Experimental Wolf Reduction to Enhance the Recovery of Threatened Caribou Herds In the South Peace

s.15,s.19
Ministry of Environment
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Background:

Woodland caribou herds in the South Peace region of British Columbia (Figure 1) are part of the Southern Mountain caribou population which is nationally listed as Threatened. In April 2014, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) re-evaluated the status of these herds as part of the Central Mountain caribou population and recommended that their status be upgraded to Endangered.

The caribou herds in the South Peace are experiencing rapid and dramatic population declines (Seip and Jones 2014). The Moberly herd declined from 191 caribou in 1997 to 22 caribou in 2014. The Burnt Pine herd numbered about 17 animals in 2006 but as of 2014 appears to have been extirpated. The Kennedy Siding herd decreased from 120 in 2007 to 25-35 by 2014. The Quintette herd has declined from 173-218 in 2008 to 98-113 in 2014. The Narraway herd (including the Bearhole/Redwillow subgroup) is also believed to be declining based on the population parameters, but actual numbers are uncertain as this herd winters in forest cover and is difficult to census. The population trend of the Scott herd (n=20) is unknown.

Annual mortality rates of radio-collared adult females range from 12-24% for the different herds (Seip and Jones 2014). Wolf predation is the cause of 37% of adult mortalities that have been documented, but the actual rate of wolf predation is likely higher as some portion of adult mortalities classed as unknown predator and unknown cause are probably wolf predation. Calf recruitment rates for the herds range from 9 to 14% calves in the March population which is inadequate to compensate for the adult mortality in most of the herds. The causes of calf mortality have not been documented for the South Peace caribou herds, but other studies have identified wolf predation as a significant cause of caribou calf mortality (Gustine et al. 2006), and calf survival has been documented to increase in response to wolf reductions (Farnell and McDonald 1988, Seip 1992, Hayes et al. 2003).

Wolf distribution has been documented within the range of the Quintette caribou herd (Figure 2). The Quintette herd ranges over an area of about 5000 square km, and this area contained 3 primary wolf packs and several peripheral packs. The 3 primary wolf packs numbered about 30-40 wolves for a wolf density of about 6-8 wolves/1000 square km. Most of the packs had territories of about 1000 square km in size, although one of the packs ranged more widely. Similar densities of wolves have been reported within mountainous caribou range in west-central Alberta (11 wolves/1000 square km) and in the Yukon (5-9 wolves/1000 square km) (Kuzyk 2002, Hayes et al. 2003). For this project, we assume that the ranges will contain 6-10 wolves/1000 square km.

In winter, wolves remain primarily in the valley bottoms (97% of telemetry locations) and feed primarily on moose, elk and deer. Most of the South Peace caribou winter in high-elevation alpine and subalpine habitats which keeps them spatially separated from wolves in winter. However, the Narraway herd winters in low-elevation forested habitat which puts them in close contact with wolves throughout the

winter. Also, in recent years some of the Quintette caribou have used low-elevation habitat in winter, apparently due to do being displaced from high-elevation habitat by expanded mining activity. In summer, wolves make more use of high-elevation caribou range (10% of telemetry locations) where they occasionally encounter and kill caribou.

Although caribou and wolves co-existed in the South Peace for thousands of years, the level of wolf predation has become unsustainable over the past few decades. That period corresponded to extensive landscape change due to industrial activities. Forest harvesting, road building, and oil and gas developments modified valley-bottom forests. Mining exploration and development occurred in some high-elevation caribou habitat. It is thought that the recent increase in the amount and distribution of early-seral habitat has increased the abundance and distribution of moose, elk, and deer and led to an increase in wolf numbers and distribution on caribou ranges. A similar process is believed to be threatening woodland caribou herds across Canada.

Even if all industrial activities on and adjacent to caribou habitat were to cease immediately, it would take decades for the habitat to recover, and direct management of the predator prey system would likely be necessary to maintain caribou populations until the habitat recovered. In practice, industrial activities within and adjacent to core caribou habitat are expanding and continue to make the situation worse, so recovery of the caribou herds will require ongoing predator prey management. The 2014 National "Recovery Strategy for Woodland Caribou, Southern Mountain Population (*Rangifer tarandus* caribou), in Canada" recommends wolf reduction in addition to habitat protection to recover these Threatened herds.

Wolf control programs in other areas of caribou range have reported that when effective wolf control programs have been implemented, improved calf recruitment rates and reduced adult mortality rates result in a caribou population growth rate of about 10% (Farnell and McDonald 1987, Boertje et al. 1996, Hayes et al. 2003). Given that effective wolf control is only likely to generate 10% annual population growth, the benefits will be greater when applied to a larger herd. Therefore, wolf reduction to enhance the Quintette herd (n=98-113) would be the most effective, with the Kennedy Siding herd (n=25-35) being second. The small Moberly and Scott herds (n=22 each) likely require much more intensive recovery actions such as the ongoing maternity penning in combination with wolf reduction to allow recovery in a reasonable time frame. A maternity penning project for Moberly and Scott caribou in 2014 was of limited success because although 9 calves were reared and released from the pen, 3 of the calves and one of the adult females were killed by wolves soon after release. Wolf reduction for the Narraway herd would be very challenging as they have a very large annual range that includes both low-elevation forested winter range, and high-elevation summer ranges that are over 100 km apart.

Wolf reduction can be very challenging as wolf populations are very resilient and difficult to reduce due to a high reproductive and recolonization rate. In the Little Smokey boreal caribou range in Alberta, the wolf numbers completely recovered after each year of control so the same number had to be removed every year. Wolf reduction programs in more mountainous habitat, however, usually find fewer wolves present after control is initiated so the number killed in subsequent years is somewhat less (Farnell and McDonald 1988, Hayes et al. 2003). Wolf control programs need to be very intensive and ongoing if they are to be effective.

