

2017AFSAR2947

# Towards a Multi-Stakeholder Approach For Caribou Population Management in the Cold Lake Air Weapons Range



Sean Konkolics (University of Alberta)

Findlay MacDermid (Cold Lake First Nations)

Nicole Nichols (Cold Lake First Nations)

September 29<sup>th</sup>, 2018

## Executive Summary

This project focused on learning more about wildlife management strategies that are likely to be considered and employed in caribou recovery and how CLFN could be involved in implementation of wildlife management. This report lays a foundation for caribou population and predator alternate prey management by combining review of the scientific literature with knowledge and input from CLFN members gained through a two-day engagement session and through one-on-one interviews. The engagement session consisted of a two-day event held at Cold Lake where First Nations, governments, NGO's and academics gathered to share perspectives on the problems associated with caribou recovery. Based on information gained through these activities, an analysis of various management strategies is presented in this report, accompanied by recommendations on how CLFN can operationalize the techniques for wildlife management.

The report includes an academic review of the science-based literature, the intent of which is to provide more detailed information to leaders in Cold Lake First Nation (CLFN) about conservation initiatives and CLFN's capacity for involvement with caribou recovery programs. The goal of the review was to determine, from an academic perspective, what the successful elements of a predator and alternate prey control program are and how they could be operationalized on the Cold Lake Air Weapons Range (CLAWR). Additionally, the review compared maternal penning fencing strategies for woodland caribou.

A summary of the two-day engagement session follows the literature review, including highlights of discussion on key topics. The session was hosted by CLFN on March 20 and 21, 2018 at Le Goff and included presenters from a variety of governmental (including First Nations governments), academic, non-governmental organizations on caribou conservation. The content of the session included restoration as well as policy and planning, predator and alternate prey management. The session was well attended by community members and there was excellent and sometimes heated discussion about the issues, in particular wolf control. Overall, this session allowed for the sharing of perspectives, knowledge and increased understanding among all parties that participated.

In January 2018 CLFN conducted interviews with 14 CLFN members, including Elders and current harvesters, to collect information about caribou populations, habitat use, alternate prey, alternate prey control measures and predator management. This report presents only a brief summary of key findings pertaining to wildlife management strategies that are likely to be considered and employed in caribou recovery. These findings include key information about caribou presence and use in areas outside the current Environment and Climate Change Canada herd boundaries, information on predator control methods, and methods for alternate prey control. A separate, more detailed report that included indigenous knowledge, was produced specifically for the Alberta Range Planning Process.

The final section of this report combines the above information in an analysis of various wildlife management strategies and provides program recommendations on wildlife management. This analysis focuses on penning, predator control and alternate prey population control. The

analysis of each takes monitoring, methods and access requirements into account. Key findings are :

- More work is required to address technical issues and community concerns regarding various strategies, in particular predator control and maternal penning;
- It is prudent to move ahead with temporary maternal penning in a pilot project and potential sites were identified but feasibility studies are required;
- CLFN members support predator control programs and alternate prey that can integrate and support direct CLFN involvement in trapping and provide socioeconomic benefits through appropriate use of the carcasses of culled animals; and,
- A critical stumbling block for all management strategies is CLAWR access.

While there is a great need to move ahead with these strategies, it is unclear if or how the access issue can be resolved. Further engagement with 4-Wing is necessary.

## Table of Contents

Executive Summary .....	2
Acknowledgement and Thanks .....	5
1 Introduction .....	7
2 Literature Review.....	9
2.1 Introduction .....	9
2.2 Status of Woodland Caribou in Northeastern Alberta .....	10
2.3 Predator Management .....	10
2.4 Wolves.....	11
2.5 Black Bear .....	13
2.6 Apparent Competition Management.....	13
2.7 Moose.....	14
2.8 White-tailed Deer .....	14
2.9 Beaver Trapping .....	15
2.10 Maternal Fencing Facilities.....	15
2.10.1 Chisana Herd, YT .....	16
2.10.2 Little Smokey Herd, AB .....	16
2.10.3 Klinse-Za Herd, BC.....	17
2.10.4 Columbia North Herd, BC .....	17
2.11 Planning and Building .....	18
2.11.1 Fencing Site .....	18
2.11.2 Caribou husbandry.....	19
2.11.3 Monitoring.....	19
2.11.4 Post-pen monitoring.....	20
2.12 Conclusion.....	21
2.13 Literature Cited .....	22
3 Report From the Community Engagement Session.....	27
3.1 The Klinse-Za Maternal Penning Facility .....	27
3.2 Predator and Alternate Prey Control .....	30
4 Focused Indigenous Knowledge Interviews .....	30
4.1 Caribou Occurrence Relative to ECCC Range Polygon .....	31
4.2 Predator Control Methods.....	32
4.3 Methods for Alternate Prey Control .....	32

5	Proposed Management Strategies .....	32
5.1	Introduction .....	32
5.2	Penning .....	32
5.2.1	Temporary Maternal Penning .....	33
5.2.2	Permanent Caribou Penning.....	33
5.2.3	Analysis of the proposed methods.....	33
5.2.4	Site Selection .....	35
5.3	Recommendations.....	35
5.4	Predator Control .....	36
5.4.1	Monitoring.....	36
5.4.2	Methods .....	36
5.4.3	Access Requirements .....	37
5.5	Recommendations.....	37
5.6	Alternate Prey Population Control.....	37
5.6.1	Methods for Beaver .....	38
5.6.2	Methods for Deer .....	38
5.6.3	Access Requirements .....	39
5.6.4	Monitoring.....	39
	Recommendations.....	39
	Appendix 1: Community Engagement Session Report.....	41
	Appendix 2: Klinse-Za Maternal Penning March 2018 Update .....	42
	Appendix 3: TLU Interview Guide .....	1

## Acknowledgement and Thanks

The authors of this report would like to acknowledge the following people and groups who have contributed to the report – either directly or by making it possible through their support:

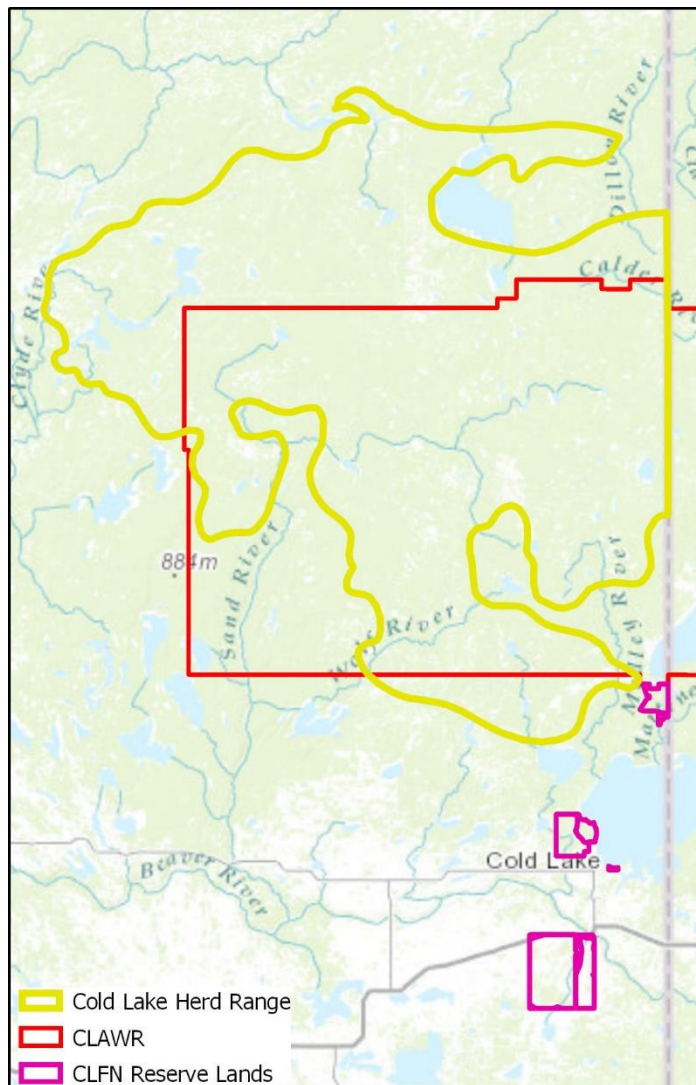
- ❖ The Elders and Land users at CLFN who gave so much of their knowledge and time
- ❖ CLFN Chief and Council as well as the Access Committee who set the path for us to follow
- ❖ The CLFN community members who came out to engagement sessions and shared perspectives.
- ❖ The guests who came for our engagement sessions and were so generous with their time. In particular Naomi Owens (Saulteau First Nation) and Tamara Dokkie (West Moberly First Nation) who traveled so far to share their experience.

- ❖ Rene Lapointe, Solange Nadeau, and Marie Anick Liboiron from Canadian Forest Service for their help and support with the workshop and many other projects not covered by this report.
- ❖ Stan Boutin, Rob Serrouya, and Sean Konkolics from the University of Alberta for sharing their knowledge and experience.
- ❖ Monica Dahl from the Alberta Government's Caribou Range Planning team for being so open and supportive of CLFN in the Range Planning Process
- ❖ Carmen Callihoo-Payne at ECCC for helping us fumble through the financial forms.

# 1 Introduction

The Cold Lake Air Weapons Range (CLAWR) contains approximately 60% of the recognized Cold Lake Caribou Herd Range as well as some of the least disturbed habitat for the herd. The Cold Lake Caribou herd is classified as “not self sustaining” by Environment and Climate Change Canada. Alberta currently is in the process of developing a range plan as required by the Federal Recovery Strategy. This plan will likely involve management of wildlife populations including wolves, caribou, and alternate prey (bear, deer, moose, beaver etc.) (see Alberta 2017). Wildlife management of this type impacts Cold Lake First Nations (CLFN) Treaty and Aboriginal Rights so it is essential that CLFN consider how to respond and build capacity to participate. The objective of this report is to define how wildlife population management tools can be deployed in the CLAWR by CLFN and what would be required from an operational standpoint to ensure they are effective.

CLFN has been working on the complex problem of caribou recovery closely with Alberta and industry and there have been barriers to progress as a result of issues related to access to the herd range within CLAWR. Wildlife management and monitoring in the CLAWR has historically been limited because the area is a restricted military facility and access to the ground and airspace is controlled by the Department of National Defense (DND). CLFN has an Access Agreement with the Federal Government and the governments of Alberta and Saskatchewan that allow the Nation and its members to access the CLAWR, subject to



conditions, to practice Treaty rights, traditional uses, and other uses. These include access for the purpose of environmental protection as described in the following articles of the agreement:

5.3 All of the parties recognize that protection of the environment of the Alberta portion of the Range is a matter of mutual concern and they agree to work together to protect the environment having regard to the impact on the environment caused by normal military operations.

5.4 The protection of the environment and of heritage resources are subjects which the parties may discuss at meetings of the Advisory Committee referred to in Article 9.2.

9.4 The parties may discuss of the meeting the protection of the environment of the Range described in Article 5.3, including the Alberta Boreal Caribou Research Program and other conservation issues.

While the Access Agreements provide a vehicle by which CLFN can collaborate with the Federal Government on caribou recovery within CLAWR, progress has been limited due to lack of clarity on where the responsibility for addressing the caribou issue lies within the Department of National Defense. The original intent of this project was to work with DND to co-construct a path towards constructive wildlife management on the CLAWR in order to overcome barriers to progress. Upon project commencement, DND chose not to participate and the project proceeded without their involvement.

This project focused on learning more about wildlife management strategies that are likely to be considered and employed in caribou recovery and how CLFN could be involved in implementation of wildlife management, integrating science-based literature and the knowledge and views of CLFN members. The particular research and engagement activities included:

- An extensive academic review of the scientific literature (completed and current to January 2018);
- A two-day forum, hosted in March 2018, that gave community members an opportunity to interface with caribou recovery experts from other First Nations, academia, and the federal and provincial governments; and,
- Focused one-on-one interviews with knowledgeable CLFN members including Elders and harvesters, which occurred January 2018.

This report integrates the results of these activities and concludes with some recommendations on how CLFN can move forward with wildlife management in the CLAWR. As a result of this project, CLFN has obtained a solid scientific foundation for wildlife management that will be invaluable for caribou recovery and other areas of interest to CLFN.



## 2 Literature Review

### 2.1 Introduction

In the past century, caribou (*Caribou rangifer tarandus*) populations across Canada are threatened by human disturbance. Decreases in suitable habitat have caused the Canada-wide caribou population to plummet (Hummel and Ray 2008). Environment Canada has required that all provincial governments with threatened caribou populations establish range recovery plans by October 2017. In response, the Alberta Government created draft range plans for two woodland caribou herds and had plans to release proposed range plans for all other Albertan herds by December 2017. Drafted range recovery plans have included strategies such as preservation of critical habitat, reclamation of prior disturbances, increased alternate prey hunting, maternal fencing and predator control. These strategies are likely to be considered as part of any future range plan in Canada.

The intent of this literature review is to provide more detailed information to leaders in Cold Lake First Nation (CLFN) about conservation initiatives and CLFN's capacity for involvement with caribou recovery programs. Specifically, the review will determine what the successful elements of a predator and alternate prey control program are and how they could be operationalized on the Cold Lake Air Weapons Range (CLAWR). Additionally, this review will compare maternal penning fencing strategies for woodland caribou. The goal is to proactively support CLFN's current conservation efforts in crafting a fully formed, technically sound, and operationally viable plan.

The benefit of incorporating traditional ecological knowledge (TEK) into conservation efforts is clear, particularly when academically researched information may be difficult to obtain or unavailable (Schmidt and Stricker 2010). Many holders of TEK spend a significant amount of time on the land in areas where large-scale research projects have limited access. This gives TEK an intimate view of the ecological mechanisms and systems taking place in these remote areas. TEK has been successful in providing information into many aspects of wildlife biology, including species ecology (Ramstad 2007), baseline observations, and historical distributions (Ferguson and Messier 1997). TEK provides essential information to wildlife managers, informing the scientific process in difficult research environments. In addition to the viability of TEK in conservation efforts, the Species at Risk Act (SARA) requires both western and traditional science methods be used.

Caribou in northeastern Alberta have been notoriously difficult to study because of factors like widespread distribution, large ranges, their reclusive nature, and problematic access to the boreal ecotypes preferred by caribou. Yet, CLFN has spent generations accumulating TEK on these animals. The inclusion of CLFN's knowledge in Alberta's future conservation efforts will be pivotal. CLFN has the tremendous opportunity to engage and deliver the tangible actions of range plans throughout Alberta. Northeastern Alberta provides the unique opportunity for rights-holders, including CLFN, to join together to support efficient and effective caribou conservation efforts.

