence. Around the pen yearling/weaning complex and down the center 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/weaning 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 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 herd management.

The bull pens are located in the southern portion of the site. In each of the bull pens is a catch pen that connects to the raceways to gather and move bulls to other pens.

The harem pens are located near the handling barn, between 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 quarantine pens are located near the edge of the facility and drain towards the periphery to decrease the risk of pathogen transmission to the resident animals. However, the western pen complex drains into the eastern one. The interconnected pens of varying size are divided into two symmetrical complexes by a central raceway. The configuration allows staff to easily service both sides. The existing road is connected to the quarantine raceway to allow for the direct transfer of incoming animals into the quarantine pens.

The quarantine pen complex, which is connected to the building center and the other pens via separate raceways, can be used for other purposes (e.g., cow pens, isolation) when no animals are in quarantine.

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 center is located on the flattest area of the facility.

High densities and pen overuse can lead to environmental contamination, and invariably increased exposure to pathogens or disease introduced from live caribou from other herds (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 an unfortunate gap caused by a damaged gate (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 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).

It should also be noted that there have been no incidents of chronic wasting disease (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 ~50km or less). A health and disease risk assessment was completed for the project (Macbeth 2015), in addition to a husbandry and health management and husbandry strategy (Slater 2017, 2018). Available evidence suggests that pathogens or diseases will not limit the success of this project (Macbeth 2015).

The health and disease risk assessment identified CWD (an infectious and degenerative disease of the central nervous system that affects species of the deer family (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. Although many details about the disease remain unknown, much has been learned through research and experience over the last 3 decades. In Alberta, 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, AB; Canadian Wildlife Health Cooperative, Saskatoon, SK) on new findings related to this disease. CWD surveillance also 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 annually). To better understand and mitigate this disease, a CWD strategy will be developed to incorporate rigorous disease surveillance, health monitoring, mitigation, and response plans for potential disease outbreaks at all project phases.

Research, monitoring and adaptive management

Research and monitoring activities will generate useful information and will overall result in positive impacts. Well-planned animal husbandry and adaptive management are essential for the success of this project. The possibility of reintroducing caribou into the Brazeau herd will be explored as soon as the captive herd is well established and the Tonquin herd augmentations have been successful.

8.7.3 Residual effects and significance – Brazeau caribou herd

Brazeau caribou herd will be depopulated and the herd 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 herd are presented in Table 11.

Table 11: Significance of residual impacts of the project to Brazeau caribou herd

Activities	Residual impacts	Magnitude
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 caribou, including the Brazeau herd, are considered among the best and most appropriate source caribou for captive breeding (Hebblewhite 2018). Capturing and relocating all animals of the Brazeau herd 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 Jasper caribou 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 herd from the 10 to 20-year project are unlikely to occur.

8.8 À la Pêche caribou herd

8.8.1 Existing environment

Historical sizes of caribou herds in Alberta are imprecise because caribou distribution was generally contiguous; distinct herds 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 (WWP) and adjacent foothills, i.e., much of the range of the À la Pêche herd). 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 WWP peaked around 1960, at 375–450 animals (Edmonds and Bloomfield 1984).

Caribou numbers in the À la Pêche herd 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 herd 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 herd 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 and al. 2019), indicating that the herd grew by 16% and 12% in those years, respectively. The herd 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 through to present, and the herd 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). The herd is not monitored by behavioural subgroup (mountain-resident, migratory, foothills-resident), but further analyses of the 2018 scat DNA data could provide an abundance estimate for the mountain-resident.

Considering that the herd has grown on average 12% (4.2%–15.7%) since 2016, it is expected that by 2025 there will be well over 200 caribou from which it would be possible to capture and remove females. 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).

8.8.2 Impacts and mitigation measures

Parks Canada could potentially remove 25 to 35 caribou from the À la Pêche herd to help populate the founding herd. Caribou from the À la Pêche herd will be primarily females, plus calves, and two males, biasing toward younger animals (Hebblewhite 2018; Neufeld 2019). Thus, impacts of the project on the À la Pêche herd will occur predominantly during the capture phase to secure source caribou, which will include capturing, handling and transporting caribou by helicopter. Table 12 outlines the potential effects to the À la Pêche caribou herd and mitigation measures.