The efficacy of wolf reduction using enhanced trapping and hunting is unproven and most effective wolf control programs have relied on aerial shooting and poison. Consequently, any attempt to effectively reduce wolves in the South Peace would likely require the use of aerial shooting. The efficacy of the

program may be improved by first collaring some wolves in each pack to help locate the packs for removal later in the year.

The proposed wolf control program consists of 3 treatment areas and 1 no treatment area for comparison:

i) **Quintette herd**: This is the largest remaining herd in the South Peace numbering 98-113 caribou. Wolf reduction in this area has the potential to produce the greatest absolute population response. If wolves are effectively reduced within the Quintette range, the caribou population would potentially increase up to 10% each year. At that rate, the caribou population would recover to over 220 caribou after 9 years. Wolf removal would have to occur each year as new wolves from surrounding areas recolonize the range. After the population objective of 220 caribou is reached, more limited or periodic wolf control may be sufficient to maintain the caribou population at that number.

   The Quintette herd also provides the best opportunity to improve our scientific understanding of wolf control to recover caribou. The herd provides an adequate sample size of caribou and the wolf reduction treatment would not be confounded by other management actions being conducted. Also, this herd has the only data available from previous research on the distribution and ecology of wolves on the range.

ii) **Moberly herd:** This herd has declined to about 22 caribou, so even if effective wolf control was conducted, the population increment in the first few years would only be 2 or 3 additional caribou each year. For that reason, the Klinse-Za caribou management plan recommends that maternal penning also be used to enhance recovery. First Nations are conducting a maternal penning program in the Moberly range to enhance the survival of newborn calves. However, that program was of limited success in 2014 because 3 of 9 released calves and one adult female were killed by wolves soon after release.

   Given the small number of adult females available in this herd, some adult females from the adjacent Scott herd are also brought to the maternity pen. Those Scott caribou are able to migrate back to the Scott range following release. There is range overlap between the Scott and Moberly herds so wolf reduction on the entire Moberly herd range would also incorporate about half of the Scott herd range. Therefore, the combination of maternity penning and wolf control on the Moberly range would also provide some benefits for the Scott herd.

   The combination of maternity penning and wolf control is anticipated to increase the herd to 200 caribou in 10 years (McNay et al. 2013).

iii) **Scott and Kennedy Siding herds:** Reducing wolves in this area would directly benefit caribou in the Scott and Kennedy Siding herds, but also make the Quintette and Moberly treatments more effective by reducing the source of wolves that could recolonize those areas. The Kennedy siding herd has declined to 25-35 caribou and effective reduction in wolf predation should allow it to slowly recover. Effective wolf control would likely increase the Kennedy Siding population to about 80 caribou within 10 years. As the Kennedy Siding population increases it may expand its range and recolonize the Burnt Pine range where caribou have recently been extirpated. This treatment area would also ensure that the risk of wolf predation was reduced over the entire Scott herd range.

Another benefit of reducing wolves in this treatment area is that it would likely reduce the problem of ongoing wolf recolonization into the Quintette and Moberly areas. By extending the boundary in the north and west to the shores of Williston Reservoir, it would likely prevent any wolf recolonization from that direction during the ice free months. By reducing wolves in the zone between the Quintette and Moberly treatment areas, it would reduce or eliminate any wolf recolonization from that area.

iv) **Graham No Treatment Area**: The Graham caribou herd lives north of Peace Arm and numbers about 700 caribou. There are no plans for wolf control in this area, although there is evidence that the herd is declining and wolf predation is a major cause of mortality (Culling and Culling 2009, Culling et al. 2005, MOE unpublished data). Therefore, this herd will be used to monitor annual adult caribou mortality and calf recruitment in the absence of wolf control. It will also be periodically censused to compare the population trend to the herds where wolves are being reduced.

The effectiveness of wolf control to improve caribou population growth has not been demonstrated in these herds, so there is some chance that the programs will not be effective. Difficulty in achieving an adequate level of control, high levels of wolf immigration, or high levels of caribou mortality due to other causes may limit the success of the program. To maximize the probability of success, the wolf reduction should be very intensive over the entire area and there must be a financial commitment to keep the program going for at least a decade. Also, it is very likely that moose and other early seral ungulate populations will increase more quickly than caribou in response to wolf reduction. That increase in early seral ungulates will attract wolves from surrounding areas and potentially exacerbate the risk to caribou unless the population increase is suppressed by increased human harvest. Therefore, liberalized hunting for moose, elk and deer should be instituted within the treatment area.

Ultimately, as long as the habitat conditions on and adjacent to caribou ranges remain heavily modified by industrial activities it is unlikely that any self-sustaining caribou populations will be able to exist in the South Peace. If extirpation of the caribou herds is to be prevented, an ongoing, intensive wolf control program is the management action that has the greatest likelihood of success.

Experimental Wolf Control:

Wolf control to enhance caribou populations in the South Peace should be viewed as an experimental program. Although numerous caribou recovery plans in B.C. have recommended wolf control, in reality the efficacy of wolf control has yet to be demonstrated for B.C. caribou herds. There are several uncertainties that can only be resolved by conducting a rigorous experimental program:

i) The role of wolf predation in caribou calf mortality in the South Peace is unknown. Caribou herds throughout B.C. have low calf recruitment, but the causes of calf mortality are not clearly understood. Calf mortality can be studied by collaring newborn calves and recording the causes of mortality, but this method is very intrusive, expensive and the results can still be ambiguous. Capturing and collaring newborn calves puts them at risk of injury or abandonment, and may make them somewhat more vulnerable. This risk is unacceptable for critically Threatened caribou herds. The best method to evaluate the importance of wolf predation on caribou calf survival is to effectively reduce the wolf numbers and monitor calf survival.

ii) Although the importance of wolf predation on adult caribou mortality has been documented, there remains some uncertainty how effective wolf reduction will be at improving adult caribou survival.

iii) Even if wolf predation is a major limiting factor and reducing wolves would benefit the caribou population, it is not known how effective a wolf control program will be at reducing wolves to sufficiently low numbers and maintaining them at low numbers throughout the year. Efficient reduction of wolves that range over large areas in forested habitat is challenging. Also, maintaining the wolf population at low numbers can be difficult due to high reproductive rates and recolonization from surrounding areas.

