



TECHNICAL REPORT

Conservation of Caribou in the Scott West Herd Area: Year 3 Final Report

K.L. SITTLER¹ AND R.S. MCNAY¹

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¹Wildlife Infometrics Inc., PO Box 308, Mackenzie, BC, V0J 2C0, wild_info@wildlifeinfometrics.com

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Financial support was provided by the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations and public stakeholders who work together to conserve and enhance fish and wildlife impacted by existing BC Hydro dams.

EXECUTIVE SUMMARY

The Scott caribou herd was bisected by the creation of the Williston Reservoir, and as a result, caribou no longer undergo what was a traditional migration across the Parsnip reach, resulting in the herd now existing as two separate subpopulations; the Scott West and Scott East. For 3 years we have been attempting to determine if there are still caribou left in the Scott West subpopulation. This project aligns with the Fish and Wildlife Compensation Program Peace Basin Species of Interest Action Plan – specifically Action 1b-3: to implement projects identified through approved recovery strategies, action plans and management plans developed for woodland caribou.

We have been using a blend of survey techniques (aerial searches and camera trapping), as well as seeking the public's help, since September 2014 to collate information on recent or historic observations of caribou within the Scott West herd area. We did not detect any caribou in either the aerial searches (year 1) or in the subsequent two years (years 2 & 3) of camera trapping. Over the 3 years, we received 10 reports of caribou in the vicinity of the Scott West Herd. Only 3 of these were confident sightings or tracks within the last 3 years. The most recent sighting was reported last fall (fall 2016), of two caribou observed along the Finlay FSR in the early hours of the morning. With few remaining animals, detection becomes more difficult, requiring intensive effort. Although we received a few reports of a few animals (or tracks), our results suggest there is no longer a local population of caribou thriving in the Scott West.

We recommend that the population estimate of the Scott West sub-population of the Scott herd be down-graded to “of trace occurrence” with the high likelihood of extirpation. There is low probability of recovering the remnant population based on the extremely low population size and the current levels of habitat disturbance.

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INTRODUCTION

The Scott herd is part of the Central Mountain Caribou Designatable Unit DU8 (COSEWIC 2011), and is federally listed as threatened. The portion of the Scott caribou herd area that lies west of the Williston Reservoir (henceforth, Scott West), in British Columbia (BC), is unique in the region because it appears to have become isolated by the Williston Reservoir. The installation of the W.A.C. Bennett hydroelectric dam and flooding of the Williston Reservoir in 1968 bisected the original herd area. Anecdotal information from aboriginal sources and other long-time residents of the Mackenzie area indicate that the Scott caribou herd historically migrated seasonally from the mountains around the headwaters of Scott Creek and other adjacent drainages (summer habitat), across the Parsnip River to low-elevation winter range (BC MOE 2014) in what is now the Manson Peninsula (BC Govt 2000). Because of the flooding, this migration pattern has, over time, become essentially non-existent leaving, remnant parts of the original herd basically resident (i.e., non-migratory) on both sides of the reservoir (i.e. Scott West and Scott East; Figure 1).

A current-day study of the herd was initiated in 2000 with radio collaring beginning in 2002 and population surveys conducted in 2007 (Giguere and McNay 2007) and in 2013 (Seip and Jones 2013). These two population surveys focused on the Scott East subpopulation and resulted in estimates of approximately 22 caribou in both surveys. In 2015 the Scott East was surveyed again, but because of ongoing management in the Moberly and the overlap of caribou between the herds the population estimate for the Scott East was combined with the Moberly and was estimated to be 42 individuals (Seip and Jones 2015). The Scott West population has never been surveyed and only one male caribou was collared there, in 2002. This caribou subsequently swam to the east side of the reservoir, never returning to the west side – it died in 2007 (Unpubl. data; Wildlife Infometrics Inc.; Mackenzie, BC). There have been occasional sightings of caribou on the west side; more historical observations of caribou on the west side include accounts of much larger numbers (e.g., up to 70), while more recent observations are of fewer caribou (e.g., one or two), and made less frequently. With few remaining animals, detection becomes more difficult, requiring intensive effort.