## 2.2 Status of Woodland Caribou in Northeastern Alberta

The populations of woodland caribou in Northeastern Alberta face several factors impacting their persistence. Throughout Alberta, human-induced habitat degradation from increases in forestry, gas and oil exploration, mining, and human sprawl have led to deterioration of caribou habitat. Additionally, these human-modified landscapes have increased primary prey, moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*) populations, which in turn increased predator, wolf (*canis lupus*) and black bear (*Ursus americanus*) populations, subsequently increasing the incidental take of caribou, a phenomenon known as apparent competition (Wittmer 2013). Moose and white-tailed deer prefer young forests, including areas with ground and low bush foraging species. (Seip 1992, Serrouya 2011) These habitats are typical in human disturbed areas such as well pads, seismic lines, pipelines, forestry cut blocks, and other resource extraction disturbances. This wide spread habitat transformation is the initial driver for shifts in predator-prey dynamics of the region, resulting in unsustainable predation pressure on caribou.

The increased predation pressure on caribou is having an immediate impact. Predation by wolves and other predators has always been the most common reason adult caribou die (James 1999). In five northeastern Albertan herds, 52% of adult mortality resulted from predation (McLoughlin 2003). Furthermore, Alberta herds have low calf recruitment, or the number of calves that survive into adults the following year, even though the five largest herds in northeastern Alberta have pregnancy rates between 90-100%. Further, spring birth of calves continued to be high: 70-95% of the pregnant females seen with a calf on heel just after the calving period (McLoughlin 2003). Alberta's calf recruitment rate of only 20 calves per 100 cows is lower than that of similar caribou herds with stable populations in neighboring provinces. This implies the increase of predators in the region is having a significant impact on the herd's ability to grow.

Most biologists agree the long-term recovery of woodland caribou requires extensive habitat restoration and protection. However, there is also consensus that if short term strategies are not implemented to stave direct mortality rates of adult and juvenile caribou, populations will not persist long enough to encounter a recovered landscape. Caribou recovery should consist of a three-period action plan with the near-term focusing on emergency recovery measures to stop immediate declines, the mid-term focused on habitat reclamation and limit new development, and the long-term focused on recovery and protection of critical caribou habitat (McNay and Sittler 2013). The intention of this review is not to debate on which term of recovery is most vital but to further discuss near-term solutions to keep caribou from becoming immediately extirpated from the region.

## 2.3 Predator Management

Wittmer et al. 2013 reviewed conservation strategies for several predator-prey systems affected by apparent competition, including huemul deer (*Hippocamelus bisulcus*) and island foxes (*Urocyon littoralis*), as well as the caribou-moose-wolf issue in Alberta. The authors propose three effective strategies (1) reduction of predators, (2) reduction of apparent competition species, and (3) combined reduction of both predators and apparently competing species. Examples utilizing the strategy three proved to be the most effective in recovering the population of the species of concern. Aspects of strong implementation practices included

assessing current population densities and trends, reducing numbers by the appropriate amount, efficient and humane removal methods, continued or long-term removal pressure, and continued monitoring after removals. Below will attempt to describe these important steps for several species, whose reduction could benefit caribou herds in Alberta. The primary species of concern are wolf (primary caribou predator) and moose (apparent competition). Yet, research suggests several other species also play an important role in the predator-prey dynamics of caribou and should simultaneously be considered for reduction to create a landscape most conducive to caribou recovery. After review, black bears arise as another potential predator, while white-tailed deer and beaver (*Caster canadensis*) continue to be central in wolf diets with the potential to sustain high wolf densities.

## 2.4 Wolves

Decreasing wolf populations has a stabilizing effect on caribou survival (Seip 1992, Herviux 2014, Hayes 2003). Eighty-four wolves were removed from the Little Smokey caribou range (LSM) over seven years and the herd population growth increased from .95 to .99, effectively stabilizing this herd (Herviux 2014). Similarly, in the Yukon, there have been four major wolf control programs (Finlayson, Aishihik, Southern Lakes and Fortymile herds) each implementing sequentially more progressive methods, such as non-lethal removals and fertility control (Farnell 2009, Hayes 2003). These programs have not created rapid increases in caribou numbers, but have stabilized herds and shown more positive trends than herds where predator control was not implemented. To estimate pre-reduction annual wolf numbers, fixed wing aerial censuses are used to complete track surveys during the winter. With ideal snow conditions, observers locate wolf tracks then forward-track until trails until sighting the pack, obtaining a minimum estimate of pack size and density in the study area (Hayes and Harestad 2000). Other studies have utilized camera traps to estimate densities, however, this still requires marked individuals from aerial net gunning and air time. Past reductions have decreased wolf densities between 45%-80%, with reductions of 70%-80% resulting in higher response of short-term caribou population increases (Boertje 1996, Hervieux 2014, Hayes 2003).

Lethal aerial methods have been the most widely used method of reducing wolf numbers. Wolf packs are located in mid-winter from helicopter and one or more wolves per pack are radio-collared using net-gunning techniques. From the air, sharp shooters lethally remove all remaining members of each pack throughout the winter. Aerial removals are typically conducted over a five-year period and over a large enough area to eliminate the entirety of packs within the peripheral range of caribou herds. Aerial gunning is efficient in dense and difficult landscapes and is also effective at eliminating all animals of a single pack. During the LSM wolf management experiment (2005-2011) aerial gunning was able to remove 82.7 wolves/per year (Hervieux 2014). This method though, is highly controversial, often attracting negative attention from the public and animal rights advocates. Additionally, as programs are usually government run and require a small group with specialized skills this removal strategy is limited in the ability for local community involvement.

Wolf trapping and hunting from the ground could supplement organized aerial gunning operations. Currently, trapping for wolf pelts is unsustainable as the cost of trapping cost more than the fur products are worth. In other provinces, incentive programs have been used to help subsidize the trapping costs. The government of NWT currently offers monetary options to

increase wolf harvest: (1) \$200 for intact wolf (2) \$400 for wolf pelt skinned to tradition standards (3) up to \$800 for wolf pelt skinned to Genuine Mackenzie Valley Fur auction standards (Sahtu Renewable Resources Board 2016). However, incentive programs have proven ineffective for large scale management of populations. Traditional methods of trapping remove fewer wolves than aerial wolf removal programs and often fail to accomplish chosen levels of wolf reduction, particularly in areas with difficult landscapes and limited access (McLaren 2016). During the LSM experiment, trappers were able to remove 15.4 wolves/year (Hervieux 2014). Two large scale incentive programs in the NWT and Yukon failed to reduce wolf densities, effectively ending the programs after just a few years (McLaren 2016). Trapping may be an option to promote community engagement and supplement areas of aerial reduction programs, but reports show they are limited in their ability to achieve significant large-scale reductions of wolf abundance.

North America has a long history of poisoning wolves, particularly by ranchers and farmers at the turn of the century to protect livestock. However, more recently, there have been only a few poisoning efforts to reduce wolves. Hervieux 2014 utilized strychnine to kill 22 wolves per year to test whether wolf reductions could have positive effects on caribou survival. It should be noted this research was met with major backlash from the public and science communities. Proulx 2016 argued poisoning is inhumane to wolves causing a painful death, violates animal welfare guidelines, and is non-selective causing unnecessary death of a variety of bycatch.

Non-lethal sterilization of dominant breeding pairs has been used in conjunction with previously mentioned reduction methods. Because of this, success of sterilization has been difficult to assess. Farnell 2009 discusses several cases where sterilization was used in the Yukon for the purpose of recovering the Aishihik and Fortymile caribou herds. In both studies, dominant breeding male and female wolves were captured and sterilized. Sterilized pairs maintained pack dynamics and pack territories, while the caribou herds experienced population growth. More recently, sterilizing the dominant pair and removal of subordinate individuals from most packs in the Quesnel highland area of BC, led to the stabilization of wolf populations at low densities (McLaren 2016).

Wolf reduction programs consistently report: (1) Population declines are arrested during wolf control years effectively stabilizing herds, but there is little evidence for complete reversal or population trajectories towards increasing populations; (2) Wolf populations substantially recover between wolf cull periods and rapidly return to pre-reduction densities after culling programs end. Wolf populations can incur mortality of 50% yet quickly rebound when reduction programs end (Fuller 2003, Murray 2010, Webb 2011); and, (3) Caribou herds return to declining numbers after wolf reductions cease and wolf populations recover. Functionally, wolf culls have shown to be effective as a short-term stabilization method for caribou herds but without continuous application wolf populations quickly recover. A significant hurdle with predator control is the ability for predators to return to pre-removal levels very quickly. Creating the need for continuous control programs that can be costly and logistically difficult.

Successful removals have utilized aerial gunning to obtain drastically decreased wolf numbers. If wolf control is utilized then a comprehensive effort needs to be completed, otherwise there will be little positive effect on caribou and efforts will have been wasted. Although, air time will likely

be necessary for a strong removal effort on the CLAWR, integrative methods involving CLFN members could be a resourceful way to limit the amount of air time necessary. Additionally, traditional knowledge and live trapping could be used to deploy collars for preliminary research without the need for aerial access. This could create a knowledge base that allows airtime to be efficient with more directed flight routes. Regardless, these difficulties provide a unique opportunity for CLFN to play a key role in caribou conservation. The community's trappers could provide the yearly pressure on furbearer populations required to sustain lower wolf numbers. If the CLFN were to implement a variety of strategies with trapping efforts, caribou population recovery could benefit.

## 2.5 Black Bear

Management strategies for recovering caribou populations should consider other predators rather than focusing only on wolves (Latham 2011). Although wolves are responsible for most caribou mortality, black bears have been identified as an effective predator of caribou calves (Mahoney 1990, Seip 1991, Ballard 1994). Unfortunately, no current research has tested the direct link between increased black bear densities and lowered calf survival at the population scale.

However, black bear density could be evaluated, and population reduction could be considered for the recovery of caribou. Although, preliminary research would need to be conducted to estimate black bear numbers and caribou demographic response to varying bear densities. Estimating densities of black bears is difficult as the species is solitary and more cryptic than wolves. The most common method of estimating black bear density is to use hunting records. Where records are unavailable or inconsistent, other methods include collaring, camera traps, and DNA hair snares. For accurate density estimates it would be ideal to have a combination of both collared animals and hair snares or camera traps to correct for open population and unmarked individuals, but large-scale hair snare methods have been shown to give sensible density estimates (Obbard 2010, Boersen 2003). The only available examples of black bear removals are small-scale individual-level removal of nuisance bears from areas with high human traffic and the potential for human-wildlife conflict. Hunting is the most tested and proven method of regional lethal black bear management, with success stemming from both the ability to bait animals and the public interest to hunt charismatic fauna.

Concerning Alberta's conservation efforts, CLFN may see fit to support an increase of regional hunting permits to spread interest to hunt black bear in the Cold Lake region. Additionally, on the CLAWR, where the public would not have access to sport hunt, CLFN members could engage in increased hunting efforts. It's noted though, limited road access in the region may inhibit members to distribute increased hunting pressure evenly across the entire range.

## 2.6 Apparent Competition Management

Management of apparent competitors should be executed in conjunction with predator reductions because the consecutive decrease in predator numbers can lag behind reduction of the alternate prey species. With less prey available on the landscape, the predators could potentially switch to the secondary prey species, reducing its numbers. For example, if moose are removed from the landscape and wolf abundance does not immediately decline, then the remaining wolves will target caribou as a food source. Further \reduction capabilities for three

species that have been shown to be important food resources for wolves in the region are discussed below. Moose, white-tailed deer, and beaver have all been increasing in abundance within northeastern Alberta and supporting evidence shows that they all have the potential to sustain wolf populations.

## 2.7 Moose

Using a Before-After Control-Impact experimental design moose reduction feasibility and effectiveness was tested in the mountains of southern BC. In a treatment area, moose hunting permits were increased 10-fold for 2003-2005, across 6500 square kilometers (km) of mountainous terrain. Moose survival, wolf survival and dispersal, and caribou survival and recruitment were all recorded to measure the effects of reduced primary prey in the system. Results showed the moose population declined by 70%, wolf numbers declined, and wolf dispersal rates were 2.5 times greater. Consequently, caribou survival increased from .78 to .88 and recruitment was unchanged, effectively stabilizing a large subpopulation of caribou in the treatment area (Serrouya 2017). Authors described the caribou population stabilization comparable to predator control programs focused on heavily reducing wolf abundances. Though this study was able to achieve lowered moose numbers with increased hunting pressure, the authors do suggest high fecundity and immigration rates could affect the success of reduction programs in other systems.

Logistically, moose abundance is estimated using stratified random block aerial survey and trends can be monitored using annual pellet transects. This involves using fixed-winged aircraft to fly over sections of the study area and recording all observed moose into demographic orders (Gasaway 1986). Similar to bears, hunting records can be used to project trends in the moose population but cannot state explicit densities. Aerial counts are the most common method of moose surveys with no other substantial literature describing other methods.

## 2.8 White-tailed Deer

Young forest landscapes, initiated by industrial development, not only increase habitat suitable for moose but also white-tailed deer. Latham et al. 2011 examined densities of deer pre- and post-industrial expansion in the southern part of northeastern Alberta and the effects of this change on wolf diet. Observable white-tailed deer increased 17.5-fold in the region coinciding with an increase in wolf numbers of 6-11.5/1,000 km<sup>2</sup>. Using scat analysis, deer replaced moose as the primary prey for wolves in the area. Latham indicates management actions to conserve caribou should also include deer as a primary prey species responsible for increasing wolf abundance.

From a management standpoint white-tailed deer have been notoriously difficult to control with sport hunting as female deer have high fecundity with the capability to breed at young ages and support twins (Brown 2000). An experiment to reduce overabundant deer with harvesting was unable to regulate the population at lower levels, even in a controlled island environment (Simard 2013). In urban settings, research has shown that sharp-shooting at bait piles can help curb deer population growth but admits that these responses are short term and need continued implementation. This method or a similar method of using helicopters could be a way to kill substantial amounts of deer in single events but it seems that with widespread dispersal and



increasing movement north any population decreases would be quickly compensated for (Doerr 2001).

To assess the relative abundance of deer, fixed-wing aerial grid surveys were completed. Seven thousand km<sup>2</sup> of the study area were surveyed. Surveys were conducted in winter (Jan, Feb, or early-Mar), depending on suitable snow conditions. One observer on each side of the airplane recorded the location and number of deer observed (Latham 2011). Again, aerial surveys and hunting records are the only commonly reported methods for estimating deer densities for large tracts of land.