Wolf Reduction and Monitoring Plan

Treatment Areas:

Quintette

i) Wolf reduction will occur on the range of the Quintette caribou herd because that herd is most likely to exhibit a strong positive response to wolf reduction.

ii) The treatment area of 6,354 square km incorporates most of the range of the Quintette caribou herd (Figure 3). The area includes the watersheds of the Sukunka, Wolverine, Murray and Wapiti Rivers.

iii) This area incorporates most of the summer (95.9%) and winter (94.2%) locations of the Quintette caribou herd (Figure 4).

iv) The treatment area contains most of the locations of the 3 core wolf packs (Figure 5) that were monitored in past years, as well as some locations of peripheral packs. The treatment boundary generally follows the height of land of watersheds used by the wolves in winter.

v) It is anticipated that the area contains 3-6 wolf packs and 38-64 wolves.

Moberly

i) Wolf reduction will occur on the annual range of the Moberly caribou herd, which also overlaps part of the range of the Scott caribou herd. Given the small size of this herd, a combination of maternity penning and wolf control will be used to recover the population. Wolf control is required to reduce the risk of predation for caribou that are reared and released from the maternity pen.

ii) The 4,855 square km treatment area (Figure 3) incorporates most of the range of the Moberly caribou and includes the watersheds of the Moberly, Pine, Carbon and Clearwater Rivers.

iii) The area contains 98% of the winter locations and 99% of the summer locations of the Moberly herd. It also contains 83% of the winter locations and 73% of the summer locations of the Scott herd (Figure 4).

iv) Assuming an average wolf territory size of about 1000 square km, the area likely contains 4-5 wolf packs and a total of 29-49 wolves.

Scott and Kennedy Siding

i) Wolf control would occur on the portion of the Scott caribou range not included in the Moberly treatment area, as well as the annual range of the Kennedy Siding caribou herd. Wolf reduction would aid the recovery of these two small caribou herds, as well as reduce the risk of wolves from this area recolonizing the Quintette and Moberly treatment areas.

ii) The 5,285 square km treatment area includes the watersheds of the Parsnip, Missinchinka and Pine River watersheds (Figure 3).

iii) The area includes 17% of the winter locations and 27% of the summer locations of the Scott herd, which in combination with the Moberly treatment areas represents all of the recent locations for this herd. The area includes 99% of the winter locations and 94 % of the summer locations for the Kennedy Siding herd (Figure 4).

iv) Assuming an average wolf territory size of about 1000 square km, the area likely contains 5-6 wolf packs and 32-53 wolves.

Wolf Reduction Methods:

i) Wolves will be removed by aerial gunning from a helicopter each winter. Removal will commence as soon as snow conditions are suitable in early winter, and continue through the winter.

ii) Wolves will be located by searching for tracks in valley bottoms, especially along frozen rivers and other open areas. Tracks will then be followed until the wolves are located. Based on the previous radio-telemetry project, about 97% of winter wolf locations are in the valley bottoms.

iii) When possible, wolves will be captured by darting and radio-collared if they are in open habitat. The radio-collared wolves will then allow the pack to be located at a later date for removal. In situations where capture and collaring are not possible, the wolves will be shot as soon as they are located.

iv) When practical, dead wolves will be transported to an area where they can be picked up by the registered trapper for the area to utilize the pelts.

i) The objective will be to kill all of the wolves within the treatment areas to maximize the chances of caribou recovery. The conservation of wolves will not be jeopardized because wolves are abundant in the surrounding area. It is likely that there will be a significant amount of wolf recolonization each year and that a similar number of wolves will have to be removed each year until population recovery objectives have been achieved. After that, reduced or periodic wolf control may be adequate to maintain the caribou population.

Monitoring of the Caribou Response:

i) A sample of radio-collared adult female caribou will be maintained in each wolf removal area each year using GPS radio-collars that upload to a satellite. Those caribou will be captured by net-gunning and collared in March.

ii) The sample sizes for each herd will be 20 in Quintette, 6 in Kennedy Siding, and 15-20 in the Moberly/Scott group depending on how many and which caribou are put into the maternity pen each winter.

iii) The radio-collars transmit a mortality signal that is relayed by satellite if the caribou dies. Mortality sites will be visited immediately after death to determine the cause of death. Survival rate of adult female caribou will be evaluated based on the survival rate of the collared caribou.

iv) Calf recruitment will be determined each March by aerial surveys to count the number of calves located in groups of caribou located by aerial telemetry.

v) A sample of 30 VHF radio-collared caribou will be maintained in the Graham herd where wolf reduction is not occurring to collect comparable data on adult mortality and calf recruitment.

vi) Adult mortality rate and calf recruitment will be compared to data collected for each herd since 2002 in the absence of wolf control, and also with the Graham herd where wolf reduction is not occurring.

vii) The populations will be counted every 3 years by aerial surveys of the alpine winter range, using the collared animals to correct the count for sightability.

viii) It is anticipated that it will take up to 10 years of wolf control to achieve population recovery objectives for each herd. However, if there is no evidence of successful recovery occurring after 4 years, the program should be reconsidered.