Table 12: Summary of potential effects to À la Pêche caribou herd and mitigation measures

Activities	Potential impacts	Mitigations
Capture, handling and transport by helicopter	Caribou are likely to be stressed during capture and are at risk of injuring themselves.	• Please refer to Brazeau caribou herd mitigation measures (Section 8.7.2 Impacts and mitigation measures)
	Impacts to the À la Pêche herd's abundance and ecology (removal of adult females, males and calves) in the short term	• Capture caribou over two years or more. • Translocate small numbers of caribou from other wild (e.g.: Brazeau and Tonquin herds), and or captive sources for genetic diversity and to decrease the impact on the À la Pêche herd. • Return founding animals or progeny after captive herd is well established. • 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 recovery of the À la Pêche herd.
	Other animals could be disturbed by helicopter flights when caribou are translocated from the À la Pêche to the breeding facility.	• Follow wildlife flight guidelines and maintain minimum flight elevations of 500 m above ground to mitigate disturbance.
Research, monitoring and adaptive management	Will generate positive impacts	Positive - no mitigation required • Pursue research to quantify potential impact of the loss of local genetics.

Capture, handling and transport by helicopter

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 herd is one population being considered for founding a captive herd. Based on removal scenario

results using matrix population models and informed parameters, the À la Pêche herd, residing in northern JNP, meets the criteria of being locally adapted to mountain environments and genetically and behaviourally suitable.

Preliminary study indicates that it's possible to remove a small number of caribou from the À la Pêche caribou herd without affecting its long term viability (Neufeld and Calvert 2020). In none of the removal scenarios did either of the initial populations reach the quasi-extinction threshold of < 10 mature females (Environment Canada 2014), even under the most extreme removal of up to 31 females from the mountain-resident population (Neufeld and Calvert 2020).

Caribou source modelling (Neufeld and Calvert 2020) indicates that the À la Pêche herd can be considered as a source herd for caribou conservation breeding, but that careful consideration to the impacts is required. Modelling of the impacts of removals demonstrates that removal of 14 animals from only the mountain-resident portion of the herd will be unlikely to result in population declines, but removal of 18 animals could result in declines, with limited recovery if animals are not replaced (i.e. augmentations from the breeding centre). When the larger portion of the herd (mountain-experienced, i.e. including some migratory individuals) is considered, results show that the herd should be resilient to removals of up to 28 animals. Caribou source modelling recommends specific additional best practices to lessen potential impacts of caribou removals, including:

- Return founding animals or progeny to their source herd after a captive herd is established.

- Add 5–10 cows from other genetically appropriate herds to allow development of a captive herd of close to 40 animals within 3 years of initial capture. This will also help improve genetic diversity within the facility and reduce impacts to the À la Pêche herd. For example, using a few females from the Columbia North herd should be strongly considered.

- Slow the establishment of the captive herd to 40 breeding females, by capturing fewer females per year, but over more years. In this analysis, rapid expansion of the captive herd through two captures of À la Pêche caribou and depopulation of the Brazeau herd was examined. A better approach could be to populate the facility with Brazeau and À la Pêche herd captures in year one, assess impacts to the mountain-resident population after removals, identify and mitigate issues in animal management in captivity, and remove additional À la Pêche animals when the herd is considered sufficiently large and robust to withstand those removals.

As a result, caribou captures to populate the conservation breeding facility will occur over at least two 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 herd will therefore include removal of adult females, and also reduction in total number of calves recruited for several years, due to a smaller number of breeding females in the herd (Neufeld and Calvert 2020).

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 herd mitigation measures (Section 8.7.2 Impacts and mitigation measures) for more details.

Given that the À la Pêche herd is transboundary, and that responsibility for the herd is shared with the Province of Alberta, a dialogue with interested Indigenous partners as caretakers of the À la Pêche herd and the Province of Alberta 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 Province of Alberta and Indigenous partners will ensure that recovery of the À la Pêche herd will not be jeopardized.