Caribou population declines are common elsewhere across caribou range in Canada (Wittmer et al. 2007, Boutin et al. 2012) and anthropogenic disturbances (e.g., creation of the reservoir, road-building and intensive forest harvest) have been strongly correlated with the declines (Sørensen et al. 2008, Johnson et al. 2015). The disturbances manifest in an altered predator-prey system characterized by apparent competition (Latham et al. 2011) where predators (in this case, mostly wolves; *Canis lupus*) benefit from an enhancement of their primary prey (in this case, mostly moose; *Alces canadensis*) and a secondary prey (in this case caribou) suffer increased coincidental predation and downward pressures on their population demographics (e.g., poor juvenile recruitment and poor adult survival). Our hypothesis in the Scott West herd area is that the interruption of historical migration patterns (Williston Reservoir) in combination with extensive habitat alteration from logging has led to few to no caribou remaining in the herd area.

GOALS AND OBJECTIVES

The overall goal for the 3-year project was to provide information about the status of the Scott West caribou herd as a basis to help protect and conserve the subpopulation. Specifically, the objectives were: 1) to determine if there are any caribou left in the herd area and 2) to review the amount and distribution of anthropogenic disturbances in the area. In the first two years we used a combination of survey methods (aerial searches, citizen science, and remote camera trapping) to try and find remnant groups of caribou. In year 3, we continued camera trapping and engaging with citizens of local communities.

This project aligns with the Fish and Wildlife Compensation Program Peace Basin Species of Interest Action Plan – specifically Action 1b-3: to implement projects identified through approved recovery strategies, action plans and management plans developed for woodland caribou.

STUDY AREA

The Scott West herd area is ~1,934 km² and is located on the south-west shore of the Williston Reservoir, stretching from the southern tip of the reservoir (Parsnip River) north to the Manson Peninsula (16km to 102km on the Finlay Forest Service Road; Figure 1). From the western shore of the Williston Reservoir, the herd area extends westward for approximately 25km. Elevation in the area ranges from approximately 650m to 1200m, encompassing biogeoclimatic subzones ESSFmv3, SBSmk1, SBSmk2 and SBSwk2. There are two legally designated Terrestrial Lichen Habitat Aggregates (TLH Aggregate) within UWR #U7-007 (BC MOE 2004) that overlap with the herd area: 15 Mile Swamp and Eklund Creek. 15 Mile Swamp is composed of eight polygons, all of which overlap with the Scott West herd area. Two of six Eklund Creek polygons overlap with the herd area. Logging is the primary industrial activity within the herd area, and a recent increase in disturbance from logging due to mountain pine beetle salvage is evident in recent years.

The Scott East herd area is ~ 2,215 km² and is bounded by the Peace Arm in the north and extends along the south-eastern shore of the Williston Reservoir to the Parsnip River (just south of Mackenzie). From the eastern shore of the Williston Reservoir, the Scott East area extends eastward ~33 km. This herd area is bordered by the Moberly (Klinse-Za) Caribou herd to the east and the Kennedy Siding herd to the south.

Other ungulates in the area include moose, deer (*Odocoileus* spp.), and elk (*Cervus elaphus*). Predators of the ungulates, including Scott West caribou, include wolf, lynx (*lynx canadensis*), wolverine (*Gulo gulo*), grizzly bear (*Ursus arctus*) and black bear (*Ursus americanus*).