Budget:

2014-15:

Quintette:

20 GPS Life-cycle radio-collars	20,000
Capture and collaring of 20 caribou	30,000
Wolf control costs (helicopter and contractor)	75,000
Total	125,000

Moberly:

Wolf control costs (helicopter and contractor)	75,000
Caribou capture, collaring (conducted by Klinse-Za program)	0
Total	75,000

Kennedy Siding/Scott

6 GPS Life-cycle collars	6,000
Capture and collaring	10,000
Wolf control costs	75,000
Total	91,000

Graham:

30 VHF radio-collars (already in hand)	0
Capture and collar 30 caribou	35,000
Population census	22,000
Total	57,000

GRAND TOTAL: $348,000

Subsequent Years:

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Additional radio-collaring of caribou ……

Monitoring of collared caribou
(data fees, mortality investigations, calf counts) ……

Wolf control costs ……

Total ……

Every 3 years:

Quintette census ……

Kennedy Siding census ……

Moberly census ……

Graham census ……

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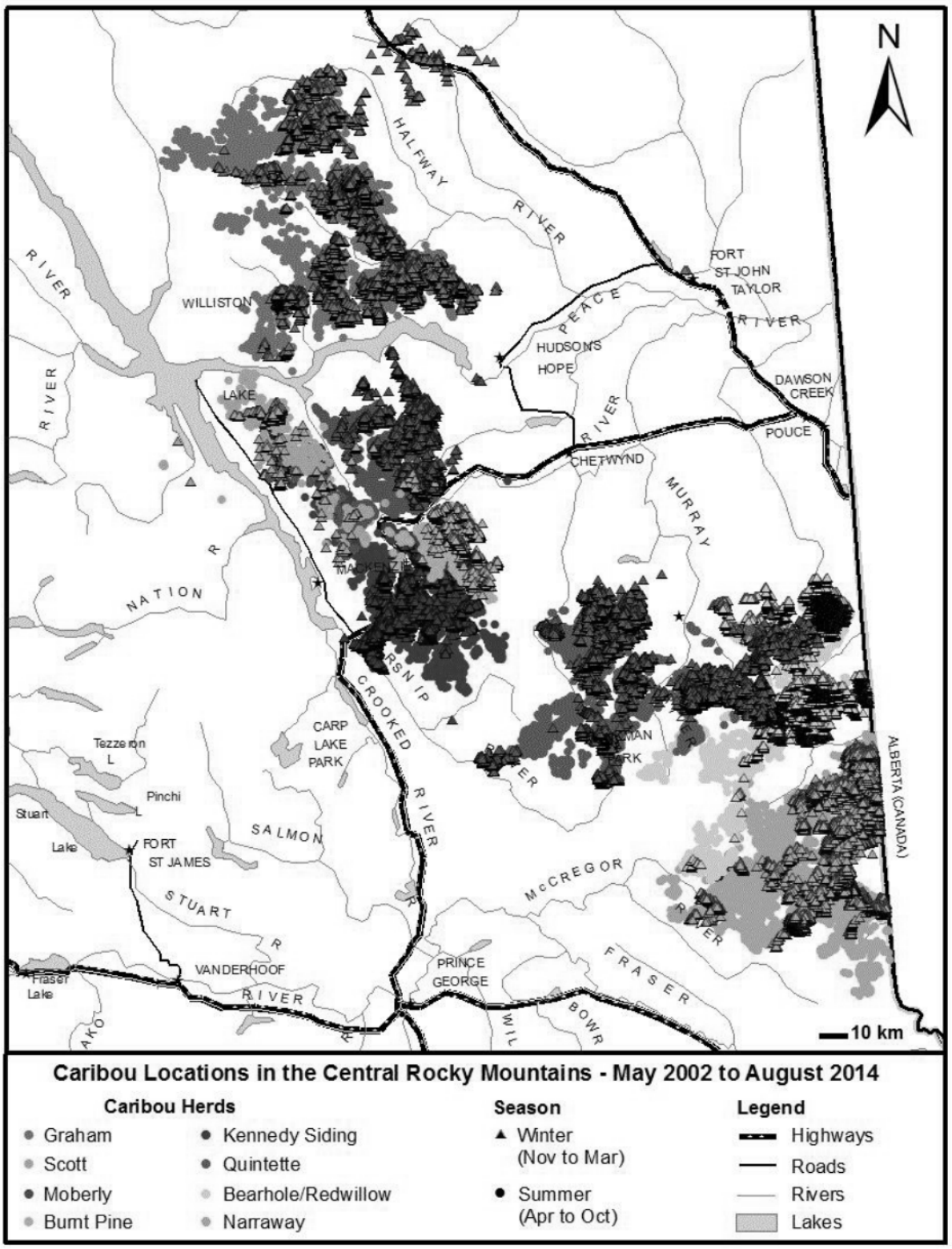

Figure 1. Distribution of radio-collared caribou in the South Peace, 2002-2014.