Research, monitoring and adaptive management
Research, monitoring and adaptive management activities will, overall, generate positive impacts. Parks Canada intends to pursue research, monitoring and adaptive management activities to quantify potential impacts to source herds, including demographics and genetics. Animals from the À la Pêche herd in captivity could serve as an insurance population, preserving genetics and also animals for the future if/when needed (Neufeld and Calvert 2020).

8.8.3 Residual effects and significance – À la Pêche caribou herd

Residual adverse effects to the À la Pêche herd are presented in Table 13. Residual impacts are expected to occur after mitigations, but none are anticipated to cause significant adverse impacts. Consideration and implementation of a combination of mitigations (established best practices of capturing, capturing caribou over two or more years, translocating small numbers of caribou from other sources, etc.) to lessen potential impacts of caribou removals will help the À la Pêche herd experience a positive population growth in the short term to ensure a healthy, stable and sustainable population of woodland caribou in the À la Pêche caribou range.

Table 13: Significance of residual impacts of the project to À la Pêche caribou herd

Activities	Residual impacts	Magnitude
Capture, handling and transport by helicopter	Caribou are less stressed during the capture and are less at risk of injuring themselves	**Negligible** due to following existing and effective best practices established in other caribou breeding programs
	Impacts to the herd's abundance and ecology	Preliminary results indicate **Negligible** due to consideration and implementation of a combination of mitigations to lessen potential impacts of caribou removals. Further review and analysis is needed.

Summary: The À la Pêche herd , due to ongoing wolf control by the Province 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 herd show that removal of approximately ten adult females and two female calves in two subsequent years could be absorbed by the current population (Neufeld and Calvert 2020). As a result, given the above mitigations, significant residual adverse effects to À la Pêche herd from the 10 to 20-year project are considered low, but further review and analysis in collaboration with the Government of Alberta is needed. If, after further analyses, impacts to the À la Pêche herd are considered to be too large and detrimental to the herd, Parks Canada will consider: alternate sourcing strategies; returning a portion of females to the wild after retaining their calves for breeding stock in the facility; or supplementing the À la Pêche herd with calves born in the facility after the Tonquin herd is recovered (Neufeld 2020). Where appropriate, and as advised by Indigenous partners, cultural and spiritual protocols surrounding working with caribou will also be respected.

8.9 Tonquin caribou herd

8.9.1 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 herds of southern mountain caribou. Historical records and Indigenous knowledge indicate that the Tonquin caribou herd was once much larger, but today this herd 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 herd, which is now stable at approximately 52 (49–55) caribou, but with only nine adult females in 2020.

A suite of actions that were meant to cumulatively protect the herd 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 herd 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; 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 highways frequented by caribou.

The Tonquin herd is part of a complex ecological system with many factors combining to impact the herd (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 herd. However, the biggest issue facing caribou at the present time is very low numbers, from which the herd 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 herd size and the low number of females, recovering the Tonquin caribou herd 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 herd.

8.9.2 Impacts and mitigation measures

Parks Canada intends to capture a few animals (to be determined after forthcoming analysis) from the Tonquin herd and release several animals into the Tonquin herd. The benefits of augmenting herds 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 herd of at least 200 is intended, based on the recent decline from 100, and historical values of the herd's size (Neufeld 2019). Modelling potential scenarios contributed to better understanding the implications of varied actions or parameters (Neufeld 2019). Impacts and mitigations are assessed and discussed during the capture and release phases for the Tonquin caribou herd in Table 14.

Table 14: Summary of potential effects to Tonquin caribou herd, and mitigation measures

Activities	Potential impacts	Mitigations
Capture, handling and transport by helicopter from Tonquin to the breeding facility, if considered	Caribou are likely to be stressed during capture and handling, and are at risk of injuring themselves.	• Please refer to Brazeau caribou herd mitigation measures (Section 8.7.2 Impacts and mitigation measures)
	Impacts to the Tonquin herd'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 herd. • Replace individual animals after captive herd is well established through quickest augmentation schedule.
Release: augmentation of recipient herds. Release site fence construction; transport by helicopter; hold translocated caribou at release site in temporary pen for about three weeks	Caribou are likely to be stressed during transportation from the breeding facility to the release site and are at risk of injuring themselves.	• 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.* • Respect Indigenous cultural and spiritual protocols surrounding Indigenous relationships with caribou and the land.
	Post-augmentation survival depression 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 herd. • Ensure vital rates measured/experienced in the wild