## 2.9 Beaver Trapping

Beaver populations in northern Alberta have been recovering from past near-extirpation, and their impacts on riparian areas are pronounced (Martell 2006). Beaver are also an important prey species for wolves (Latham 2013). Scat analysis has shown a high proportion of beaver in wolf diets during the snow-free season as there is a higher availability of beaver when streams, rivers and lakes are unfrozen (Latham 2009). Accordingly, summer habitat selection by wolves to be in the vicinity of beaver, caused a major overlap with caribou ranges and consequently triggered increased adult caribou mortality during summer months (Latham 2013). Therefore, beaver populations in proximation to caribou herds should be kept at low densities to dissuade wolves to persist in the area in the summer, even after moose and white-tailed deer numbers have been decreased. Trapping, with its recreational appeal, income, and food potential seems a prudent approach for control of nuisance beaver than other options that have been considered (Hill 1976).

After review, a comprehensive management plan for the Cold Lake area could include reductions of wolves, black bear, moose, deer and beaver. A reduction of these 5 species would facilitate a landscape that has low densities of predators and a limited prey base to keep predators from rapidly returning to the area. Completing significant reductions of these species is very difficult in a remote region such as Cold Lake. These difficulties are intensified by the limitation of air and ground access of the CLAWR, which makes up 60% of the region's caribou herd range. CLFN has opportunity for involvement in supplying knowledge, cooperative management ideas, local trapping and hunting, and population surveys. CLFN has the potential to be the pivotal entity that implements continued responsibilities of recovery strategies, while informing decisions about large scale recovery plans such as aerial surveys and removals.

## 2.10 Maternal Fencing Facilities

Although there are only a few implemented examples, maternal fencing has been long considered a recovery option for caribou in Alberta. Previous examples include the Little Smokey herd (LSM) in Alberta (Smith and Pittaway 2011), Chisana caribou herd in Yukon (Farnell 2009), Columbia North herd in British Columbia (BC) (Serrouya 2015), and Klinse-Za herd in BC (McNay 2017). The objective of maternity pens is to reduce the mortality of pregnant cows and their calves during the birthing and post-natal calving period. Parturition and neonate survival are key drivers in the population demographics of ungulates (DeCesare 2012). As mentioned before, low calf recruitment (survival into the following year) is the lead demographic driver in population declines of Albertan caribou. There is a drastic decline in predation on calves at the four-week mark (Pinard 2012), thus suggesting protecting the calves for at least

one month would likely lead to increased calf recruitment. Movement rate progressively increases through the neonate period until calf speeds reach similar rates as mothers, thus gradually increasing their predator escape ability (DeMars 2013). Subsequently, maternity pens have the potential to help augment caribou by adding older calves in to the population with increased chances of survival. Maternity pens could play a significant role in the near-term goal of reversing immediate caribou declines. It should be noted, however, that previous penning projects are limited in number with mixed success.

Recently, there has been industry-led support for a different type of penning facility consisting of a permanent predator exclosure of approximately 100 km<sup>2</sup> into which 40-50 females and a small number of male caribou would be placed. The idea was piloted by the Canadian Oil Sands Innovation Alliance (COSIA) with the objective of "advance[ing] predator fence design sufficiently to expedite Government of Alberta (GOA) endorsement and authorization of a caribou fencing trial." The idea has some advantages over maternal penning such as reduced handling of caribou, reduced uncertainty for oil and gas operations, and lower long term cost. The idea was selected at a multistakeholder (IUCN facilitated) event where 43 participants participated in a structured decision making process. This 100km<sup>2</sup> enclosure concept was ranked a close second to a similar option with a larger area and slightly ahead of the ~200 hectare (ha) temporary maternal penning facility described above. The group included a broad set of stakeholders including academia (7), provincial government (6), federal government (4), First Nations (2), industry (11), NGOs (3), zoos (7), and independent/consulting groups (3).

#### 2.10.1 Chisana Herd, YT

The Chisana herd (Yukon) experienced rapid declines due to poor forage and heavy neonatal predation. The herd, numbering around 1800 animals in 1987, numbered less than 720 animals in 2003 (Farnell 2009). Chisana is the first large scale test of the feasibility of rearing caribou in captivity. At the time, there was little experience with using captive rearing facilities for large ungulates and many current design methods originated with this project. Chisana was initiated as a small pilot project.

Twenty-one caribou were captured in 2003, 36 in 2004, and 58 in 2005. This project proved successful: the survival of calves to 5-months was 77%, 76% and 82% in captive-reared individuals compared to 13%, 7% and 23% among free-ranging individuals in 2003, 2004, and 2005 respectively (Farnell 2009). Additionally, captivity had no apparent negative effects on mortality or physical condition of cows.

#### 2.10.2 Little Smokey Herd, AB

The Little Smokey Herd consists of mountain caribou located in west central Alberta. The herd is under similar pressure as those in northeastern Alberta, with calf recruitment as low as 11%. In 2006, 10 caribou cows were captured and penned. Based on a sample size of 10 calves for the Little Smokey and seven calves for the wild population, the calf survival rate was 50% and 71% respectively. Penning in the Little Smokey Herd resulted in lower recruitment for captive calves than wild calves, yet at 19% of the population, the autumn following pen release was the highest percentage of calves observed since 1982. Classification flights the following March showed that penned and wild calves were alive in similar survival ratios, three out of five calves alive, with calves making up 14.5% of the total 55 caribou (Smith and Pittaway 2011). Additionally, success



was difficult to measure given that the Alberta Government executed a wolf control program during the same period.

### 2.10.3 Klinse-Za Herd, BC

The Klinse-Za caribou in northern British Columbia (BC) are listed as Threatened under SARA (Environment Canada 2012). Due to similar drivers of habitat conversion and predation, the Klinse-Za herd has experienced significant population decline (Seip and Jones 2015). The herd decreased from 189 animals in 1995 to just 16 in 2013. (Cichowski 2012). Additionally, recruitment has been below 10% resulting in a herd that is unlikely to persist without immediate intervention. Consequently, in 2014, 22 caribou cows were placed in a maternity pen over three subsequent years to reverse population declines. The project was met with successful recovery measures of 38 individuals in 2013 to 61 in 2017, though these population estimates likely benefit from organized wolf reductions done by the government and First Nations (McNay 2017). The survival ratio was assessed in March of the following year with a rate of 0.54 for penned animals and 0.29 for the wild part of the population. Increased recruitment the following spring indicates that penned calves did not have lower chances of surviving because of development in the safety of a maternal pen. Again, adult cow mortality remained similar between penned and wild individuals, suggesting the pen had insignificant effects on post-pen behavior and mortality for either adults or calves.

### 2.10.4 Columbia North Herd, BC

Farther south, the Columbia North herd was experiencing similar population declines of over 200 animals in the 1990's to less than 150 today (Serrouya 2015). Here, maternal penning was also implemented for recovery of the herd near Revelstoke, BC. This 5-year pilot study started in 2014, subsequently capturing and penning 10, 18, 12, and 12 cows over the first four years of the project, with an estimated net addition of eight calves over three years, with no population estimate after the fourth year. This denotes roughly a 21% increase in calf survival compared to the wild population. Although calf survival was higher for penned animals, the population effect of the maternity pen pilot trial in the Columbia North likely did not have a major effect on the populations (Serrouya 2015).

These examples demonstrate captive rearing for woodland caribou as a successful short-term strategy. During favorable conditions the strategy was effective in past implementations, but unfavorable conditions, for various reasons, are unlikely to support an efficient recovery. Breeding in captivity has been a useful tool in other endangered species recovery, often being the conversion between survival and extinction. Nevertheless, captive breeding for large mammals is riddled with issues such as domestication, genetic drift, transmission of disease, high cost, and unforeseen negative impacts. Here, the nature of caribou maternal pens may be an effective way to compensate for these typical captive issues. Penned calves raised by wild adults in the vicinity of the historic calving range may limit the effects of domestication and increase the ease of release back into the wild population. Traditional captive problems are also diminished because the penning period required is relatively short (12-16 weeks), as pens are primarily used to aid in neonatal development stage of calves. Thus, short-term captive rearing within the wild populations herd range can increase the recruitment of calves by decreasing mortality during the high-risk neonate stage of life without the potentially negative effects of long-term captive adaptations.

## 2.11 Planning and Building

These four trials are the only current implementations of caribou captive rearing facilities. Each project was developed independently, but extensive knowledge was passed from one project to the next as the experience of previously involved biologists were the basis for much of the knowledge. The Chisana and Little Smokey plans were implemented years before the Klinse-za and Revelstoke projects, thus much of the current methods of implementation are results of success and failures of the original two projects. A key component of all four projects have been the involvement of veterinarians, nutrition specialists, indigenous peoples, academia, and governments. Only through the collective knowledge and cooperation of all stakeholders have these projects come to fruition.

### 2.11.1 Fencing Site

Selection of the penning site is crucial because caribou are expected to become semi-habituated to the pen (Smith and Pittaway 2011). If the pen is in an area of high predator density, then animals who return to the pen site after release could be placing themselves at risk of predation. Previous sites have been selected because 1) the site occurs within the natural, historically used calving range of the herd, 2) it is within a ten-minute helicopter flight from currently used calving range, 3) it is reasonably accessible for project staff, and 4) it is in an area where the release of cows and their calves would provide relative safety. Cows and calves can frequent the penning area after release because of some habituation to the fencing area and pelleted food source. Therefore, it is critical to consider the predation and risk pressure of the maternal fencing location. An area with few wolves would be ideal. The Little Smokey Herd had two cows return to the area of the penning site where calves were predated by bears. The pen site was close to a large river which may have attracted the bears in early spring, creating higher predation pressure for the cow-calf pairs (Smith and Pittaway 2011). In addition, predators may attempt to gain access into the maternal pen, further suggesting selecting a site with a low chance of predator conflict. Every situation is unique, with many factors to be considered, but site location is paramount to success.

Additional considerations like access to a fresh water source and pen size should also be evaluated. The Chisana considered distance to fresh water for transport in their decision process, while the Little Smokey Herd already had natural water sources. Pen size was a function of feasibility and the number of cows captured. LSM only used 4 ha, while the others necessitate larger pens with Klinse-za using 7 ha, Chisana using 8-10 ha, and Revelstoke using 9.3 ha.

All four projects have followed relatively simple fence building methods laid out by the Chisana project. This entails a fence made of geotextile fabric looped over three strands of wire that have been tightened around trees about two meters (m) apart. One wire hangs at 2-3 m above snowpack, a supporting middle wire, and a third wire placed as close to the ground as possible. Along the exterior, the geotextile fence is fortified by a 2 m high, three to eight strand electric fence placed approximately 0.5 m away. Depending on effort and funding, the enclosures typically take one or two springs to build and must continue to be reinforced throughout the projects lifetime. Typically, watch towers are constructed in trees on the outside of the fence, with vegetation and land angles that allow for the greatest vantage point. Some previous projects moved the fencing location at least once, with Chisana reconstructing the enclosure

annually. These measures were taken to ensure fresh browse was available to the animal, particularly the lichens preferred by caribou, which can take 30-60 years to return to previous unbrowsed levels. When logistically and monetarily possible, moving the enclosure annually is thought to be a best practice.

### 2.11.2 Caribou husbandry

In all four previous trials, the terrestrial lichen species preferred by caribou (*Cladonia* sp., *Cladonia* sp., *Stereocaulon* sp., *Cetraria* sp.) were collected pre-penning. For details on collection and storage of lichen species see Robin et al. 2013. Initially, penned caribou are fed a diet of mostly wild lichen supplemented with some commercial reindeer pellets in a central feeding trough. Slowly, practitioners decreased the amount of terrestrial lichen and increased the pelleted feed until the animals were consuming a diet entirely of pellets. As the animals approached release, the opposite pattern was employed. The Little Smokey Herd implemented an initial diet of 75% lichen and 25% commercial feed then rotating to 25% lichen to 75% commercial and back again. Each caribou was estimated to consume between 2.5 and 3.2 kg/animal/day (Smith and Pittaway 2011). All studies had staff recording daily food intake and general behavior at feeding areas.

The capture of caribou is conducted by wildlife professionals and veterinarians with the aid of community volunteers. Ideally, captures are completed in late March before widespread calving begins. The animals are penned until calves reach an age of 3-4 weeks, when they become more mobile and less susceptible to predation. The captures are accomplished via aerial net gunning from helicopters using physical restraint during capture and intranasal sedation during transport, by helicopter, to the penning facility. Aerial net gunning has been proven an effective method for capturing caribou, not only for these penning projects but most other caribou research that includes capturing animals. While restrained, additional measurements such as blood, tooth, weight, body condition, body measurements, and pregnancy status can be obtained, as well as identification ear tags and a GPS radio collar can be equipped. Due to the complexities of capture methods, please see McNay and Sittler 2017 for general guidelines. Within a few days of giving birth calves are captured, radio collared, sexed, and weighed to track trends and changes in calf survival. When possible, cows and calves continue to wear GPS collars after release to monitor survival, behavior, and movement to be compared with wild individuals from the population.

### 2.11.3 Monitoring

Once in the pens, caribou are monitored 24 hours a day, seven days a week by on or near-site staff. Staff members complete daily maintenance and recording activities while being supported by on-call biologists and veterinarians. Daily tasks include feeding caribou twice, assessing caribou for signs of nutritional or behavioral distress, identifying calving, assessing structural integrity of the fence, searching for signs of predators or attempts to breach the fence, reporting daily observations, and tracking changes to penned caribou. If maternal pens were to be a part of the caribou conservation efforts in northeastern Alberta, these staff positions provide the ideal opportunity for community and CLFN members to play a vital role in the efforts.

#### 2.11.4 Post-pen monitoring

It is also important to track post-pen survival and behavior of caribou. This monitoring is two-fold, as it allows the assessment of the primary goal, increasing calf survival and recruitment, but also allows monitoring of individuals to be certain movement and mortality of penned adults does not differ from the wild population. There could be potentially hidden long-term effects on caribou populations if the cows exposed to maternal penning have a change in biology. Maternal penning of large ungulates is a very new science in endangered species recovery. As much information as possible should be collected during post-penning to avoid future catastrophic events and to continue to improve the penning process. All four previous projects have followed release by a short-term demographic monitoring flight to check on cow and calf survival in late fall and another long-term flight to measure recruitment the following spring. Klinse-za plans to take this further by implementing spatial studies using the GPS locations of penned individuals and comparing them to the location data of wild individuals. Over the past three years, 22 adult cows have been collared and penned at least once. Preliminary analysis of relocations of these animals after release show they are using some but not all of the historical caribou range (McNay 2017). The group plans to compare the habitat selection of these penned individuals to that of the wild population and to the habitat selection of the same individual animals pre-initial penning event. This will give researchers strong insight as to whether the penning period resulted in changes of movement and habitat selection.