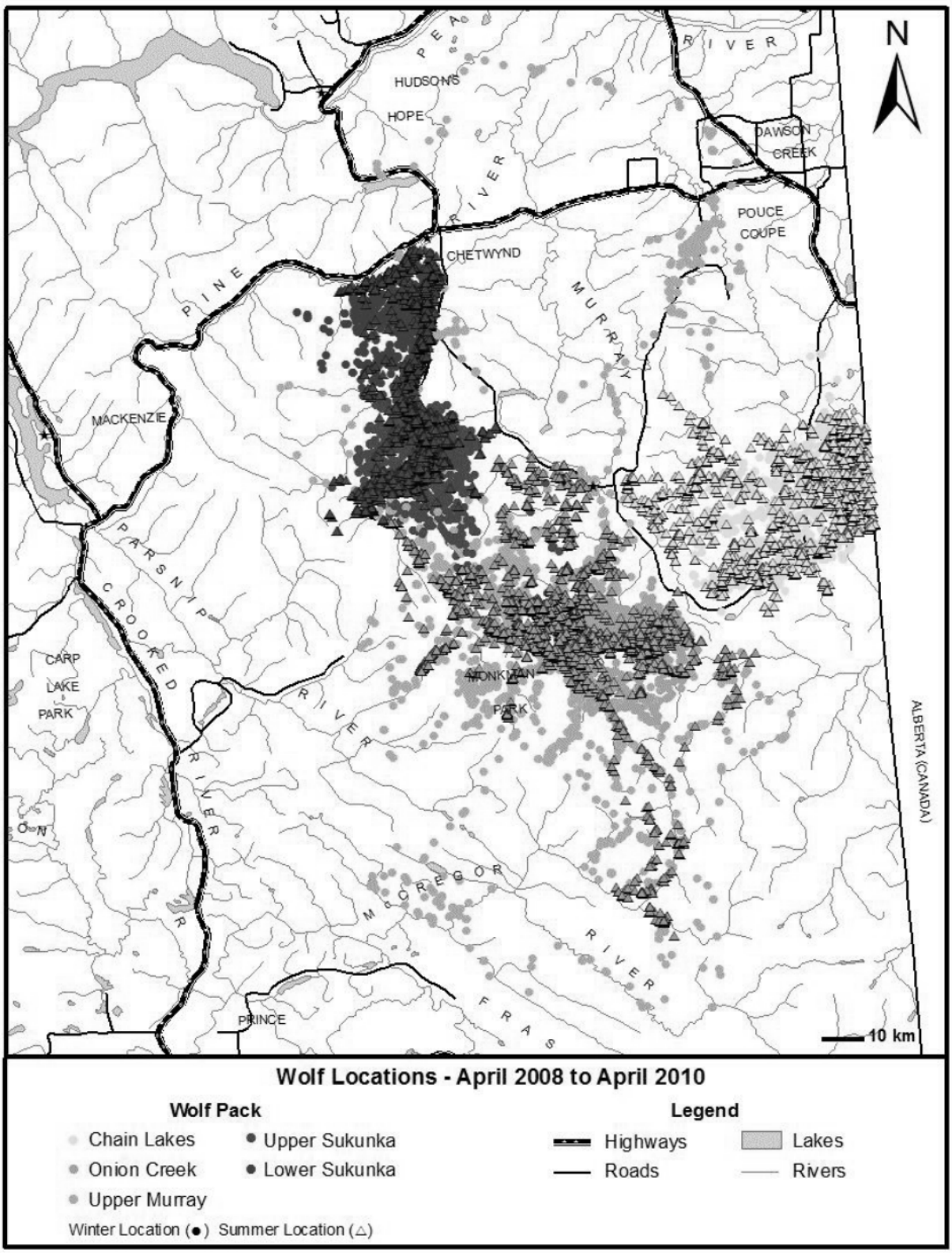

Figure 2. Distribution of radio-collared wolves in the South Peace, 2008-2010.

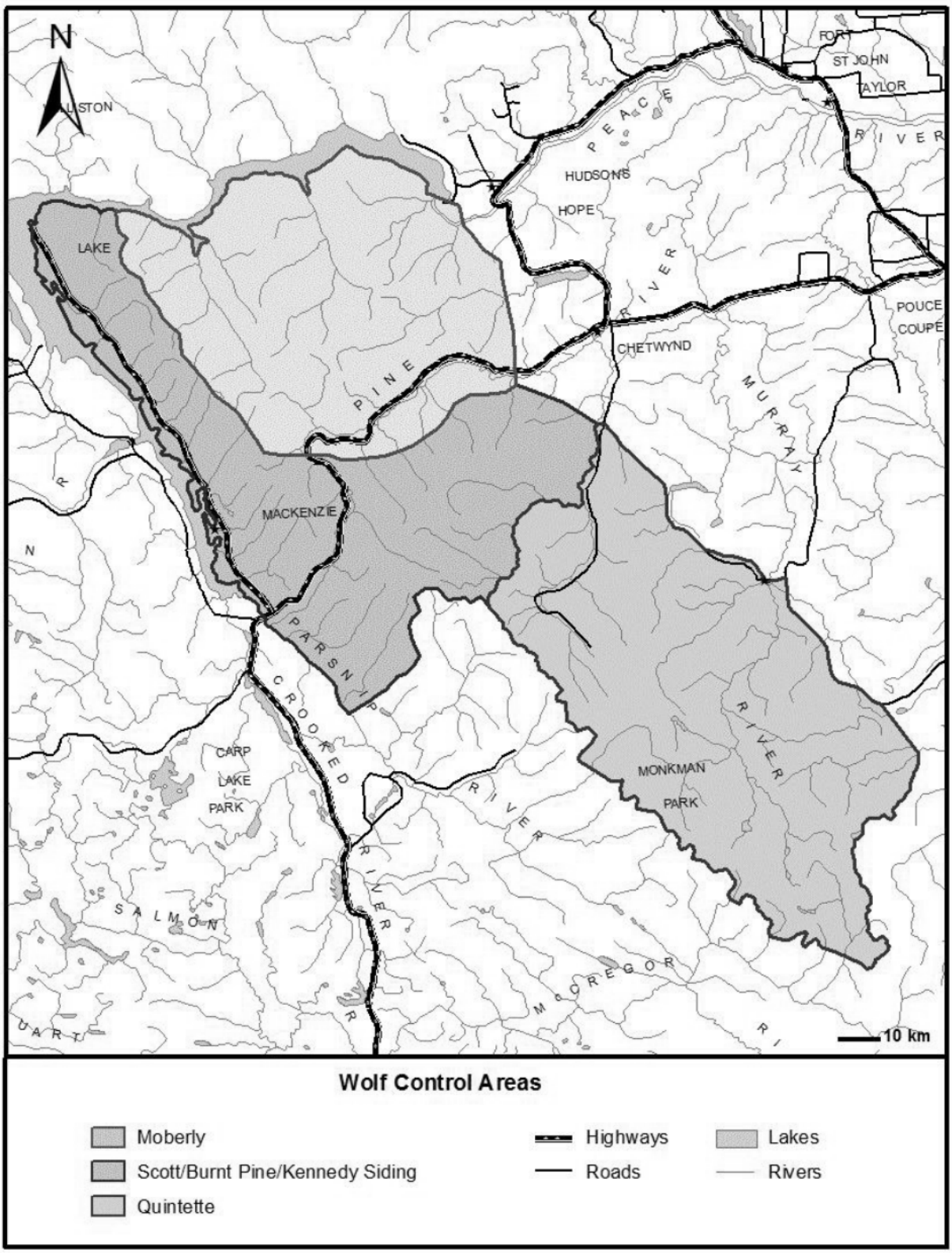

Figure 3. Boundaries of wolf control areas.