Activities	Potential impacts	Mitigations
		herd are conducive to population stability. • Continue to monitor and address main threats contributing to caribou herd decline where appropriate. • Respect Indigenous cultural and spiritual protocols surrounding Indigenous relationships with caribou and the land.
Research, monitoring and adaptive management	Will generate positive impacts	Positive - no mitigation required • Monitor and address ecological consequences of adding captive yearlings and mixing animals from different herds.

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 herd mitigation measures (Section 8.7.2 Impacts and mitigation measures) for more details.

The project proposes capturing a few male animals from the Tonquin herd, and several wild animals from regional herds, to be translocated to the conservation breeding facility over two 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 herd'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 herd is established, through the quickest augmentation schedule, will shorten the impact to the Tonquin herd's abundance and ecology. Caribou source modelling will be run to ensure potential impacts of capture are well understood and can be addressed adequately.

Release: augmentation of recipient herds
Caribou augmentation modelling indicates that the most influential parameter on number of yearlings available for release is adult female survival in captivity (Neufeld 2019). 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 herds. 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 2019). 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 herd. 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 herd will nevertheless experience an upward trajectory (Neufeld 2019). In other words, a 32% annual survival rate of augmented females will result in Tonquin herd 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 herd decline 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, efforts could be shifted to focus monitoring on the newly recovered Tonquin herd to ensure the trajectory remains stable (Neufeld 2019).

Post-augmentation survival depression appears to be 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 survival depression is severe and protracted, recovery of the herd 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).

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, infrequent 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 herds (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.

8.9.3 Residual effects and significance – Tonquin caribou herd

Residual adverse effects to the Tonquin herd are presented in Table 15. 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 herd decline.

Table 15: Significance of residual impacts to Tonquin herd

Activities	Residual impacts	Magnitude
Capture, handling and transport by helicopter	Impacts to the herd's abundance and ecology	**Negligible** due to return of founding animals through the quickest augmentation schedule possible
Release: augmentation of recipient herds	Post-augmentation survival depression minimized to the extent possible	**Negligible** due to soft-releasing and continued monitoring of threats contributing to caribou herd decline

Summary: Removal of a few aminals can have adverse effects, while releasing several aminals is mostly positive. Introduction of captive yearlings into the Tonquin herd will be monitored to detect any changes to the behaviour of wild animals. Ecological consequences of mixing animals

from different herds 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 herd from the 10 to 20-year project are unlikely to occur.

8.10 Wildlife and predator habitat security

8.10.1 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 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." If the proportion of a grizzly bear management unit that is at least 500 m from high human use is greater than 68%, then that unit is considered to be secure. (Management units are approximately the size of a female grizzly bear's home range.) 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 Draft Management Plan, JNP aims to maintain or improve grizzly bear habitat security within the park. If the proportion of secure habitat in a grizzly bear management unit is greater than 78 percent, 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 percent, then that unit is considered to be secure, but *of concern*. 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 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).

8.10.2 Impacts and mitigation measures

Potential adverse effects on wildlife and grizzly bear habitat security VCs could occur due to breeding facility construction and the capture, breeding, release and monitoring phases of the project. Table 16 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 16: Summary of potential effects on wildlife and predator 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	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 season. • Conduct birds and small mammal surveys to avoid bird nests and ground-dwelling mammals prior to construction if necessary. • Ensure temporary laydowns are free of bird nests and small mammals. Relocate laydowns if necessary
	Potential displacement or alteration of wildlife movement patterns from sensory disturbance	• Conduct construction activity according to project hours, avoiding critical foraging times (dusk and dawn).
	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 and adjacent areas in tidy condition, free from the accumulation of construction waste products, debris and garbage.
	Decreased grizzly bear habitat security 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. • Make reasonable effort to limit total number of human events on trails and roads in the breeding facility area to not exceed 100/month. • Conduct construction activity according to project hours, avoiding critical foraging times (dusk and dawn).
Capture, handling and transport by helicopter	Wildlife disturbance from helicopter flights when caribou are being captured and translocated	• Please refer to Brazeau caribou herd 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	• Work outside of bird nesting season. • Conduct bird and small mammal surveys to avoid bird nests and ground-dwelling mammals prior to construction if necessary.
	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.
	Exclusion of large mammals from soft-release sites	• Ensure fences are in wildlife-permeable mode or are taken down whenever caribou are not present at release sites.
	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 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. Implementation of pre-construction surveys are expected to minimize these effects. Small mammal surveys, including for ground-dwelling mammals, will be conducted prior to construction to determine species presence. 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 and project hours.