#### Recommendations for the Cold Lake Herd

In summary, maternal fencing has proved to be moderately successful. The Chisana, Klinse-za, and Revelstoke herds experienced increased calf recruitment from supplementation by captive programs, but this increase had little population level benefits for the Columbia North herd. The Little Smokey Herd had negligible effects on both calf recruitment and population level changes but the year following maternal penning was a year of high calf recruitment for both penned and wild animals. Additionally, none of these projects had a decrease in penned calf recruitment or catastrophic mortality events while animals were in pens. During all four previous projects, only a single, non-pregnant female died shortly after being released in the pen due to unknown reasons, but reasonably not associated with capture myopathy. After examination of these projects it is clear maternal penning can have null-to-marginal population benefits and is likely to not have any disastrous negative effects. The Little Smokey Herd reported a cost of \$40,000 per calf, which is higher than the cost of predator control programs, though it is important to note that this project had some of the lowest success and only penned 10 cows (Smith and Pittaway 2011). Cost per calf should decrease with higher success and a larger number of cows penned as initial capital costs are spread across more individuals.

This gives evidence that maternal fencing could be an option to aid in recovery for the Cold Lake herd in the northeastern region of Alberta. The following are recommendations for a successful penning program in Cold Lake:

- 1) Build working relationships with the biologist, veterinarians, and communities that implemented previous projects with emphasis on recent and current projects, Klinse-za and Revelstoke.

- 2) Create community involvement by CLFN members to aid in the preparation and implementation such as, lichen collection, fence building, capture and transfers, and staff for daily monitoring.
- 3) Use these relationships and previous literature to select a penning site that satisfies the needs of caribou and can be efficiently implemented.
- 4) Use modern population modeling and western science to calculate the number of cows and calves needed to make significant impacts on the population.
- 5) Construct a geotextile fence grounded on methods refined by past research and application.
- 6) Capture and pen pregnant caribou cows.
- 7) Implement daily care and monitoring program founded on discussed methods.
- 8) Establish long-term monitoring to assess the success of the penning project for increasing calf recruitment and population increases.
- 9) Use western science to analyze data, GPS locations, body condition, and behavior observations, to create an adaptive management plan to continually improve the program.

Further complicating the implementation of this type of recovery strategy in the Cold Lake region is the prevalence of natural resources in the area, especially oil and gas. Large tracks of undisturbed land are infrequent. Even land that is currently undisturbed often has the chances to become disturbed in the near future with 13 companies holding oil sands agreements covering 62.61% of the herd range (CPAWS 2016). Fortunately, the CLAWR provides a unique space to support these maternal pens. Much of the land remains undisturbed with a substantial amount of optimal caribou habitat, in an area relatively far from disturbance. Additionally, the CLAWR is less disturbed with older forest disliked by moose and deer, potentially leading to lower density of wolves in the area. Despite access restrictions to the CLAWR potentially causing application concerns, it presents significant promise for a maternal fencing area.

## 2.12 Conclusion

Alberta's woodland caribou are listed as threatened under SARA because they face significant challenges of habitat loss and of unsustainably high predation rates. The near and long-term recovery goals for this iconic species require the collaboration of every stakeholder. This review attempts to collect and compare information about two key strategies for reaching the near-term goal of arresting juvenile and adult mortality. Removal programs for caribou's main predators and apparently competing species is a long-standing recovery plan in Alberta. Management decisions for these removals include estimating densities, removing an appropriate number of individuals, and sustained monitoring of all species involved. Removals of both wolves and moose have been used in the past with success, decreasing the number of each species, leading to direct positive benefits to caribou demographics. Yet, this does not take away from the difficulties or cost of implementing these large-scale efforts. A second key component, is the implementation of maternal pens to increase the survival of caribou calves to adulthood. Previous projects for maternal penning have had a net-zero to positive effect on the recruitment and survival of caribou calves. The simultaneous implementation of both apparent competition management and maternal penning strategies suggests a positive outlook for maintaining

woodland caribou, drastically increasing a single herd's population (Klinse-Za), on the landscape until long-term habitat protection and restoration can take hold.

Western science and modern methods are going to be needed to implement these near-term recovery strategies efficiently. The inaccessibility and scope of caribou ranges render it nearly impossible to not use aerial methods during some aspects of recovery plans. However, First Nation groups like CLFN can play a key role in caribou recovery, particularly when it comes to the operation of strategies. Traditional knowledge has proven helpful in making decisions for caribou conservation and groups will continue to be consulted. Efforts from indigenous trappers and hunters have proven helpful in the past, and new roles are to be discussed. Additionally, First Nations have been imperative to previous penning projects from being the proponent of the pen, to providing biological information and daily monitoring to helping with animal captures. Undoubtedly, with progressive cooperation, governments, CLFN, and industries can all be important decision-makers in the planning of conservation efforts for northeastern Alberta's caribou populations.

## 2.13 Literature Cited

- Ballard, W.B. 1994. Effects of black bear predation on caribou: a review. *Alces*. 30:25–35.
- Boersen, M.R., Clark, J.D, King, T.L. 2003. Estimating black bear populations density and genetic diversity at Tensas River, Louisiana using microsatellite DNA markers. *Wildlife Society Bulletin*. 31(1):197-207
- Boertje R.D., Valkenburg P., and McNay M.E. 1996. Increases in Moose, Caribou, and Wolves Following Wolf Control in Alaska. *The Journal of Wildlife Management*. 60(3):474-489.
- Brown T.L., Decker D.J., Riley S.J., Enck J.W., Lauber T.B., Curtis P.D., Mattfeld G.F. 2000. The future of hunting as a mechanism to control white-tailed deer populations. *Wildlife Society Bulletin* 28:797–807.
- Russell, T., Pendlebury, D., Ronson, A. 2016. Alberta's Caribou: A guide to range planning northeast Alberta. Canadian Parks and Wilderness Society.
- Cichowski, D., S. McNay, and B. Muir. 2012. A plan for sustaining Wah stzee (Caribou) in the Moberly area of British Columbia. West Moberly First Nations Lands Dept., Moberly Lake, British Columbia.
- DeCesare, N.J., Hebblewhite, M., Bradley, M., Smith, K.G., Hervieux, D., Nuefeld, L. 2011. Estimating ungulate recruitment and growth rates using age ratios. *Journal of Wildlife Management*. 76(1):144-153.
- DeMars, C.A., Auger-Methe, M., Schlagel, U.E., Boutin, S. 2013. Inferring parturition and neonate survival from movement patterns of female ungulates: a case study using woodland caribou. *Ecology and Evolution*. 3(12):4149-4160.
- Doerr, M.L., McAninch, J.B. and Wiggers, E.P. 2001. *Wildlife Society Bulletin*. 29(4):1105-1113.

Dzus, E. 2001. Status of the woodland caribou (*Rangifer tarandus caribou*) in Alberta. Alberta Environment Fisheries and Wildlife Management Division and Alberta Conservation Association Wildlife Status Report 30.

Environment Canada. 2012. Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada.

Farnell, R. 2009. Three decades of caribou recovery programs in Yukon: A paradigm shift in wildlife management. Dept. of Environment, Whitehorse, YK.

Ferguson, M.D. and Gauthier, L. 1992. Status and trends of *Rangifer tarandus* and *Ovibos moschatus* populations in Canada. *Rangifer* 12:127-142.

Fuller, T.K., Mech, L.D., and Cochrane, J.F. 2003. Wolf population dynamics. In *Wolves: behavior, ecology and conservation*. Edited by L.D. Mech and L. Boitani. University of Chicago Press, Chicago, Ill. pp. 161–190.

Ferguson, M.A.D. and Messier, F. 1997. Collection and analysis of traditional ecological knowledge about a population of Arctic tundra caribou. *Arctic* 50:17-28.

Gasaway, W.C., DuBois, S.D., Reed, D.J., Harbo, S.J. 1986. Estimating moose population parameters from aerial surveys. Biological Papers No. 22. Fairbanks: University of Alaska.

Hayes, R.D., Farnell, R., Ward, R.M.P., Carey, J., Dehn, M., Kuzyk, W.G., Baer, A.M., Gardener, C.L., and O'Donoghue, M. Experimental reduction of wolves in the Yukon: Ungulate response and management implications. *Wildlife Monographs*. 152:1-35.

Hayes, R.D., and Harestad, A.S. 2000. Demography of a recovering wolf population in the Yukon. *Canadian Journal of Zoology*. 78(1):36–48.

Hill, E.P. 1976. Control Methods for nuisance beaver in the southeastern United States. Vertebrate pest conference proceeding collection.

Hummel, M. and Ray, J.C. 2008. Caribou and the North: A shared future. Dundurn Press, Toronto.

James, A.R.C. 1999. Effects of industrial development on the predator–prey relationship between wolves and caribou in northeastern Alberta. Ph.D. dissertation, University of Alberta, Edmonton.

Latham, A. 2009. Prey use and selection by wolf packs in a novel multiple prey species system in northeastern Alberta. Thesis: Wolf ecology and caribou-primary prey-wolf spatial relationships in low productivity peatland complexes in northeastern Alberta. University of Alberta. Thesis.

Latham, A.D.M., Latham, M.C., and Boyce, M.S. 2011. Habitat selection and spatial relationships of black bears (*Ursus americanus*) with woodland caribou (*Rangifer tarandus caribou*) in northeastern Alberta. *Canadian Journal of Zoology*. 89(4):267-277

Latham, A. D. M., Latham M.C., Knopff K.H., Hebblewhite M., and Boutin, S. 2013. Wolves, white-tailed deer, and beaver: Implications of seasonal prey switching for woodland caribou declines. *Ecography* 36:1276–1290.



- Latham, A.D.M., Latham, M.C., Mccutchen, N.A., Boutin, S. 2011. Invading white-tailed deer change wolf-caribou dynamic in northeastern Alberta. *Journal of Wildlife Management*. 75(1):204-212.
- Mahoney, S.P., Abbott, H., Russell, L.H., and Porter, B.R. 1990. Woodland caribou calf mortality in insular Newfoundland. In *Transactions of the 19th Congress of the International Union of Game Biologists*, Trondheim, Norway, 1989. Edited by S. Myrberget. Norwegian Institute for Nature Research, Trondheim, Norway. pp. 592–599.
- Martell, K.A., Lee Foote, A., and Cumming, S.G. 2006. Riparian disturbance due to beavers (*Castor canadensis*) in Alberta's boreal mixedwood forests: Implications for forest management, *Écoscience*. 13(2):164-171.
- McDonald J.E., Clark D.E., Woytek W.A. 2007. Reduction and maintenance of a white-tailed deer herd in central Massachusetts. *Journal of Wildlife Management* 71:1585–1593.
- McLaren, A. 2016 Wolf Management Programs in Northwest Territories, Alaska, Yukon, British Columbia, and Alberta: A Review of Options for Management on the Bathurst Caribou Herd Range in the Northwest Territories. Government of Northwest Territories.
- McCloughlin PD, Dzus E, Wynes B, Boutin S (2003) Declines in Populations of Woodland Caribou. *The Journal of Wildlife Management* 67:755–61.
- McNay, R.S. and K.L. Sittler. 2013. Enhancing calf survival to help avert extirpation of the Klinse-Za caribou herd. Wildlife Infometrics Inc. Report No. 453. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.
- McNay, R.S., Giguere, L., Dubman, E., and Pate, B. 2017. Enhancing calf survival to help avert extirpation of the Klinse-Za caribou herd. Wildlife Infometrics Inc. Report No. 575. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.
- Murray, D.L., Smith, D.W., Bangs, E.E., Mack, C., Oakleaf, J.K., Fontaine, J., Boyd, D., Jiminez, M., Niemeyer, C., Meier, T.J., Stahler, D., Holyan, J., and Asher, V.J. 2010. Death from anthropogenic causes is partially compensatory in recovering wolf populations. *Biol. Conserv.* 143(11):2514–2524.
- Obbard, M.E., Howe, E.J., Kyle, C.J. 2010. Empirical comparison of density estimator for large carnivores. *Journal of Applied Ecology*. 47(1):76-84.
- Pinard, V., Dussault, C., Ouellet, J., Fortin, D., Courtois, R. 2012. Calving rate, calf survival rate and habitat selection of forest-dwelling caribou in a highly managed landscape. *Journal of Wildlife Management*. 76(1):189-199.
- Proulx, G., Brook, R.K., Cattet, M., Darimont, C., Paquet, P.C. 2016. Poisoning wolves with strychnine is unacceptable in experimental studies and conservation programmes. *Environmental Conservation* pp. 1-2.
- Ramstad, K.M., Nelson, N.J., Paine, G., Beech, D., Paul, A., Paul, P., Allendorf, F.W., and Daugherty, C.H. 2007. Species and Cultural Conservation in New Zealand: Maori Traditional Ecological Knowledge of Tuatara. *Conservation Biology* 21(4):455-464.



Robin, J., McNay, K., and McNay, R.S.. 2013. Lichen collection trial for caribou penning project: plan and implementation. Wildlife Infometrics Inc. Report No. 451. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.

Sahtú Renewable Resources Board. 2016. Addendum to Environment and Natural Resources Responses to Bluenose-East Caribou Herd Management Proposal Sahtú Renewable Resources Board Information Requests Round.

Schmidt, P.M., and Stricker, H.K. 2010. What Tradition Teaches: Indigenous knowledge complements western wildlife science. USDA National Wildlife Research Center-Staff Publications. 1283.

Seip, D.R. 1991. Predation and caribou populations. *Rangifer* 7 (Spec. Issue):46–52.

Seip, D.R. 1992. Factors limiting woodland caribou populations and their interrelationships with wolves and moose in southeastern British Columbia. *Canadian Journal of Zoology* 70(8):1494-1503.

Seip, D., and Jones, E. 2015. Population status of caribou herds in the Central Mountain Designable Unit within British Columbia, 2015. Unpub. Rep., British Columbia Min of Forests, Lands, and Natural Resource Operations, Prince George, BC.

Serrouya, R., McLellan, B.N., van Oort, H., Mowat, G., and Boutin, S. 2017. Experimental moose reduction lower wolf density and stops decline of endangered caribou. *PeerJ* 5:e3736.

Serrouya, R., Bollefer, K., Furk, K. and Legebokow, C. 2015. Maternal penning in the Northern Columbia Mountains: Revelstoke Caribou Rearing in the Wild's first-year pilot and results of the 2015 calf census. Version 2.0.

Serrouya, R., McLellan, B.N., Boutin, S., Seip, D.R., and Nielsen, S.E. Developing a population target for an overabundant ungulate for ecosystem restoration. *Journal of Applied Ecology* 48(4):935-942.

Simard M.A., Dussault C., Huot J., Côté S.D. 2013. Is hunting an effective tool to control overabundant deer? A test using an experimental approach. *Journal of Wildlife Management* 77:254–269.

Sittler, K.L., McNay, R.S., Giguere, L., Beckie, E., Marshall, C., and Owens, N. 2017. Protocols for maternity penning to enhance the survival of caribou calves within the Moberly caribou herd area. Wildlife Infometrics Inc. Report No. 461. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.