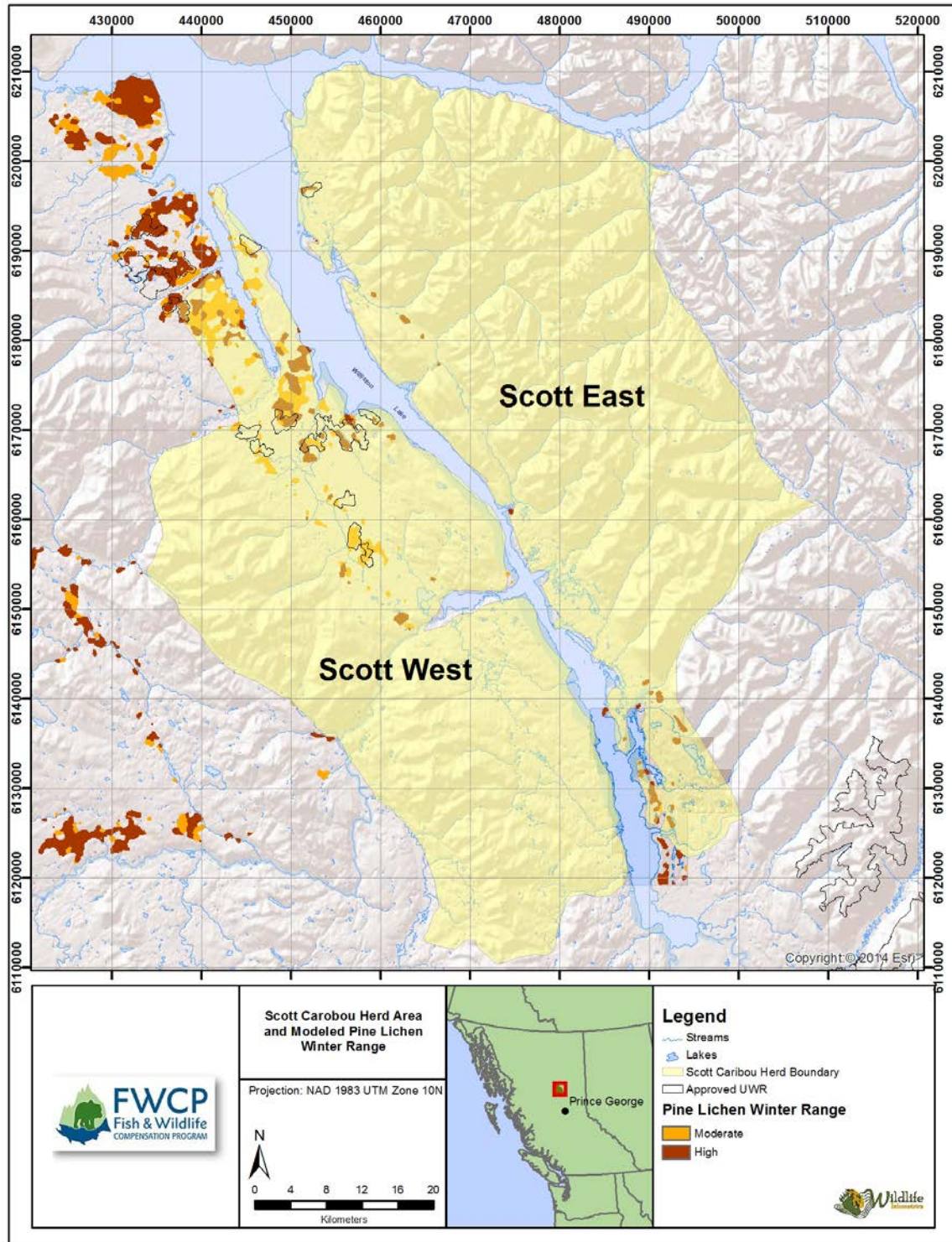


Figure 1. Location of the Scott West and Scott East sub-populations of the Scott caribou herd. Approved Ungulate Winter Ranges UWR are outlined in black and the high (burgundy) and moderate (orange) quality pine-lichen winter range are shown.

METHODS

Public Engagement

Over the 3-year span of the project we have used a variety of methods to engage the community about the Scott West Caribou Survey: radio announcements, news paper articles, social media, and brochures. A road sign (4' X 8'; Figure 2. Road sign (4' x 8') installed at the old log dump at 32 km on the Finlay Forest Service Road.

) asking the public to report any observations of caribou or their tracks (recent or historic) was developed collaboratively between Wildlife Infometrics Inc. and Chu Cho Environmental in 2015-2016. The sign was erected in the spring of 2016 (once the ground thawed), at a large pull-out at 32 km along the Finlay Forest Service Road. Contact information is provided for both Wildlife Infometrics and Chu Cho Environmental for reporting.



Figure 2. Road sign (4' x 8') installed at the old log dump at 32 km on the Finlay Forest Service Road.

In year 3 we continued to distribute brochures (Appendix A) with information about the project, and whom to contact in case of a sighting, to known user groups of the Scott West herd area. These groups included:

- Canfor - Mackenzie
- Conifex - Mackenzie
- KDL - Mackenzie
- Chamber of Commerce in Mackenzie
- Ministry of Forest, Lands and Resource Operations – Mackenzie District Office
- Blackwater Cabins
- Manson Log Dump office
- Monroe Forest Service Camp
- Omineca Forest Service Camp
- Oslinka Forest Service Camp
- Local Guide Outfitter camps
- Tsay Keh Dene
- Chu Cho Environmental

Wildlife Infometrics has a Facebook page (<https://www.facebook.com/Wildlife-Infometrics-Inc-690915284324275/>) where information about the project and a request for information on caribou sighting has been shared.

All reports of tracks or visual sightings of caribou were investigated to try to confirm sightings.

Personal interviews

Resident hunters planning on entering the Tsay Keh Dene (TKD) territory are required to check with the nations' Fish and Wildlife Department. The TKD also conduct field-level checks with hunters through the peak of the hunting season. With these two opportunities to contact hunters, over the last 3 years TKD offered to collect information about caribou sightings from hunters and forward any collected information to Wildlife Infometrics for inclusion in the observation records dataset.