Capture, handling and transport by helicopter
Wildlife will be disturbed from helicopter flights when caribou are being captured and translocated from Brazeau, À la Pêche and Tonquin herds 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 to exclude other wildlife. 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; Killeen et al. 2016; Paige 2015). However, certain types of fences allow for the passage of wildlife. Fences will be in wildlife-permeable mode (or will be taken down) whenever caribou are not in the release sites. No one fence design will adequately meet the opposing objectives of preventing caribou dispersal while still allowing for free passage of other large wildlife, or without having impacts on caribou survival in the pen. As a result, implementing an adjustable design will be considered to allow the deployment of the fences into the release sites when needed, while minimizing the amount of time fences are in caribou-holding mode, so as not to disrupt the movement of other animals.

It is difficult to foresee whether wolves may learn to exploit captive caribou in JNP, and if it may take many years. Once they do, their effect on captive caribou numbers may still be limited, but continued monitoring of wolves throughout the implementation of conservation breeding will be imperative. 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.

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.

8.10.3 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 17). 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 17: Significance of residual impacts of the project on wildlife and predator habitat security

Activities	Residual impacts	Magnitude
Breeding facility construction	Disturbance of nesting birds and small mammals	**Negligible** due to pre-construction surveys to determine presence or absence of bird nests and small mammal dwellings and avoidance of exclusion zones
	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;	Temporary exclusion of large mammals from soft-release sites	**Negligible** due to local geographic extent, reversibility after three weeks, and small area

Activities	Residual impacts	Magnitude
holding caribou at the release site	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 and predator habitat security from the 10 to 20-year project are unlikely to occur.

8.11 Species at Risk

There are three Species at Risk that are currently listed as Endangered or Threatened under Schedule 1 of SARA (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 highly important to the survival of bats (e.g.: little brown). It is also highly important to 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 is not considered to be critical habitat. No further assessment of this species will be included in this DIA.

8.11.1 Existing environment

Olive-sided Flycatcher

The Olive-Sided Flycatcher is provincially listed as May Be at Risk (AEP 2019) and federally listed as Threatened under Schedule 1 of SARA (Government of Canada 2019). 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 2007).

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 2000; 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 2000). 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 SARA.

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 *SARA* in 2014 (Government of Canada 2019) 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 (EC 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 (EC 2015). Critical habitat for Little Brown Myotis was identified in JNP near the Miette area, northeast of Jasper (EC 2015).

8.11.2 Impacts and mitigation measures

Potential adverse effects on Species at Risk could occur predominantly during the breeding facility construction phase of the project. Table 18 presents the summary of potential effects on Species at Risk, along with mitigation measures proposed to avoid or reduce these potential effects.

Table 18: 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 24) • If vegetation clearing during the migratory bird nesting period cannot be avoided, conduct pre-clearance surveys by a qualified professional biologist to identify any active nests or nesting behaviour protected under the MBCA and establish appropriate mitigation such as exclusion zones wherever possible. • 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 contact 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). • If vegetation clearing during the bat active season cannot be avoided, avoid 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). • Protect larger trees (>25 cm dbh) that could be used as maternity roosts.
	Sensory disturbance (Olive-sided Flycatcher , Common	• Design the project to minimize or remove traffic and sensory

Activities	Potential impacts	Mitigations
	Nighthawk and Little Brown Myotis) resulting in loss of habitat and displacement	disturbance within Zone II – Wilderness area.