Smith, K.G. and Pittaway, L. 2011. Little Smoky woodland caribou calf survival enhancement project. *Rangifer Special Issue* No. 19:97-102

Webb, N.F., Allen, J.R., and Merrill, E.H. 2011. Demography of a harvested population of wolves (*Canis lupus*) in west-central Alberta, Canada. *Can. J. Zool.* 89(8): 744–752. doi:10.1139/z11-043.

Wittmer, H.U., Serrouya, R., Elbroch, L.M., and Marshall, A.J. 2013. Conservation Biology. 27(2):254-260.

### 3 Report From the Community Engagement Session

On March 20<sup>th</sup> and 21<sup>st</sup> CLFN hosted an engagement session at the Band Administration Office at Le Goff where the community had the opportunity to hear from a variety of Government, Academic, and Non-Government Organizations (NGOS) on caribou conservation. The session was well attended and facilitated some excellent discussion about the issues. A meeting summary of this event is included as Appendix 1 and this report will provide a brief summary of pertinent issues discussed at the engagement. CLFN collaborated with Natural Resources Canada (Canadian Forest Service) to host this event.

The content of the session included restoration as well as policy and planning, predator and alternate prey management (see Inset A – Agenda, below). Industry representatives were invited but unable to attend. The format of the two-day event was a series of 25-30 minute presentations followed by 25 minutes of questions from the community and facilitated discussion.

#### 3.1 The Klinse-Za Maternal Penning Facility

Naomi Owens and Tamara Dokkie from Salteaux and West Moberly First Nations made an interesting and valuable presentation. They told the community how their Elders had been concerned about the lack of action from the Province on the caribou issue and how their Nations had taken action by pushing for a maternal penning program which they now operate. This project operates on a budget of approximately \$500,000 per year and their First Nations work together with biologists to catch and care for caribou during the most vulnerable time of the year. Guardians from both First Nations play an active role in the operation of the pen and are involved in capture. The Klinse – Za group considers this project highly successful and has observed that caribou populations have doubled in the herd since it began (see Appendix 2: Klinse-Za Maternal Penning March 2018 Update). The following is an overview of what is involved in operating this facility.

The site for the penning facility is chosen based on the presence of food and water, its proximity to known calving areas, and logistical considerations (such as access for the monitors). Pregnant cows are captured in March by net gunning them from a helicopter and transported to the penning facility. Once inside the caribou are slowly weaned off their diet of lichen by introducing pelleted reindeer feed. Supplemental lichen, which is harvested by the First Nations communities in mixed Elder-youth groups during snow-free conditions, is also utilized. During the time they are in the pen, guardians keep watch over them, patrol the enclosure for predators or problems with the fence and provide the feed. In approximately June, the gates are opened and the caribou cows with their calves are free to walk out of the penning area.

The program also includes two different types of predator control. Aerial culling is used by the BC government to suppress the population of wolves in the area and the First Nations run a hunter/trapper bounty program on the ground in the immediate area of the pen. Despite these programs, there was a devastating predation event several years ago when the caribou were released. The Klinse-Za group has recently switched from a bounty-based program, which they noted did not result in large numbers of predators being removed, to a support program for several members to trap and hunt wolves in the area.



## Inset A - Agenda

<b>March 20<sup>th</sup> 2018</b>		
10:00 am - 11:00 am	<b>Alberta Range Planning team</b> Monica Dahl	The Provincial Range Planning Process in the Cold Lake Herd Range
11:15 am	<b>Break</b>	
11:30 am – 12:15 pm	<b>Environment and Climate Change Canada</b> Keri McFarlane	The federal perspective on Caribou Recovery
12:15pm-1:00pm	<b>Lunch</b>	Elders & Community Open Mic
1:00 pm – 2:00 pm	<b>Stan Boutin</b> Alberta Biodiversity Conservation Chair University of Alberta	Caribou Recovery 101
2:15 pm	<b>Break</b>	
2:30 pm – 3:30 pm	<b>Renee Lapointe</b> Canadian Forest Service	NRCan-CFS's research contributions in support of the woodland caribou.
3:30 pm - 4:30 pm	<b>Naomi Owens and Tamara Dokkie</b> The Klinse-Za maternal penning project	What Are First Nations doing in BC to lead the recovery efforts? How is the community involved?
5:30 pm	Dinner	
7:00 pm – 8:15 pm	Evening Community Session With Tamara and Naomi from Sauteau and West Moberly First Nations	
<b>March 21<sup>st</sup> 2018</b>		
10:00 am - 11:00 am	<b>Presenter 1 – Tara Russell</b> <b>CPAWS Northern Alberta</b>	Protected Areas as a tool for Caribou Recovery
11:15 am	<b>Break</b>	
11:30 am – 12:15 pm	<b>Presenter 2- Ecojustice: Barry Robinson</b>	The Legal Framework of the Species At Risk Act and Legal Protection in Alberta
12:15pm-1:00pm	<b>Lunch</b>	Elders Open Mic
1:00 pm – 2:00 pm	<b>Presenter 3- Dave Poulton:</b> <b>Alberta Conservation Offsets Association</b>	What are Conservation offsets and how can they be used in Caribou Range Planning.
2:00 pm-3:00 pm	<b>Closing Comments By CLFN Councilor Dwayne Nest</b>	

The Klinse-za project required unrestricted full time access to the penning area for the guardians to support the operation and keep pressure on predators around the fence. It is probable that a similar project in the Cold Lake herd range would require similar access.

### 3.2 Predator and Alternate Prey Control

Both Monica Dahl (Alberta Caribou Range Planning Team) and Stan Boutin (University of Alberta) stressed the need for ongoing predator control. There is tension in the community about the issue of predator control and the methods and this subject elicited much discussion and debate. It is evident that the concept of culling wolves, and the methods used, run contrary to the values of many community members. Some members emphasized that it is not wolves at fault as the caribou crisis is a result of industrial disturbance. While many CLFN members expressed their understanding of the necessity of predator control measures, their support for the program hinges on ensuring industrial footprint is addressed and that wolves are treated respectfully. Part of this respectful treatment is ensuring the carcasses of culled wolves are recovered and used. In addition, community members would prefer trapping and hunting methods, rather than aerial control methods.

The biologists who presented pointed to evidence from other jurisdictions suggesting that hunting and trapping methods are not effective. According to Stan Boutin and Monica Dahl, there is a risk that trapping and hunting will not target the correct individuals, which could lead to packs fragmenting and the population going up. The Government of Alberta's wolf culling program is conducted by a specialized contractor out of Cranbrook BC who also net guns and collars caribou at the same time. Given the highly specialized nature of the work it is unclear if or how CLFN could participate.

With regard to recovery of wolf pelts, the biologists explained that this can be extremely difficult to do, particularly when culling from a helicopter, because there is not always a safe place to land and Alberta thinks the pelts are in poor condition at the time of the year when they do the cull. The community requested that they be provided with the GPS locations of culled wolves to which the Alberta Government representatives stated that this had not been successful in other places.

## 4 Focused Indigenous Knowledge Interviews

In January 2018 CLFN conducted interviews with 14 CLFN members, including Elders and current harvesters, to collect information about caribou populations, habitat use, alternate prey, alternate prey control measures and predator management. Interviews were conducted at the CLFN Lands and Resources Department Offices and used the interview guide (See Appendix 3: Interview Guide). This report presents only a brief summary of key findings pertaining to wildlife management strategies that are likely to be considered and employed in caribou recovery. A second, more detailed report that included indigenous knowledge, was produced specifically for the Alberta Range Planning Process.

#### 4.1 Caribou Occurrence Relative to ECCC Range Polygon

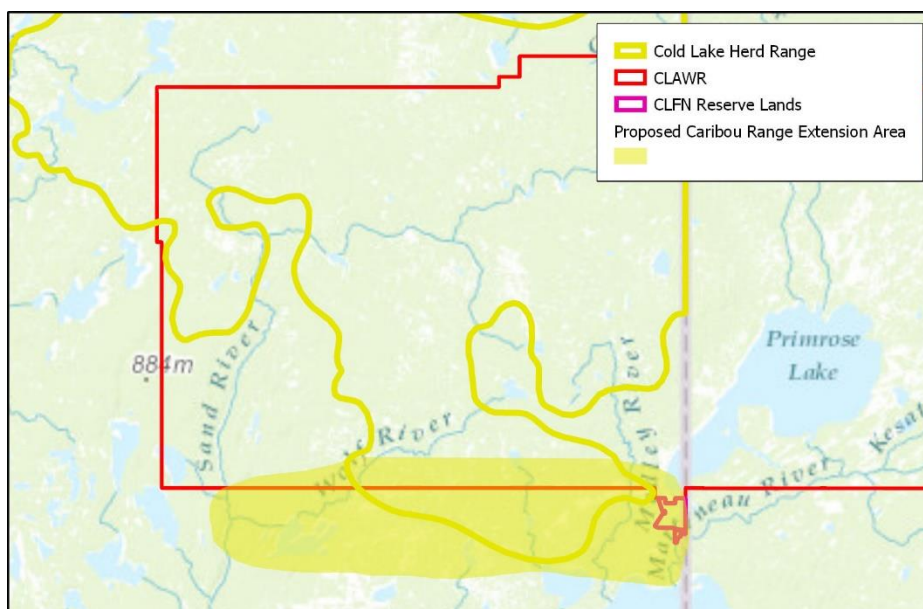
Based on CLFN indigenous knowledge (IK), caribou occur outside the ECCC-defined Cold Lake herd range in two specific areas: (1) the Wolf Lake area; and (2) north side of Cold Lake to Marie Lake and north along the Primrose Highway, including areas near CLFN reserves 148B (English Bay) and 148C (North Reserve) reserves. These areas are also calving areas as evidenced by CLFN oral history and direct observations by CLFN members in recent years.

The Wolf Lake area is a favored hunting area for CLFN and it has been in the context of hunting activities, as well as environmental work, that members have observed caribou in that area. One Elder has also described, in an interview conducted for another study, how his own Elders hunted wolves in this area specifically to protect caribou during the calving season. Interestingly, this area has also been identified by other indigenous communities in a report submitted to Environment Canada<sup>1</sup>.

The second location where caribou habitat was identified was near the 148C reserve, in particular the McFeeters Lake area, and extending down to the English Bay reserve (149B). A CLFN member who has a long-standing family trapline in the area has directly observed caribou calving in the area. The area is also an important calving ground for moose, a feeding area for whooping cranes, and there is a whooping crane nest at McFeeter's Lake, indicating very high biodiversity value.

Based on CLFN IK, CLFN is recommending an extension to the current ECCC-defined Cold Lake herd boundary (see Figure 1).

**Figure 1 – Proposed Caribou Range Extension**



<sup>1</sup> [http://www.registrelep-sararegistry.gc.ca/virtual\\_sara/files/Alberta\\_%20ATK%20Summary%20Reports\\_Boreal%20Caribou.pdf](http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/Alberta_%20ATK%20Summary%20Reports_Boreal%20Caribou.pdf)

## 4.2 Predator Control Methods

CLFN members recognized the need for predator control, but considered it acceptable only when combined with limits on industrial footprint and if done in a manner that showed respectful for the animals. CLFN members identified that although it was possible to reduce wolf populations with hunting and trapping, wolves are very intelligent and extremely difficult to trap. The engagement work revealed that only a handful of CLFN members possessed the skills and experience needed to trap or hunt wolves on the scale required for population management. All of these members identified access to the CLAWR as the critical barrier. Suppressing populations would require near full time access to the CLAWR during the winter months and a network of trails and line cabins to support the operations. In addition to population management, CLFN members identified social, cultural and economic benefits that could result from these efforts. In discussion, many identified the need for more comprehensive engagement with caribou and wildlife management.

## 4.3 Methods for Alternate Prey Control

CLFN members identified trapping and hunting as the most effective methods for beaver population control. There are problems with beaver activity impacting roads in the CLAWR (as well as other places) so the methods are well understood. Many members identified the open water season as the optimal time for targeting beavers, though winter was thought to be possible if there was advanced scouting of the sites. CLFN members were divided on whether or not beavers are an important prey species for wolves.

Deer and black bear are best controlled by hunting. Deer populations in the area appear to be rising and bear density in the CLAWR is thought to be high. Both species could be controlled by issuing more tags and extending hunting seasons outside the CLAWR but hunters, other than CLFN, do not have access inside the CLAWR and CLFN is not likely to support sports hunting in the CLAWR unless it is controlled and managed by the Nation itself. Most members, with some exceptions, did not express a strong preference for deer meat but some suggested it could be included into a “wild food bank program” to help those in need. To make this approach safe and effective CLFN would need to have a facility to store and butcher the meat as well as more access to the CLAWR for hunting. Most members did not express a desire for bear meat though some used the pelts and rendered bear fat. Depending on where a bear lives its meat and fat may be considered “dirty” as they scavenge garbage near industrial sites and communities. Bears harvested from remote locations in the CLAWR would not necessarily have this problem and (with some contaminant testing) might potentially be viewed as edible by members.

# 5 Proposed Management Strategies

## 5.1 Introduction

This section of the report combines the information from the literature review, TLU work, and the community engagement into some program recommendations on wildlife management.

## 5.2 Penning

There is support for caribou penning in the community but not consensus. CLFN members have some ethical concerns about intervening in nature to this degree. There is also concern that



penning would simply justify business as usual with respect to development when it is development restrictions and restoration that are required. That said, the success story from the Klinse-Za project was well received and many members support CLFN taking a proactive position on caribou recovery. Some members identified potential locations for a penning project during interviews and several other members have expressed interest in visiting the penning facilities in Fort St. John and Revelstoke.

### 5.2.1 Temporary Maternal Penning

The temporary maternal penning facilities used in Revelstoke and Fort St. John are constructed using a combination of high tensile wire and electric fencing wrapped around trees or poles and covered with heavy geotextile. These facilities are active for only two to three months each year because caribou are captured each spring and released in the summer. Facilities are small (3-25ha) and are moved every few years to prevent buildup of pathogens and maintain a supply of natural food for the caribou. Cows and calves are fed a mixture of lichen and reindeer pellets at feeding troughs and appear to have limited habituation response. On release, there have been predation events where wolves killed cows and calves close to the pen suggesting a possible response by predators. Both projects are showing a positive response in caribou population but it can be difficult to separate the effect of the penning versus the aggressive predator control measures.

### 5.2.2 Permanent Caribou Penning

This approach requires a considerably larger pen (~100-1000 ha) to be constructed and would contain both males and females potentially for their whole lives. These animals would be essentially bred in captivity and calves would be exported from the facility to rebuild populations. This approach has some significant costs and risks. First it would require considerable time to conduct environmental assessments and obtain approvals to construct it. Second, this is a much more complex facility to manage than a maternal penning project. It is not well known how caribou calves would react to being released without a cow and there are concerns over habituation to supplemental feeding. The idea of this larger area is that it would have sufficient carrying capacity for the caribou to consume their natural diet but it is possible that supplemental feeding would be required because of pressure on native vegetation. It is also little known how disease might impact the population inside the fence over longer periods of time. The major upside of this approach is that it requires less handling of wild populations which does carry some risk. This idea has not been tested in the field.