Camera deployment

In year 2 (2015-2016), ten Reconyx Hyperfire cameras were deployed in the Scott West Herd area. Camera sites were selected based on the location historical sighting and the distribution of high quality winter caribou habitat (Figure 3). Cameras were securely attached to trees and locked in specialized metal boxes to reduce the chance of vandalism. In year 3, the cameras remained deployed, collecting data on animal movements with the purpose of capturing images of caribou that may have been using the area. Camera sites were reassessed and moved if deemed necessary.

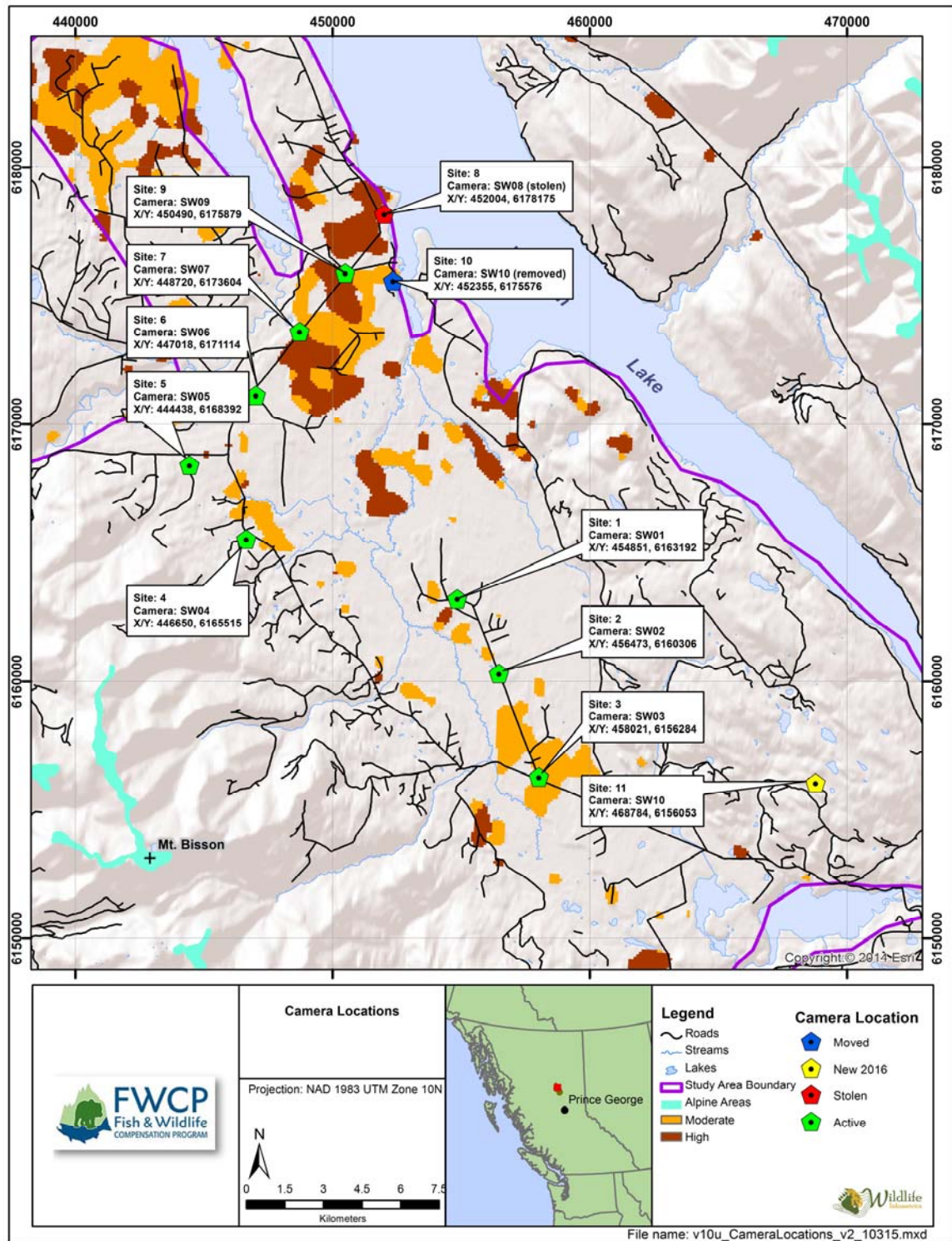


Figure 3. Remote camera deployment locations and status of cameras during 2016-2017.