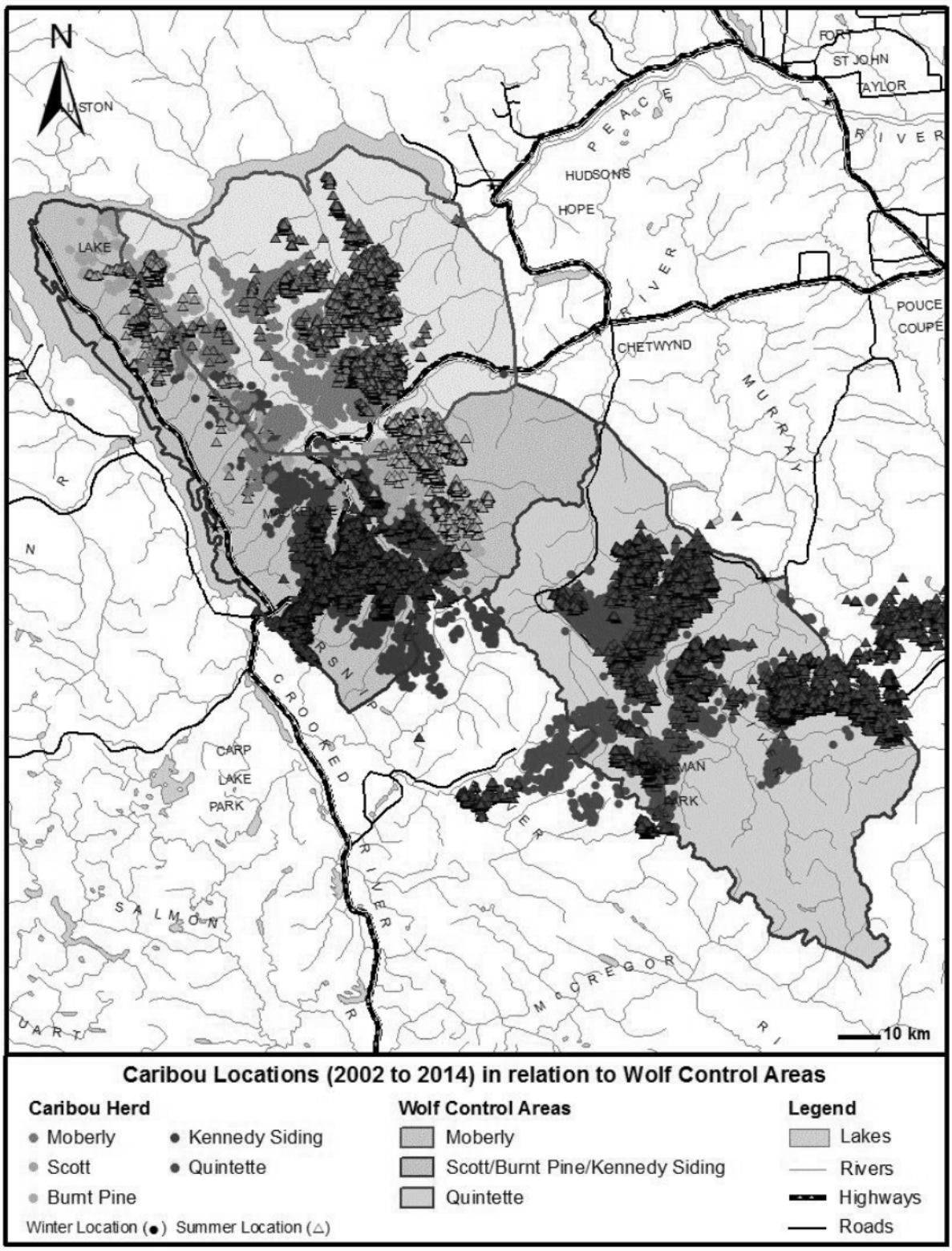

Figure 4. Caribou locations (2002 to 2014) in relation to wolf control areas.