### 5.2.3 Analysis of the proposed methods

Pen Type	Pro's	Cons
Temporary Maternal Pen	<ul style="list-style-type: none"> <li>• Quick and easy to deploy</li> <li>• Builds on an existing model</li> <li>• Keeps caribou wild</li> <li>• Keeps focus on landscape scale solutions.</li> <li>• Short review cycle, easy to incorporate adaptive management.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires a lot of animal handling</li> <li>• Risk of predation events</li> <li>• Pens need to be moved regularly</li> <li>• Site selection is critical</li> <li>• Requires 24/7 supervision for 3-4 months</li> </ul>

	<ul style="list-style-type: none"> <li>• Increases biological understanding of wild caribou populations through science done in the pen</li> <li>• Has been proven successful elsewhere for increasing calf survival rates and increasing caribou populations</li> </ul>	
Permeant Enclosure	<ul style="list-style-type: none"> <li>• Minimal animal handling</li> <li>• Full time operation, easier to staff and manage.</li> <li>• Less sensitive to site selection</li> <li>• Excellent research opportunities</li> <li>• Could allow industrial development inside fence.</li> <li>• Might not require 24/7 staffing</li> </ul>	<ul style="list-style-type: none"> <li>• Significant uncertainties related to behavior, disease, and risk to population and potential effectiveness</li> <li>• Long timeline for construction</li> <li>• Risk of deflecting attention for landscape scale solutions.</li> <li>• Politically difficult to shut down if negative impacts are found</li> <li>• Less opportunity to do science on wild caribou.</li> </ul>

Each of the proposed penning methods has pros and cons. It is important to understand that none of these methods has been tried in the same ecological context (boreal forest) as the Cold Lake herd and there could be significant differences in important factors such as capturing caribou, their diet, and predator response. For example, it may be easier to net gun caribou in an open, montane environment than in the closed canopy conditions of the boreal. Both of these approaches have significant unknowns and pose risks to caribou that are placed inside the pen.

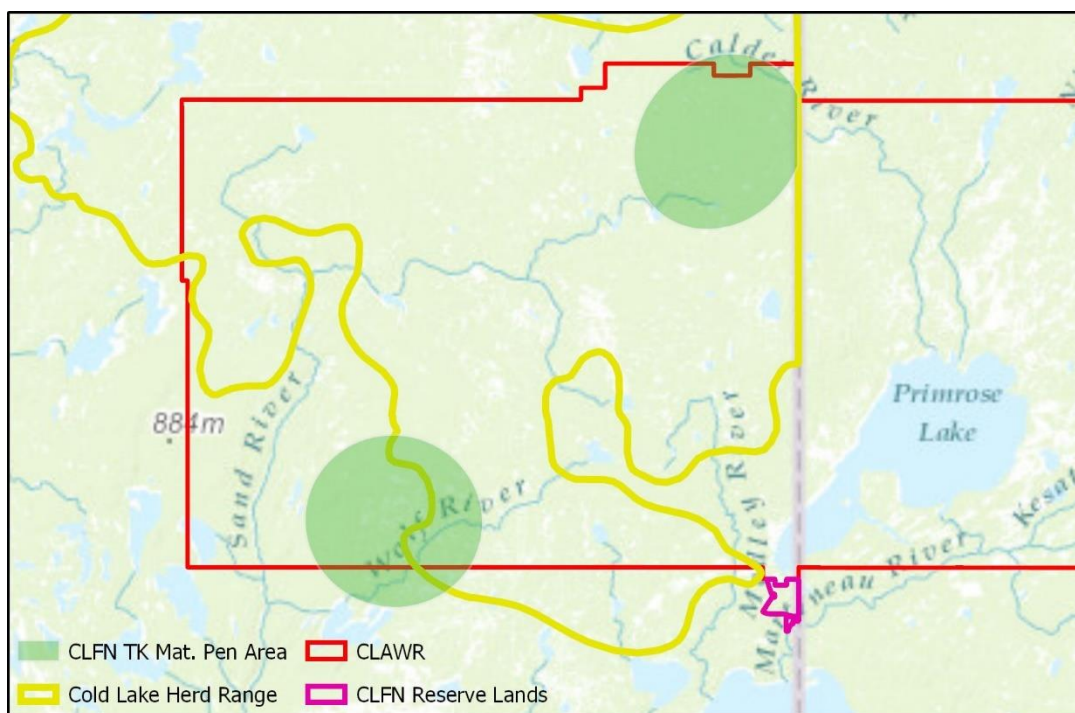
When considering this intervention it is wise to observe the bioethics maxim “Primum non nocere” (First, do no harm). This is a common term in medicine reminding the practitioner that they must weigh the chance of an intervention providing a benefit against the risk of potentially negative side effects from that intervention. In the case of caribou penning there is ample evidence to indicate that there are negative side effects – both observed elsewhere and probable to occur over time. The question is whether the risk of these side effects outweigh the benefits to the population and to what degree population growth can be attributed to penning or wolf cull. At this point, there is insufficient evidence to make a strong conclusion either way. If penning is to be done, it should be done with the greatest caution and without any organizational or ideological over-commitment. Safeguards must be in place to provide independent oversight that ensures- at a minimum- no harm comes to caribou population as a result of the intervention. If population management is to move forward there are arguments for and against both penning facilities. Given the uncertainty and the risk of harm to caribou it may be wise to proceed cautiously with temporary facilities and move to permanent pens only when more evidence has accumulate on the benefits and risks.

### 5.2.4 Site Selection

CLFN members expressed a strong preference for siting a penning project in the CLAWR. Several possible locations were identified and more work would need to be done to determine feasibility (see Figure 2). Any project located in the CLAWR would require the active support of 4 Wing Operations.

From both a biological and logistical perspective the site selection is critical. CLFN would need continuous site access during both frozen and unfrozen ground conditions. Access to the immediate surrounding area would likely also be required to aggressively suppress predators and alternate prey species.

**Figure 2 – Possible Locations for Maternal Pens**



### 5.3 Recommendations

Caribou maternal penning is a proven strategy for increasing herd recruitment. If CLFN intends to proceed towards developing a maternal pen the Nation will need to move quickly and efficiently in a number of areas.

1. CLFN could begin to lay the groundwork for a maternal penning project by working through site selection. Ground access requirements limit options in the CLAWR.
2. CLFN should build relationships. It is probable that sites are available on the CLAWR but DND has not articulated a clear position on feasibility. DND was unable to provide any direct input on this report despite numerous requests for participation. CLFN would need

to focus considerable effort on the relationship with DND for penning projects to happen on the CLAWR.

3. CLFN should work closely with the existing penning operations to learn how their facilities work and how to design and operate a facility in Alberta. These groups likely have abundant knowledge and will provide critical insight.
4. CLFN should immediately begin drafting management plans and SOP's based on learnings from both literature and the experience of other operators. Management plans will drive much of the logistical and financial requirements of a penning project.
5. CLFN should remain open to the permeant penning approach. There are real potential upsides to this but it is unclear how or when it would be built. There is considerable uncertainty here that may be resolved over time.

## 5.4 Predator Control

Both Alberta and BC currently have large scale wolf control programs active in caribou range. These programs use specialized contractors who shoot wolves from helicopters, often collaring caribou at the same time. The consensus from the western science community is that aerial methods are far superior to ground based methods because they have the ability to take out whole packs thereby preventing pack splitting. Ground based methods have been effective at controlling predators in small areas around the penning facilities but have not been shown to be effective at the range scale. Klinse-Za uses community members to suppress wolf populations by offering a bounty. This year this project shifted to a day rate for running the trap line partially because the pen moved so it would have been difficult for trappers to get set up in the new area prior to construction. There is consensus across both CLFN and the Western Science community that trapping wolves is very difficult. If a program were to be implemented at CLFN it should be combined with other wildlife control and monitoring activities because the anticipated success rate to address the predation issue is low, although it would have other cultural and social benefits.

### 5.4.1 Monitoring

Currently there is very limited monitoring in the CLAWR and this creates a serious issue with predator control in both the short and long term. In the short term there is no way to monitor the process of infill. This occurs when predators are removed and the areas are subsequently reoccupied by new packs. The rate at which this process occurs is critical to understanding the effect of cull programs. If the culling program is being done for caribou and wolf infill rates are rapid this information needs to be used to better plan the timing of the cull events. Reducing wolf numbers will also have an effect on all other prey species and this effect needs to be monitored closely. If wolf numbers are suppressed and prey populations rise it will be more and more challenging to slow infill rates because the wolves will naturally move towards the high prey densities. Long term monitoring of predator –prey systems is critical to the success of an ecological intervention as drastic as culling off top predators. In summation, there is limited information on which to design the appropriate intervention and almost no method of monitoring how it works and what side effects it has over the long term.

### 5.4.2 Methods

It is likely that provincial aerial wolf cull programs are here to stay for the foreseeable future. If ground based trapping is to be used then trappers should lead on the selection of methods.

Caution must be used to avoid opening new travel routes for wolves in remote areas. Where travel routes are opened they should be used as "bait" to confine and capture wolves.

There are several potential uses of CLFN lead predator management that could contribute to the overall impact of predator control efforts. The first is strategic deployment of trapping effort in areas where caribou are known to calve and to spend time there when the calves are young. Some of the information needed to deploy this program could be gleaned from existing caribou GPS collar data as well as IK on calving locales. The second potential deployment is to attempt to slow the infill rate of wolves. This may only work in conjunction with alternate prey control and would be conducted in a perimeter around high value caribou habitat or potentially locations where calf mortality was high.

#### 5.4.3 Access Requirements

Deploying a predator management program in the CLAWR would require regular access during the winter months (Dec-March) to relatively large areas. It is theoretically possible that this could be done. Over the course of this study it became clear that every group including the province of Alberta has challenges with access to the CLAWR for wildlife management. CLFN has almost two decades of experience with access issues but there is an ongoing process to resolve them through an update to the Access Agreement. As of now, it is not clear that any CLFN-led effort would be able to reliably secure access from 4-Wing Cold Lake. It is somewhat routine for high level commitments to be made at the leadership level but complications will occur at the operational level.

### 5.5 Recommendations

CLFN members expressed significant concerns about the predator control program methods. There is some evidence to indicate that CLFN could move to develop it's own pilot predator control program in the CLAWR. If CLFN choose to proceed with this, it should:

1. Plan a predator control program in conjunction with CLFN members that would include both a treatment and control area. These areas should be located close to roads to ensure easy access and large enough to be relevant to wolf / caribou interactions.
2. Find a partner organization to independently measure the success of the program using verifiable techniques. This organization should also be willing to provide oversight and facilitate wildlife research (eg DNA work, determining wolf diet, measuring infill etc.). It is critical that this program have clearly defined metrics and measurements of success.
3. Approach DND and an industry partner(s) for support for the project.
4. Fund and operate the project for a three-year pilot phase.

### 5.6 Alternate Prey Population Control

The other method for reducing wolf populations is to reduce the population of their non-caribou prey species. Alternate prey control has been shown to reduce wolf density in other caribou ranges. CLFN members have extensive experience with these methods from lifetimes of hunting and trapping on the land. In other jurisdictions this outcome has been accomplished by manipulating the tagged hunting system. This would not be possible in the CLAWR because there is not enough access for most species according to CLFN members.

### 5.6.1 Methods for Beaver

The optimal method for reducing beaver populations is trapping. During the fur trade era, humans trapped the population of beavers to near extirpation so there is ample evidence it can be done, although the socioeconomic conditions at that time were very different than now and lands that are now considered “remote” were not remote but “home” in that era. In the past, trapping was driven by economics but the market for fur has since become unprofitable for most commercial trappers. In the May 2017 North American Fur Auction only 78% of western beaver pelts sold and the average price was \$11.66 (U.S. Dollars)<sup>2</sup>.

Few CLFN members indicated that they harvest beaver though many expressed a desire to do so. No CLFN members currently harvest in the CLAWR because of access restrictions, which limit the ability to trap ethically and effectively. CLFN members were clear that if animals are to be culled from the land then they must be used. Beaver carcasses were identified as good bait for wolf and other carnivores and the tails are regarded as a delicacy by some. The challenge is the pelts. Skinning, stretching, and drying a beaver pelt requires time, effort and skill. Once the pelts are prepped, it is unclear what CLFN could do with them given the low auction price. One possible option is to use them for handmade crafts which could potentially be sold through the network of reserve based casinos in western Canada or marketed online through Etsy. This would require further skilled processing of the pelt to make it suitable for use, not to mention artistry and craftsmanship in transforming the pelt into a product. Further research is required to identify skilled and interested craftspersons within the CLFN community who could contribute to such a program. Another potential option is to work with the Portage Collage in Lac La Biche which has an aboriginal art program and could potentially take large quantities of beaver pelts. Despite these challenges, if an economic and culturally valuable market could be created it would have considerable net positive benefits for the community at large.

### 5.6.2 Methods for Deer

Suppressing the population of deer is extremely difficult because they breed quickly and the industrialized landscape provides abundant habitat for them. Hunting is likely to be the best method outside the CLAWR because there is a provincially managed tag system that could be expanded to increase hunter success. However, the presence of increased sports-hunters on the land can impact CLFN land use through competition and conflict without specific mitigations in place to reduce those effects. The hunting / guiding industry in the region is not well developed and an investment in infrastructure for both recreational and commercial hunting might draw additional hunters to the area. CLFN is interested in pursuing hunting/guiding opportunities, and having the Nation involved directly could help to mitigate potential impacts to rights-based land use. CLFN members did not express a preference for deer and most people who were interviewed indicated that they already met their needs for deer meat. Access restrictions on the CLAWR prevent deer-hunting there. If deer were to be culled as part of a formal program it would be essential that the deer carcass be used, in order to show respect for the animal. One potential option here is a wild food bank at CLFN which could address some of the food security needs of CLFN members. Such a facility would need to be able to process and store deer meat safely and efficiently. Many people at CLFN who would like to eat more wild game lack the knowledge or ability to harvest, process and store it. A wildlife food bank would

---

<sup>2</sup> <http://www.nafa.ca/wp-content/uploads/2016/06/NAFA-All-wildfur-results-May-2017.pdf>



also benefit those members who are in need. If some of these gaps could be closed at the community level it is probable that consumption would rise.