Habitat Disturbance Analysis

To examine the potential correlation of habitat disturbance to declines in the Scott West subpopulation, we collated and summarized disturbance layers (roads, cut blocks and fire history) using Geographic Information Systems ArcGIS 10.1 (ESRI 2013) from the following data sources:

- Cutblocks – Results Openings (Data BC; accessed February 2016)
- Roads – Digital Road Atlas (Data BC; accessed February 2016)
- Wildfire – Fire Perimeters – Historical (Data BC; accessed February 2016)

RESULTS

Public Engagement

Over the past two years we have distributed 500 brochures regarding the Scott West Caribou (Appendix A). This year we received two reports of sightings of two caribou in the early morning (between 2-3 am) in early November on the Finlay Forest Service Road, near the old barge landing at 32km. A crew (one member from Tsay Keh Dene and one member from Takla First Nation) was sent to investigate the area to try and confirm the sighting by looking for tracks. Over two days, they drove all the major Forest Service roads (Finlay, Manson Dump, Manson cut-off and Monroe) within the Scott West Caribou herd area, spending more time in areas where there were reported caribou and tracks. They recorded all of the tracks they observed. They recorded 15 moose track at 11 different sites, but were unable to confirm any caribou sightings or tracks.

Across the 3-year span of this project, we received 22 responses to the public survey (APPENDIX B). Seven of these were reports of sightings within the Scott East, one was within the Kennedy Siding area, one is a historic account of driving the ice breaker (not observing caribou) and the remaining 13 responses were within the vicinity of Scott West area. Of these 13, two were sighting of caribou north of the Scott West herd area, and were likely caribou from the Wolverine herd. One was a historic reference. The caribou tracks reported in 2014 and 2015 were later thought to be elk tracks. The tracks reported in 2015 where from two caribou and in 2016 the two caribou reported sighted have been the best leads to date. Caribou were also observed in 2012 in low numbers (3 observations of 1 to 2 animals each). In 2008, there was a sighting of 28 caribou at 98km on the Finlay FSR. Possible caribou tracks were reported in the winter of 2015, around 66km on the Finlay FSR. In the fall of 2015, a forester reported caribou tracks in a cut block near the Manson Dump (UTM 10U 451126, 6174115). There have been no other observations.

Data for the Scott West observations are presented in Figure 4 and Appendix B.

No caribou were reported during hunter surveys conducted by TKD.