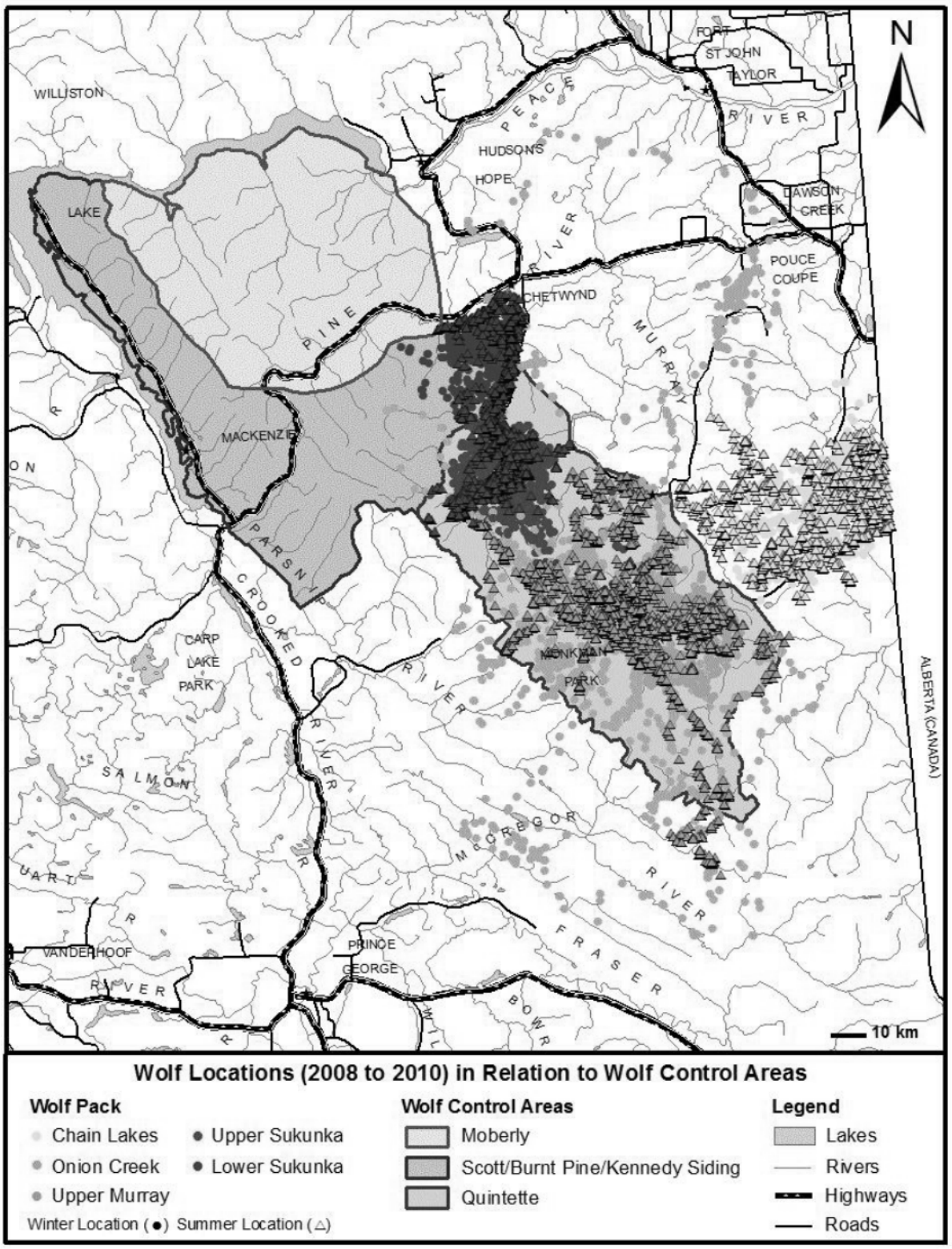

Figure 5. Wolf locations (2008 to 2010) in relation to wolf control areas.

Appendix 9
South Selkirk Mountain Caribou Wolf Management Plan

Operational Plan – October 2014 draft

BACKGROUND

- The South Selkirk mountain caribou population moves between BC, Idaho and Washington, and is the only herd in the lower 48 states. The herd is designated endangered in the US, and BC has international obligations to assist its partners in recovering this herd.
- Caribou in the South Selkirks in BC are managed under the guidance of the Mountain Caribou Recovery Implementation Plan (MCRIP). The MCRIP has resulted in protection of winter habitat from logging and road building and reduced disturbance from motorized winter recreation. In the late 1980's and 1990's, prior to the establishment of the MCRIP, the South Selkirk herd was recipient of several successful translocations of caribou.
- From 2000 to 2009, the South Selkirk caribou population increased gradually. There were no known wolf packs established in the area during this time.
- Since 2009, a pack of 10 - 12 wolves has frequently been observed in or near the caribou range.
- This caribou population declined from 46 animals in 2009 to 27 in 2012 to 18 in 2014.
- A caribou freshly killed by wolves was found in March 2014.
- There is a strong correlation between the establishment of wolf packs in the South Selkirk and the decline of the caribou population over the past five years.
- The South Selkirk caribou population is expected to continue to decline with current wolf predation rates. There is a high risk of extirpation within 2 years.
- A research project was launched in 2014 in collaboration with U.S. federal and state agencies, U.S. First Nations (Kalispel and Kootenai Tribe of Idaho), Nature Conservancy of Canada, and BC Hydro's Fish and Wildlife Compensation Program. The project proposed to collar ten caribou in the Selkirk herd to investigate the cause of the decline. Six caribou were collared in March 2014 with plans to collar four more this coming winter.

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- A ground based trapper was employed for 2 weeks in May in an attempt to trap and collar individual wolves. Information from collared wolves would help determine the amount of overlap of a particular pack's hunting territory with caribou areas and enhance aerial removal at the opportune time. No wolves were captured or killed during this period.
- A ground based trapper has been retained to respond if circumstances arise where trapping may be successful (e.g. locate a rendezvous site or active den).

PROJECT PROPOSAL WINTER 2014-5

Objective

- **Conduct aerial wolf removal to remove >80% of the wolves within or immediately adjacent to South Selkirk caribou range.**

Rationale

- Wolf predation is likely limiting recovery of the South Selkirk mountain caribou herd, and appears to be the cause of a recent dramatic decline.
- Immediate action to reduce wolf predation is a priority because of rapid declines in the caribou population, correlations with wolf pack establishment in the area, and a recent caribou mortality that was attributed to wolf predation.
- Hunting and trapping of wolves has not effectively reduced populations and may even split up packs and increase predation rates on caribou.
- Helicopter shooting to eliminate wolves in or adjacent to the South Selkirk caribou herd area is necessary to reduce the risk of imminent extirpation of the population.
- Aerial shooting is the most humane, effective and efficient method to remove wolves.
- Over the next 20 to 30 years, wolves are expected to decline in the caribou recovery area as early seral deciduous shrubs (created by forest harvesting) are replaced by young conifers. Coniferous forest will be less favourable for alternate prey (elk, moose and deer). Fewer alternate prey will result in fewer wolves and other predators (e.g., cougar).
- In addition, wolf populations in the South Selkirk caribou area may decline over the next 5-10 years since wolves are no longer increasing in northern Idaho and Washington.
- South Selkirk caribou herd habitat has been designated as Priority 1 for fire suppression. This affords it top priority for initial attack and fire fighting subject to availability of wildfire management resources. This will help reduce the risk of improving habitat for the primary prey of wolves.
- Cougar hunting seasons have been liberalized within caribou areas and the harvest will be closely monitored through Compulsory Inspections.