### 5.6.3 Access Requirements

Implementing alternate prey control on the CLAWR would require considerable access changes. Stable winter access to relatively large areas of the CLAWR would be needed for managing predator populations. If alternate prey population management were to be undertaken additional long term access to the entire CLAWR would likely be needed. A maternal penning operation would likewise require access for several months during the calving window. Access to airspace would be required for virtually all the monitoring work and consideration of long term access needs would need to be made when decisions about linear reclamation are being made. In summation, nothing can be done without better access to the Cold Lake Air Weapons Range.

### 5.6.4 Monitoring

There is a critical need for monitoring data to support alternate prey population management on the CLAWR. A combination of camera monitoring programs, fixed wing aerial counts, DNA, animal health, and GPS collars across all species in the predator - prey system of woodland caribou would be optimal. Monitoring programs need to be broad scale and attract the participation of entities with the expertise and interest, such as universities, to make the programs effective and successful. Monitoring programs should be designed to provide high quality baseline data and have the ability to integrate additional components based on the needs of researchers. An adaptive management approach is almost certainly going to be required for predator/ alternate prey/ caribou intervention. Adaptive management is only as good the monitoring and feedback systems it works with to achieve desired results. CLFN can likely take a lead role in monitoring but would need to secure partnerships with technical and academic organizations that could help with methods and reporting.

## Recommendations

Alternate prey species are a critical part of the wolf-ungulate relationship and will almost certainly require some management in the CLAWR if wolf cull is going to continue. However, this system should be modified only with the utmost care and an abundance of caution. If CLFN wishes to begin managing alternate prey it is recommended that CLFN should:

1. Secure the required access from DND in order to ensure that the work could be conducted. This will require working closely with 4-Wing Cold Lake and it is not clear if their organizational structure is able to deliver reliable access.
2. Develop the facilities required to house and support full time staff on the CLAWR in remote locations where work would need to be conducted.
3. Begin working to establish the current density of species it wishes to manage. This would likely involve a combination of aerial and ground surveys done in conjunction with Alberta and potentially another partner.
4. Develop a pilot study design that has treatment and control areas as well a monitoring program capable of estimating the effect of CLFN management actions on populations as well as their infill rate. This work should be done with an independent researcher or group.
5. Execute the program on a pilot cycle of at least 3 years.





## Appendix 1: Community Engagement Session Report

## Caribou Recovery Gathering Meeting Notes

### Cold Lake First Nations Council Chambers, Cold Lake First Nations South

March 20-21, 2018

#### Introduction

Cold Lake First Nations (CLFN) worked with staff from the Canadian Forest Service to host a two day Caribou Recovery Gathering in Cold Lake AB. This event was a multi stakeholder opportunity for CLFN members, elders, and leadership to engage with experts in the field from other First Nations, academia, the federal and provincial governments.

The event was well attended by community members with up to 30 members attending over the course of the two days. Speakers at this event included Monica Dahl from the Alberta Environment & Parks Caribou Range Planning Team, Stan Boutin from the Alberta Biodiversity Chair from the University of Alberta), Tara Russel from Canadian Parks and Wildlife (CPAWS), and Barry Robinson from Ecojustice, among others. It was very special to also have special guests from northeastern BC: Naomi Owens (Saulteau First Nations) and Tamara Dokkie (West Moberly First Nations). Besides being happy to meet their Denesųline relatives, these ladies shared a lot of information and experiences about the Klinse-Za Caribou Maternal penning project located in North Eastern BC.

The presentations are provided to the Canadian Forest Service via a file share site in confidence to support the contract deliverables. The information is provided solely to support future collaboration and cannot be reproduced or distributed without the consent of CLFN.

The following is a summary of the two day event:

#### March 20 - DAY ONE

**CLFN Lands and Resource Department Staff:** Findlay MacDermid, April Dawn Janvier, Lori Matchatis, Amber Martin, Nicole Nicholls, Sarah Chileen

**CLFN Member Attendees for part of or all of the event:** George Noel, Kelsey Jacko, Brian Grandbois, Mary Francois, Elise Charland, Adelord Blackman, Duane Janvier, Dwayne (Sonny) Nest, Mike Desjardins, Mervin Grandbois, Tyrone Bairnes, Annie Colburne, Mary Francois's son, Wilfrd Grandbois, Lynda Minoose, Rolland Piche, Cecilia Machatis, Donald Francois, Howard Grandbois, Robin Piche, Lorita Jacknife, Kevin M. Janvier, Suzy Cardinal, Shirley Cardinal, John Janvier, April Dawn Janvier, John Minoose, Timothy Janvier, Cody Jacknife. Although other members and staff from CLFN attended parts of the sessions, their names were not recorded on the sign in sheet.

9:25 am Opening Prayer Adelord Blackman and Drumming by Adelord Blackman and Duane Janvier

## Caribou Recovery Gathering Meeting Notes

### Cold Lake First Nations Council Chambers, Cold Lake First Nations South

March 20-21, 2018

9:30 am Introductions and Opening Remarks from Darren Frederick, Director of the CLFN Lands and Resource Department, Dwayne (Sonny) Nest, CLFN Councilor and Findlay MacDermid, CLFN Lands and Resource Department.

#### 10:00 am Alberta Range Planning team - Monica Dahl - The Provincial Range Planning Process in the Cold Lake Herd Range

Community Questions/Comments: How the Range Plan will consider Treaty and Aboriginal Rights, linear restoration methods and success, pipeline crossings success, wolf culling, restoration verses reclamation costs, DND contamination and radiation/laser/sound impacts, access concerns, types of research.

#### 11:30 am Environment and Climate Change Canada, Keri McFarlane - The federal perspective on Caribou Recovery.

Overview of ECCC strategy and deadlines for the caribou recovery plans and other elements linked to Federal action plan such as the Consortium on boreal caribou that is being developed and should involve First Nations, governments and stakeholders.

#### 1:00 pm – Stan Boutin, Alberta Biodiversity Conservation Chair - University of Alberta. Caribou Recovery 101.

A combination of maternal penning and wolf culling is required and encourages the consideration of developing a larger permanent penning project that can have strong First Nation involvement/management and is the only proven successful option currently in Western Canada. He promotes equality and accessible data sharing.

Community questions/concerns: Interactive discussion of:

1. Changes seen over people's lifetimes: encroachment of industry, climate change, animal health and populations, contamination, military activity, loss of habitat
2. Wolf culling and other ungulate populations, disruption of balance and spiritual connection
3. Water quality testing in Jimmy Creek and Primrose Lake to determine military activity and level of contamination. Fin spoke about the Primrose Lake Contaminant Study and shared that members can bring in samples to be tested through a university program.

#### 2:30 pm - Naomi Owens and Tamara Dokkie. The Klinse-Za maternal penning project - What Are First Nations doing in BC to lead the recovery efforts? How is the community involved?

When collaboration with the Province was unsuccessful the First Nations developed their own Caribou Management Plan to present to the Province. (Wildlife Infometrics support

## Caribou Recovery Gathering Meeting Notes

### Cold Lake First Nations Council Chambers, Cold Lake First Nations South

March 20-21, 2018

their project). The development of the plan, required many community workshops held over a year to talk about differences in perspectives, the need for restoration, caribou management, and the maternity pens. Harvest lichen to feed the caribou. Predator management – predatory pray imbalance was occurring and the community developed a volunteer monetary based hunting/trapping incentive program. The Nations agreed to 20 wolves per Nation each for a total 40 wolves per year. This year changed to hiring hunters/trappers to reduce the wolf population. \$570K per year to run the penning facility. Funding is applied for each year through the development of a society and takes a lot of work. They are looking into a Three party agreement with the province and the federal to help secure some funding. They also have Joint Ventures with a helicopter company. The project has been running for 4 years.

The Nations are also working on a community based program for habitat Reclamation and restoration with traditional and cultural plants. They have a nursey built for seed collection and growth. To begin with 50% Industry partner that provided upfront costs and built the nursery. The nursery is now 100% First Nation owned. The nursery \$40k to reclaim 2. 5 kms.

3:30 Renee Lapointe, Canadian Forest Service, Natural Resources Canada - CFS's perspective on reclamation of working landscapes – overview of the CFS, restoration methods and examples of projects.

Community Questions/Comments: How can NRCAN and the Province contribute to the development of land use planning with in the CLAWR and the traditional Territory? Has CFS learned from Europe and other areas? Cumulative impacts concerns and when will there be an Environmental Protection Order?

Sonny closing comments want to look at doing something like what West Moberly is doing. Wants input from the community and wants to get the word out for the community to give leadership direction for getting involved in management and working for future generations.

7:00 pm Evening Community Session With Tamara and Naomi from Saulteau and West Moberly First Nations - Presentation and open discussion with Saulteau and West Moberly First Nations

## Caribou Recovery Gathering Meeting Notes

**Cold Lake First Nations Council Chambers, Cold Lake First Nations South**

**March 20-21, 2018**

### March 21 - DAY TWO

**CLFN Lands and Resource Department Staff:** Findlay MacDermid, Lori Matchatis, Amber Martin, Nicole Nicholls, Sarah Chileen

**CLFN Communications:** Department: Charles Muskego

**CLFN Attendees for part of or all of the event:** Mary Francois, Brian Grandbois, Kelsey Jacko, Bridget Machatis, Shirley Cardinal and her son in law, Duane Janvier, Tyrone Barines, Elise Charland, George Noel, Cecilia Machatis, Cecilia Piche, Joyce Metchewais

9:00am Opening prayer Bridget Machatis with drumming and song by Duane Janvier and Kelsey Jacko

Opening remarks

10:00 am - Ecojustice: Barry Robinson - The Legal Framework of the Species At Risk Act and Legal Protection in Alberta.

Environmental Protection Orders - CLFN could enter in to a Section 11 conservation agreement to have greater involvement and role in implementing a recovery strategy –

11:15 am Tara Russell CPAWS Northern Alberta - Protected Areas as a tool for Caribou Recovery.

Non Profit organization. Developed a guide to Caribou Range Planning to inform the Provincial range planning. Working with Mystic is Saskatchewan on cross boundary issues and gaining more data on the Saskatchewan side. United Nations Target 11 17% goals and the Pathway to Canada Target 1 for the development of conservation and protected areas. Federal budget includes funding for the creation and management of protected areas including 100% funding for indigenous led protected areas.

Community questions/concerns: Can CPAWS help CLFN create a protected area and how? Yes, CPAWS could provide information, support and mapping to help the Nation navigate the process. The need for jurisdictional issues to worked out and true communication with First Nations.

1:00 pm Dave Poulton, Alberta Association for Conservation Offsets, Alberta Conservation Offsets Association - What are Conservation offsets and how can they be used in Caribou Range Planning.

Opportunities for First Nations, recognizing that they are lacking an indigenous perspective in the work they are doing.

## Caribou Recovery Gathering Meeting Notes

**Cold Lake First Nations Council Chambers, Cold Lake First Nations South**

**March 20-21, 2018**

Community Questions/Comments: Validation that concerns at one end of a pipeline may be very different from the concerns at the other end. Questions to provide more clarity of credits and the idea of banking conservation offsets.

2:30 pm -4:30 pm    Next steps, Open Mic, Wrap-up (closing prayer)

## Appendix 2: Klinse-Za Maternal Penning March 2018 Update



## Maternal Penning to Enhance Survival of Caribou within the Klinse-Za Herd

### External: Issued March 18, 2018

In this memo, we provide an update on maternal penning activities within the Klinse-za/ScottEast caribou herd area. The update, and others to come as the mat pen project progresses, are sent to the Nîkanêse Wah tzee Stewardship Society directors and members, Klinse-za caribou recovery program advisors and sponsors, the technical working group members, and field crews.

Much has happened since the last external newsletter (issued prior to release of caribou from the Bickford mat pen in July of 2017):

- We released 9 cows and 7 calves from the Bickford mat pen in late July, 2017 – all 7 penned calves were confirmed to have survived to early March 2018.
- We confirmed that the remaining 21 wild cows had 6 calves in late July 2017 and 5 of those were still alive in early March 2018.
- Two collared cows were confirmed to have been killed by predators; one cow released from the mat pen was killed by a wolf in September and one cow that spent the year in the wild was killed by a wolverine in February.
- The mat pen at the Bickford site was dismantled after the release in July 2017 and a new pen, double the Bickford size, was constructed approximately 40kms northwest of Bickford on Mt. Rochfort.
- Last week, we caught and penned 11 cows and 2 calves.

**Table 1. Cumulative results for the Klinse-Za maternity pen.**

Year	Wolves removed		Cows In pen	Preg- nant	Failed	Calves born	Deaths in pen <sup>a</sup>	Released <sup>a</sup>	Pen deaths outside <sup>a</sup>	Survived full year <sup>a</sup>	Wild deaths <sup>a</sup>	Wild calf survival	Pop'n size	Collars	
	Ground	Air												Pen	Wild
2013	22												36		04
2014	20		10	10	00	10	0f,1c	10f,09c	2f,5c	08f,04c	2f	2c	40	10	05
2015	20	69	11	09	03	06	0f,1c	11f,05c	0f,0c	11f,05c	0f	4c	42	11	06
2016	46	57	14	13	02	11	1f,0c	13f,11c	0f,4c	13f,07c	4f,2m <sup>b</sup>	5c	54 <sup>c</sup>	13	09
2017	35	26	09	09	02	07	0f,0c	09f,07c	1f,0c	09f,07c	1f	5c	61 <sup>d</sup>	09	13
2018			11										67-70	11	8

a- Where f is adult females, c is calf, and m is adult male;

b- Includes 1f and 2m unmarked, wild animals

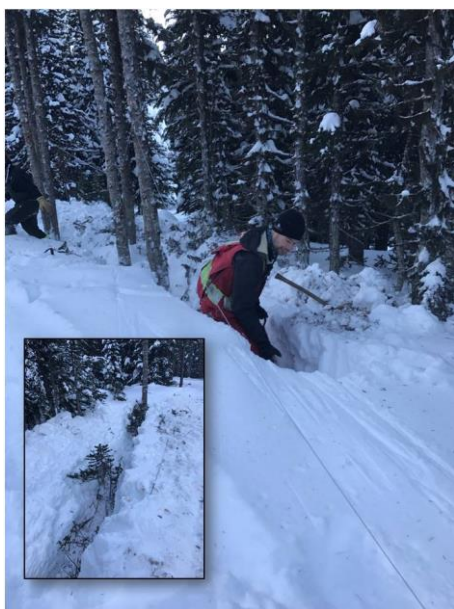
c- Includes 3 immigrants

d- Includes 1 penned calf that was found after the annual population survey was conducted





## Rochfort mat pen construction:



The objectives for the change in site were to: a) allow for vegetation recovery at Bickford, b) avoid any pathogen build up that may have occurred at Bickford, c) provide for a larger pen accommodating more caribou and therefore increasing the potential return to the population recruitment, and d) test the notion that mat pens can be used to redistribute caribou into currently unused portions of the historic range.



Figure 1. The Rochfort mat pen showing fence line, feeding meadow, and capture processing meadow.