Breeding Facility Construction

Olive-sided Flycatcher and Common Nighthawk

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 (EC 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 (EC 2016).

The Species at Risk Guidance for birds (December 2021) will be followed. Vegetation clearing will 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 MBCA 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 Species at Risk Guidance for bats (December 2021) will be followed. To avoid any accidental mortality during the breeding facility construction, vegetation clearing will 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. For protection of non-volant pups, vegetation clearing during this time will be strongly 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; however, it is recommended to protect larger trees (>25 cm dbh) that could be used as maternity roosts. In addition, the breeding facility will be designed to minimize traffic and sensory disturbance within Zone II –Wilderness area.

8.11.3 Residual effects and significance

Residual adverse effects on Species at Risk are presented in Table 19. Residual impacts are expected to occur, but none are anticipated to cause significant adverse impacts.

Table 19: 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.

8.12 Indigenous values and connection to caribou

8.12.1 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 2022). 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 2022).

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 2022). 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 2022).

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 knowledges and languages into park initiatives, and have more employment and economic opportunities for local Indigenous communities (Parks Canada 2022).

8.12.2 Impacts and mitigation measures

Adverse effects to Indigenous values and connection to caribou may occur during the capture, breeding and release phases of the project. Table 20 presents potential effects on Indigenous values and connection to caribou and corresponding mitigations proposed to avoid or reduce these potential effects.

Table 20: Summary of potential effects on Indigenous values and connection to caribou, and corresponding mitigations

Activities	Potential impacts	Mitigations
Capture: securing source caribou Breeding: animal husbandry and care Release: augmentation of recipient herds	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 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 engage to identify and address potential impacts to intangible Indigenous values. • Continue to implement engagement programs with Indigenous partners to ensure concerns, interests and participation are effectively incorporated into all phases of project.

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, 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 2022).

8.12.3 Residual effects and significance

Residual adverse effects on Indigenous values and connection to caribou are presented in Table 21. Parks Canada anticipates that some Indigenous partners will be supportive of the project, other Indigenous partners may have concerns with the approach selected to recover the Tonquin caribou herd, including concerns with being involved with the project, its benefits and alignment with their values.

Table 21: 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 herd.	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 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 discuss with Indigenous partners during the consultation process to ensure residual adverse effects of the project on Indigenous values and connection to caribou are well understood and can be addressed adequately.

8.13 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 VCs is not focused on the winter closure and other measures already implemented. The assessment 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. It should also be understood that there is no plan to expand the winter closures or implement summer use restrictions in addition to what is currently implemented.

The project area is 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.

8.13.1 Existing environment

One of the defining features of the project footprint, including the breeding facility and soft-release sites, is its 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 (Parks Canada 2020).

Tonquin Valley (release sites)

In addition to seven backcountry campgrounds, there are 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), an Alpine Club of Canada hut near Chrome Lake, and a Parks Canada patrol cabin (Parks Canada 2020). The majority of visitor use in the valley is concentrated in the Amethyst Lake area, with a total overnight capacity of 150 visitors per night in the summer. A recent upsurge in backcountry use in the Tonquin Valley mirrors park-wide increases in backcountry use (Parks Canada 2020). Wet conditions in the Tonquin'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 2020).

No motorized access is permitted in the project area. Summer access in the Tonquin Valley is mainly by foot and horseback (licensed outfitters only). Mountain biking and private horse use is 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 in the project 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 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 used for cross-country skiing/snowshoeing and is part of the current winter offer.

8.13.2 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 22 presents potential effects on wilderness character and visitor experience opportunities, and corresponding mitigations proposed to avoid and/or reduce these potential effects.