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Communication

- Wolf control remains a controversial wildlife management tool opposed by many people. s.16

- Regional staff have worked closely with the Kootenay region local trapping community over the past few years encouraging wolf trapping. This has included explaining the management regime for wolves and caribou, providing trapper training, wolf snares and incentives to surrender wolf carcasses. Aerial removal of wolves will reduce the likelihood of successful wolf trapping and may inadvertently alienate local trappers. To help avoid this consequence, meeting will be held with local trapping groups to explain the project and explain how trapping may compliment aerial removal once wolf numbers have been reduced.
- Other stakeholder and the public will be informed through release of the South Selkirk Caribou Wolf Control Plan via a regional information bulletin on date targeted to begin wolf removal actions.
- The strategic communications plan for the South Selkirk Caribou Recovery Implementation Plan will be refreshed to serve as the communication plan for the project.

Logistics

Methodology

- Ground based trapping will be initiated in October once snow conditions enable track detection. The objective is to trap and collar wolves in early winter to help learn about wolf movement and to make removal more efficient.
- Bait stations will be established at several suitable locations within the core caribou range in early December. This avoid the period when bears are active and could use baits, but has snow conditions well suited for tracking wolves. Information on habitat use by radio-collared bears will help further avoid conflicts with bears. Large ungulate carcasses will be delivered to large openings (e.g. meadows, lakes) to attract and temporarily retain wolves travelling thru caribou habitat. Bait stations improve the ability to locate, count and remove wolves.
- Aerial searches will be conducted in the core caribou habitat area for wolf tracks using a fixed-wing aircraft within 2 days of a fresh snowfall of >10cm. s.16

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- If wolf tracks are found, the number of tracks and location will be recorded and communicated to the helicopter company, so that wolves can tracked. The helicopter company will be on stand-by, ready to be deployed as soon as wolf tracks are found.

- If groups of >2 wolves are found, we will attempt to remove all wolves by aerial shooting If groups of 1 - 2 wolves are found, we will attempt to capture them using helicopter net-gunning. Wolves will be fit with satellite GPS collars and the data monitored daily. Tracks in the snow will be followed by foot and / or the collared individual(s) observed by air on several occasions to attempt to determine pack size. Removal of single or pairs of wolves will not significantly reduce the wolf population and may split packs up, which could increase predation rates. Once pack size is determined attempts will be made to remove the entire pack. The collared individual(s) will be taken out last in case the complete pack is not removed at one time.
- The carcasses of all wolves killed will be recovered and examined for body condition, reproductive history, age and hair samples collected

Treatment area

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Timing

- The appropriate time to track and remove wolves in the South Selkirk caribou herd area is when snow conditions facilitate aerial tracking down to the lowest elevations, usually from early December to late March.
- The project should commence a soon as conditions are suitable to maximize the operational window and flexibility to use or adjust to weather conditions
- Fixed wing reconnaissance flying will be conducted in advance of the primary removal period to collect track information and wolf distribution. Timing will depend on snow cover at high elevation, likely in mid- November.

Duration

- Aerial removal should continue until >80% of the wolves in the designated area are removed. The program should be resumed if new packs move into the treatment area as determined by annual monitoring.
- The program should have committed resources for at least 5 years to enable annual monitoring and removal as required

Approvals

- The provincial wildlife veterinarian will review the contracted helicopter company's Standard Operating Procedures for wolf capture/collaring and aerial shooting. A government staff person will provide oversight to the wolf capture and/or shooting from the ground through close communication with the contractor.
- Regional staff will ensure that all necessary Wildlife Act authorities are in place.

Monitoring

- Six of the 18 remaining caribou have been recently fitted with satellite GPS collars that will send notification of mortalities after 12 hours of inactivity.

- All caribou mortalities will be visited within 48 hours to confirm mortality and its cause. Consistent with advice from the Provincial veterinarian, information will be collected at each site on predator type and number, caribou body condition. Information will also be collected on site level habitat characteristics.
- Information will be collected from each recovered wolf carcass on body condition, reproductive history, age and hair samples collected. This information will help assess the general health and fitness of the pack members, the pack productivity and through isotope analysis of hair, if caribou is a significant part of their diet.
- The South Selkirk caribou herd will be surveyed annually to assess population response. Population size, sex composition and recruitment will be assessed.
- Wolf abundance and distribution within the caribou area will be monitored at least every 3 years through fixed wing flights.
- A process to monitor habitat condition in the treatment area will be initiated on a 5 year frequency. Changes in the amount of forest cover removal and roading in the core area will be monitored.

Reporting

- A communication plan will be prepared to outline the dissemination of information within government, with affected First Nations, between agencies and groups that are partners on South Selkirk caribou management and with the public
- Weekly updates will be developed during the treatment period. This will include the details on reconnaissance surveys, aerial removal activities, and data from radio collared caribou and wolves.
- An annual report will be submitted by May 30 that summarizes the results from the year, budget details and recommendations for improvement.

Performance Measures

- Short-term success will be:
    1. Removal of 80-100% of the estimated wolves in the core caribou area (i.e. removal of approximately 8-12 wolves in 1-2 packs)
    2. No wolf predation on radio-collared caribou in 2014
- Long-term success will be no further declines in the caribou population and eventually a recovery of the population.
- s.16
- s.13,s.17

South Selkirks Wolf Control project annual budget	
year	**1** s.13,s.17
Wolf collars (4 wolves in 2 packs)	**5k**
Initial wolf collaring	**40k**
Replacement wolf collaring	
Reconn track survey 10@$1k/	**10**
Annual caribou survey	**15k**
Baiting	**3k**
Caribou mortality inspections assume 2/y @$3k/	**6k**
Wolf/caribou Collar data fees	**1k**
Wolf removal	**30k**
BC Gov't FTE*	**0.5**
Annual Total	**150k**

- **Staff time is necessary to provide general project oversight, permitting, ground monitoring of removal, communications, reporting, organizing baiting, mortality site visits, carcass assessment, caribou surveys**