### 2018 captures:

On March 13-14<sup>th</sup> we caught 11 cows and 2 calves, transported them to the pen where the cows received radio collars, and released all animals within the pen. See below for pictures of the event.

Days in pen → 5

Days to release → 127



Figure 2. A captured cow being prepared for transport to the pen (left) and then relayed into the pen by snowmobile (right).





Figure 3. Caribou C332K being processed. This cow was originally caught in the Klinse-za area in 2015 and gave birth to a male calf in the 2015 mat pen that died 2 days after birth. She was recaptured in 2016 and gave birth to a female calf that survived to the following March (and is still alive today). She lived in the wild since release in 2016 but had no calf with her when recaptured this year. Inset is a picture of the collaring kit prepared for each captured caribou.



Figure 4. Taking measurements of C332K's body fat as a part of the health studies.





Figure 5. Helen Schwantje waiting for C364K to become mobile again. This cow was first caught last year and was taken to the 2017 pen but failed to raise a calf as it was stillborn in the pen. We're wishing her a healthy calf this year.



Figure 6. Some of the team going for a walk inside the pen after captures (left). On the walk, we were able to observe all 13 penned caribou feeding at the feed troughs in the feeding meadow (right).





Figure 7. View of the feeding meadow from the observation tower with Battleship Mountain in the background.



Figure 8. Discussing protocols for guarding the mat pen.



## The teams:

- Nîkanêse Wah tzee Stewardship Society
  - West Moberly First Nations (Chief Roland Willson/Tamara Dokkie)
  - Saulteau First Nations (Estelle Lavis/Naomi Owens)
- Caribou Mat Pen Working Group<sup>1</sup>
  - West Moberly First Nations (Bruce Muir/Jason Lee)
  - Saulteau First Nations (Naomi Owens/Carmen Marshall)
  - Wildlife Infometrics (Scott McNay/Brian Pate, alt - Line Giguere)
- Mat Pen Technical Advisory Team<sup>2</sup>
  - Revelstoke penning trial (Rob Serrouya/Corey Legebokow)
  - FLNRO (Chris Addison/Chris Ritchie/Helen Schwantje/John Surgenor)
  - MOE (Dale Seip)
- Support teams – capture specialists, veterinarian team, shepherds, lichen collectors

## Thanks to our sponsors<sup>3</sup>



<sup>1</sup> The Caribou Mat Pen Working Group is a committee appointed by the Nîkanêse Wah tzee Stewardship Society.

<sup>2</sup> The Mat Pen Technical Advisory Team is an ad hoc committee chosen by the Working Group to obtain technical advice.

<sup>3</sup> Current and historic

## Appendix 3: TLU Interview Guide

### Interview Introduction

(read with RECORDER ON at the start of every session)

Today is \_\_\_\_\_, 2017. We are interviewing \_\_\_\_\_ for the CLFN Woodland Caribou IK Study. You have been asked to participate in this interview because we have been told that you are likely to have knowledge about woodland caribou.

My name is \_\_\_\_\_ and my co-researchers are \_\_\_\_\_. We are at \_\_\_\_\_. [Interview participant] has read and signed the consent forms and we have assigned Interview ID# \_\_\_\_\_. We will be recording the interview on a digital voice recorder and taking detailed notes in this interview guide. We will be mapping digitally using google earth images projected on the wall and may also use hard copy mark-up maps. [Mapper name] will be doing the digital mapping using points, lines or polygons, and will be entering the site codes and other data as we go. The study area is Cold Lake First Nations traditional territory, Denne Ni Nenne. To the extent possible, IK about changes over time will be specified according to three key time periods: pre-1952(CLAWR), 1952-2000, -today.

All data (audio recordings, interview transcripts, digital mapped data) will be stored by the CLFN Land and Resources Department. A report will be prepared to share with Alberta's caribou range planning team. This report will not contain personal information such as participant names and any specific data will be coded in such a way as to protect privacy and confidentiality.

### PART 1 – BIOGRAPHICAL AND BACKGROUND QUESTIONS

#### Information about yourself:

Participant Info (ID Number)	
What is your name?	
Are you a CLFN member?	
What year were you born? How old are you?	
What is your connection to woodland caribou? How have you come to know about them?	

### PART 2 – CLFN KNOWLEDGE AND USE (GENERAL)

#### Are you able to share the Dene words used to identify:

Woodland Caribou (generally)	
Bulls	
Cows	
Calves	
Are there any other relevant Dene words related to woodland caribou?	



**Herds:**

What caribou herds are you aware of within CLFN's traditional territory?	
(If more than one) How do you distinguish between them?	
Can you identify their range(s) on the map?	

**Use and Respect:**

What have you been taught about how caribou were used in the past?	
How are caribou used today?	
Has use of caribou changed over time? If so, why?	
Are there any teachings or stories about caribou that you are comfortable sharing with us?	
What kinds of things were done in the past to respect and honour caribou?	
Are those things still done today?	

**Traditional Indicators:**

<p>Are there any traditional indicators that are related to caribou?</p> <p>For example:</p> <ul style="list-style-type: none"> <li>- signs on the land that told people when caribou would be rutting / calving / moving?</li> <li>- Signs that tell people whether caribou are healthy and/or good to eat</li> </ul> <p>Anything else?</p>	
--	--

**Harvesting & Use Knowledge**

Have you harvested caribou?	<input checked="" type="checkbox"/> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> <input type="checkbox"/> No
If so, do you continue to do so?	<input checked="" type="checkbox"/> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> <input type="checkbox"/> No



If you harvest caribou, do you have preferences on the age or sex of the animal?	<input checked="" type="checkbox"/> <input type="checkbox"/> Yes – bull <input checked="" type="checkbox"/> <input type="checkbox"/> Yes – cow <input checked="" type="checkbox"/> <input type="checkbox"/> Yes - juvenile <input checked="" type="checkbox"/> <input type="checkbox"/> No Preference
Is there a particular time of the year that you harvest caribou? Why?	
If you used to harvest caribou, but no longer do so, when and why did you stop?	<input checked="" type="checkbox"/> <input type="checkbox"/> change in access due to CLAWR <input checked="" type="checkbox"/> <input type="checkbox"/> change in access due to industry <input checked="" type="checkbox"/> <input type="checkbox"/> change in herd presence/abundance <input checked="" type="checkbox"/> <input type="checkbox"/> other (specify):
Who else do you know that harvests caribou or used to?	
Are there specific areas where your older relatives (or other Elders) hunted caribou in the past?	
If these areas are different than those used today (or in more recent years), why is that?	<input checked="" type="checkbox"/> <input type="checkbox"/> change in access due to CLAWR <input checked="" type="checkbox"/> <input type="checkbox"/> change in access due to industry <input checked="" type="checkbox"/> <input type="checkbox"/> change in herd presence/abundance <input checked="" type="checkbox"/> <input type="checkbox"/> other (specify):

### Mapping Exercise:

<p>Where do you remember seeing caribou in the last:</p> <ul style="list-style-type: none"> <li>- five years?</li> <li>- 5-20 years</li> <li>- 20 – 50 years</li> <li>- Prior to 1970?</li> <li>- Prior to 1952 (if possible)</li> </ul> <p><i>For each locale (to extent possible):</i></p> <ul style="list-style-type: none"> <li>- <i>when</i></li> <li>- <i>who</i></li> <li>- <i>what (specific – how many caribou, sex/age)</i></li> <li>- <i>why here?</i></li> <li>- <i>How did you come to be there?</i></li> <li>- <i>How often have you observed caribou here over time?</i></li> <li>- <i>Do you still observe caribou here today/currently?</i></li> </ul>	List assigned site IDs:
---	-------------------------

<p>Please show us on the map specific locations where you have harvested, participated in harvesting or otherwise observed caribou.</p> <p><i>For each locale:</i></p> <ul style="list-style-type: none"> <li>- <i>when</i></li> <li>- <i>who</i></li> <li>- <i>what (specific – how many caribou, sex/age)</i></li> <li>- <i>why here?</i></li> <li>- <i>How often have you observed caribou here over time?</i></li> <li>- <i>How did you come to be there?</i></li> <li>- <i>Do you still observe caribou here today/currently?</i></li> </ul>	List assigned site IDs:
---	-------------------------

### PART 3 – CARIBOU RANGE, MOVEMENT, BEHAVIOR

#### Habitat:

What kind of feed do caribou prefer? Do feed preferences vary by sex, age or season?	
What makes an area good for caribou?	
<p>What kinds of places do caribou like to be at different times of the year?</p> <ul style="list-style-type: none"> <li>- When and where do they rut? Why?</li> <li>- When and where do they calve? Why?</li> <li>- What other locales are used throughout the year and why?</li> </ul>	
<p><b>Mapping exercise: specific habitat locales.</b> For each specify:</p> <ul style="list-style-type: none"> <li>- first hand/second hand knowledge</li> <li>- date of observation / knowledge</li> </ul>	

<ul style="list-style-type: none"> <li>- habitat type and season (rut, calving, mineral lick, summer, winter, etc.)</li> <li>- what makes the area "good" habitat</li> <li>- has a change occurred to this habitat locale?</li> </ul>	
---	--

### **Movement:**

<p>What do you know about the movement of woodland caribou (migration, distances, cycles, separating and joining up?).</p> <ul style="list-style-type: none"> <li>- Do they move or migrate across the land? How far and where?</li> <li>- Do they move as individuals or in groups? Does group size change throughout the year? How so?</li> </ul>	
<p><b>Mapping exercise: movement patterns</b> today. Specify:</p> <ul style="list-style-type: none"> <li>- time of year</li> <li>- groups/individual movement</li> </ul>	
<p>Have movement patterns changed? If so, how? Map past movement patterns (if possible)</p>	
<p>Are there any traditional indicators that related to caribou movement? For example, signs on the land that told people when caribou would be moving?</p>	

**Behavior:**

How do caribou react to predators?	
How do caribou react to people?	
How do caribou react to industrial activity?	
Do bulls and cows have different patterns in their movements and habitat? <b>Can these be mapped?</b>	
What do you know about <b>bull caribou behavior</b> during the rut and the rest of the year?	

**Changes:**

Were you told by your Elders about any changes to caribou that occurred in the past? (What, when, who? Why?)	
Have you observed any changes in the movements and habits, behavior or presence and abundance of woodland caribou in your lifetime? If so, what?	
Why do you think these changes occurred?	
How do you feel about these changes?	

**PART 4 – PREDATOR / PREY SPECIES AND RELATIONSHIPS****Wolves:**

Do you know of any specific places in the caribou range where there are a lot of wolves?	
Are there more wolves now than in the past? If so, why? When did you notice that these changes started? What affect, if any, has that had on caribou?	

What are the main species wolves live on?	
Are you aware of any traditional practices or teachings that CLFN members / ancestors observed with respect to wolves? Is there anything people used to do to manage the abundance, presence or relationship with wolves in the past?	
How should the relationship between wolves and caribou be managed? Do you support culling wolves?	
What is the best way to cull wolves? - methods - time of year - frequency? - What kinds of places are best for this?	
What should happen with the remains of wolves that have been culled?	
Would you be interested in participating in wolf management activities including wolf culling? If not, is there anything that could be done to increase your interest? For example a bounty?	

### **Black Bear:**

Are there more black bears in areas where there are caribou than there were in the past? If so, when did this change occur and why do you think it occurred?	
What can you tell us about how black bear interact with caribou? If there was a change in black bear abundance has this had any affect on caribou?	
Are you aware of any traditional practices or teachings that CLFN members / ancestors observed with respect to bear? Is there anything people used to do to manage the abundance, presence or relationship with black bear?	
Do you harvest or use black bear at all? If so, how often and for what use? If not, why not?	
If you do harvest and use black bear, would you like to do so more often? If available to you, how many black bear would you be able to use in a year?	
What could be done to prevent black bear from predating caribou calves? What kinds of things would you support to help manage black bear populations in caribou habitat?	
What is the best way to get black bear? What season is best? What kinds of locations?	
How would you feel about increasing the non-First Nation harvest of black bears?	

Could or should CLFN harvest of black bear be increased? If so, what could be done to encourage this? If not, why not?	
--	--

#### Deer:

Have there been changes in the presence or abundance of deer within the caribou herd range over time? Please describe.	
Do you harvest or use deer at all? If so, how often and for what use? If not, why not?	
If you do harvest and use deer, would you like to do so more often? If available to you, how many deer would you be able to use in a year?	
How would you feel about increasing the non-First Nation harvest of deer?	
Could or should CLFN harvest of deer be increased? If so, what could be done to encourage this? If not, why not?	

#### Beaver:

Have there been changes in the presence or abundance of beaverthin the caribou herd range over time? Please describe.	
Are there any places in the caribou herd range where there are lots of beaver?	
Do you harvest or use beaver at all? If so, how often and for what use? If not, why not?	
If you do harvest and use beaver would you like to do so more often? If available to you, how many deer would you be able to use in a year?	
What are the best ways to get beaver? How many beavers per season do you think you could get this way? How frequently would you need access to do this?	
How many beaver are typically in a single lodge? How many is it ok to remove?	
How would you feel about increasing the non-First Nation harvest of beaver?	
If beaver were going to be culled as part of wildlife management, what should be done with the remains of the beavers?	
Could or should CLFN harvest of beaver be increased? If so, what could be done to encourage this? If not, why not?	

## PART 5 – VIEWS ON CARIBOU AND THEIR MANAGEMENT

Are there any areas that you feel are the most important to protect for caribou?	
What would it mean to you if caribou were gone forever?	
Maternal pens are one option for helping caribou populations recover. This involves penning pregnant caribou so that their calves are born in enclosures where they are protected from predators. Eventually calves are released outside the pen when they are big enough to evade predators effectively. The maternal pen could be permanent or temporary.  What do you think about this idea? Do you support it? Would you be interested in learning more about it?  Alberta may explore this idea for the Cold Lake herd. If so, is there a particular place you think a facility like this should be located? Why?  What kind of role could CLFN play in a project like this?	
Should CLFN be involved with caribou management? What are the best ways you think CLFN could be involved?	

## PART 6 – Reclamation and Ongoing Access Needs

Alberta recognizes that restoration of caribou habitat is key. This will involve a lot of reclamation, particularly of seismic lines. Do you support this idea?	
Alberta recognizes that some seismic lines may be used for hunting access. Are there areas that you would want to see access removed ?	
Are there areas that you would want to see access maintained?	
Are there specific Trails or Seismic lines that you would like to see maintained?	

### Interview closure

(read into recorder)

My name is \_\_\_\_\_ and I'm here with \_\_\_\_\_, whom we've given Interview

ID# \_\_\_\_\_. We've a total of \_\_\_\_\_ tracks on the digital recorder. Detailed notes have been recorded in the interview guide. A .kml file of mapped locales has been saved in Google Earth.