Table 22: 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. • Clearly communicate to potential visitors that the short-term increase in staff presence is an investment towards greater wilderness values and ecological health. • Maintain a vegetated buffer between the facility and the Geraldine Fire road. • 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.	• Clearly explain to potential skiers and visitors that Geraldine Fire Road plowing is an investment towards greater wilderness values and ecological health. • Explore trail reroute or plow narrower section of the road.
Release: augmentation of recipient herds	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. • Consider taking down fences when caribou not in release sites. • 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 when it is absolutely necessary. • Consider limiting camping during high helicopter use periods (days of the release, resupply flights) and inform visitors of helicopter use at booking. • 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 road regularly and access may be temporary limited during construction. In addition to traffic, noise should be expected at the site during the construction period. During the operation of the facility, a few 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/snowshoeing, will be plowed. To minimize impact on winter users, mitigation measures such as plowing a narrower section of Geraldine Fire Road or exploring trail reroute will be considered. Short-term increase in staff presence and traffic will be clearly communicated to potential visitors as an investment towards greater wilderness values and ecological health. 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 as soon as feasible.

Release: augmentation of recipient herds
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. As such, 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 permits 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. Fences could also be taken down when caribou are not in the release sites. 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, helicopter will be use when it is absolutely necessary and limited during high visitation periods, and the Helicopter Flights Guidelines will be followed.

8.13.3 Residual effects and significance

Residual adverse effects on public and visitor experience opportunities are presented in Table 23. Residual impacts are expected to occur, but none are anticipated to cause significant adverse impacts.

Table 23: 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	**Low** due to decommissioning and restoration of the breeding facility site although impacts on snowshoes /skiers using the Geraldine Lakes Fire Road might be long-lasting and a small geographic extent.
Release: augmentation of recipient herds	Curiosity to see caribou in the wild	**Low** 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 two horse outfitter operations, seven campgrounds and an Alpine Club of Canada hut. There is currently no plan to increase access restriction in the winter or 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, low in magnitude, from the 10 to 20-year project are anticipated.

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 historically. 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); and
    - Cavell Road/Parking Protection (2015).

- Present projects and actions:
    - use of existing trail network by visitors and both commercial and horse outfitters.

- Future actions and projects:
    - caribou augmentation beyond the 10-20-year project (should it occur);
    - other activities/developments unlikely, given the wilderness zoning and grizzly bear habitat security goals and the non-motorized policies: winter closure length and over-snow vehicle use will be considered to improve conditions for caribou recovery in the Tonquin Valley;
    - 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 horse use on vegetation, species at risk, visitor experience and assets in the Tonquin Valley and associated trails will be reviewed (Parks Canada 2020).

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 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 weeds were observed during the rare-plant survey of the breeding facility footprint, the past practice of importing hay to feed Parks Canada's and outfitters' horses may have led to the non-native plant infestations in the project area. 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 use by outfitters will be reviewed the Licence of Occupation (LOO) expires in 2026.

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 contribute a negligible impact on non-native vegetation. 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 area is wilderness with no development beyond a small network of non-motorized trails. 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 and predator 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 2020). 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 this wilderness-zoned portion 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 project area except for the possible continuation of the breeding facility, should longer-term caribou augmentation proceed.

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 project 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 EPP, 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 0% 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 24.

Table 24: 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 (augmentation zone)	• Number and duration of excursions outside augmentation zone	• No caribou excursions outside augmentation zone	Ongoing monitoring of all 10 to 20-year measures
Fences for caribou may affect the movement of other wildlife	• Percentage of time fences in caribou-holding vs. wildlife-permeable mode (days/yr).	• Release site fences will collectively be in caribou-holding mode <5% of the time.	Ongoing assessment of % time fences in caribou-holding mode.

Issue	10 to 20-year monitoring measures	10 to 20-year project performance measures	Longer-term monitoring measures
	• Safe passage 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.	
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 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 • Use of roads/trails remains at <100 events/month	• Continue to monitor helicopter use. • Ongoing monitoring of human use and grizzly bear habitat security
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 weeds.			

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 (EPP) 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 EPP is typically completed by the selected contractor. The project-specific

EPP 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.

- A signage plan 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

Some components of the project are currently at a conceptual level, including soft-release strategy, fence design, caribou translocation methods, on-site management, caribou food supplementation, etc. 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 likely project effects will be possible.

12. Conclusion

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 DIA assessed potential environmental impacts of the project in the context of potential biodiversity and future ecological gains. Should the Tonquin caribou herd 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 heal broken connections 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. One could argue that 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 and cultural integrity and Parks Canada's mandate.

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