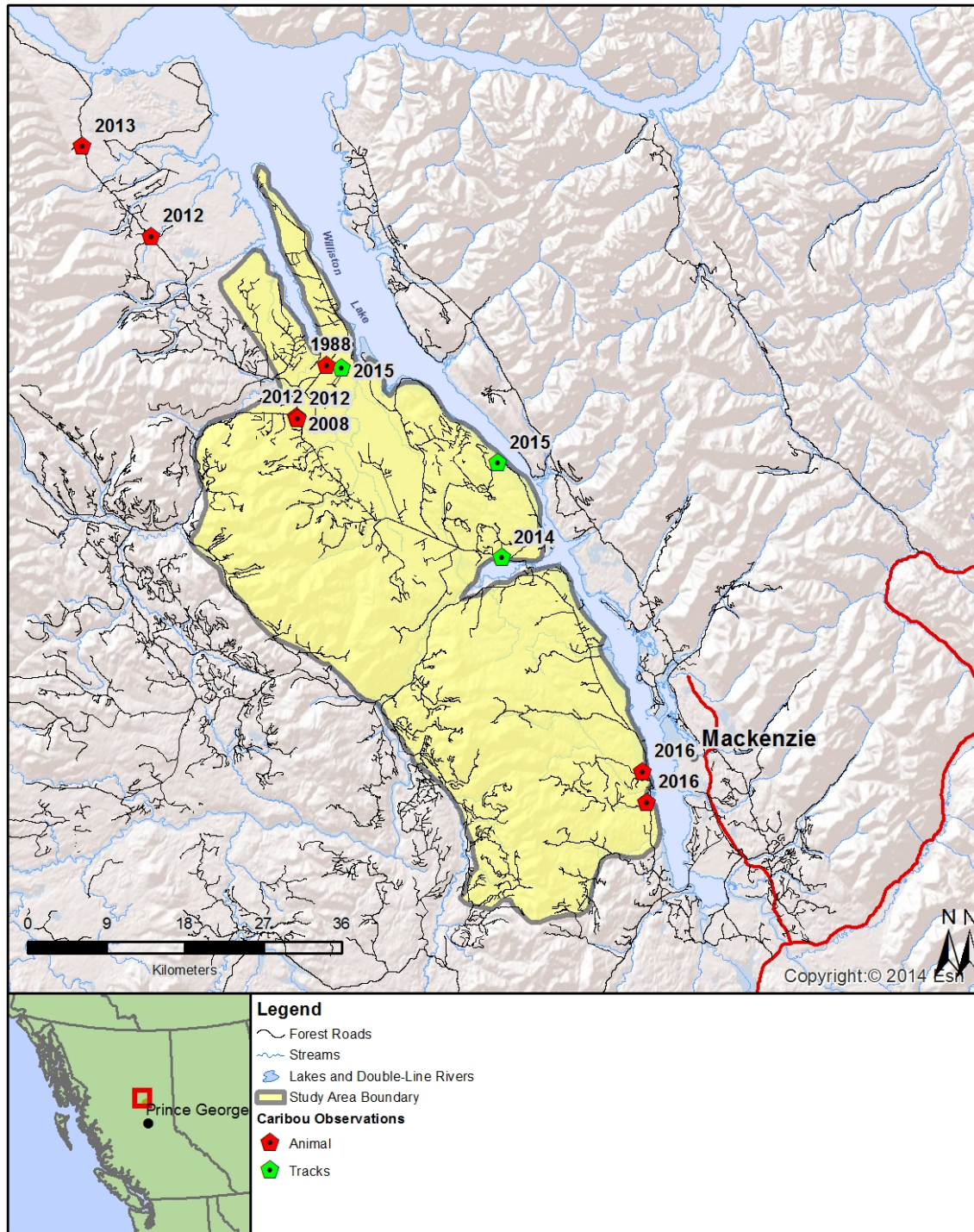


Figure 4. Caribou and caribou track observation locations attained during the 2014-2017 survey period.

Camera deployment

Year 2 of the project (2015-2016) was the first year the cameras were used. That year, ten cameras were deployed for a total of 1,220 camera-days of operation. During this time the cameras were checked three times (14 Jan 2016, 03 Mar 2016, and 24 Apr 2016) and SD cards replaced. A total of 5,467 photos were taken. 43 moose were observed in the photos as well as 2 coyotes, 2 wolves, 3 lynx, 1 fox and 1 grizzly bear. No caribou were identified.

In Year 3 (2016-2017), 10 cameras were deployed. On October 17 2016, the camera locations were reassessed and it was discovered camera # 8 was stolen. We also moved camera # 10. Three attempts were made to move camera #10 into high quality, pine lichen winter range, but each site was either logged or was flagged with the intention of being logged in the near future. The new location for camera #10 was chosen because it spread out the distribution of the cameras and was along a road that would not be ploughed during the winter. The other 9 cameras were deployed for 3,042 camera days. A total of 41,284 photos (Table 1) were taken and processed – of those 39,899 were inconsequential (i.e. moving branches, crew changing camera, people, vehicles and unknown detections). From the remaining 1,385 photos we observed 91 moose, 37 black bears (2 sows with 2 cubs), 7 grizzly bears, 14 coyotes, 14 lynx, 6 elk, 11 wolves, 9 white tailed deer (1 doe with 2 fawns) 2 squirrels, 1 sandhill crane and 1 humming bird. No caribou were observed. We did have one interesting observation of a clown being chased by man wearing a hockey mask carrying a chainsaw (Figure 5).

Table 1. Summary of the number of photos collected by camera in Year 3.

Row Labels	No. of Photos Camera Check #1	No. of Photos Camera Check #2	Grand Total
SW01	557	234	791
SW02	1643	529	2172
SW03	4894	996	5890
SW04	16275	392	16667
SW05	2092	117	2209
SW06	696	250	946
SW07	64	82	146
SW08	Stolen	Stolen	-
SW09	1416	879	2295
SW10	9990	Moved	9990
SW11	NA	178	178
Grand Total	37627	3657	41284



Figure 5. Selection of photos captured on nine remote cameras deployed in the Scott West Caribou herd area in Year 3.

Habitat Disturbance

The Scott West herd area currently contains 1,200 cut blocks, with a total footprint of 634.3 km², many of which were former pine-lichen stands that were salvaged logged due to beetle-killed pine (Figure 6). The current road density in the Scott West herd area is 1.26 km/km² (Figure 6). Over the years there have been 24 wildfires with a total area of 649.5 km².

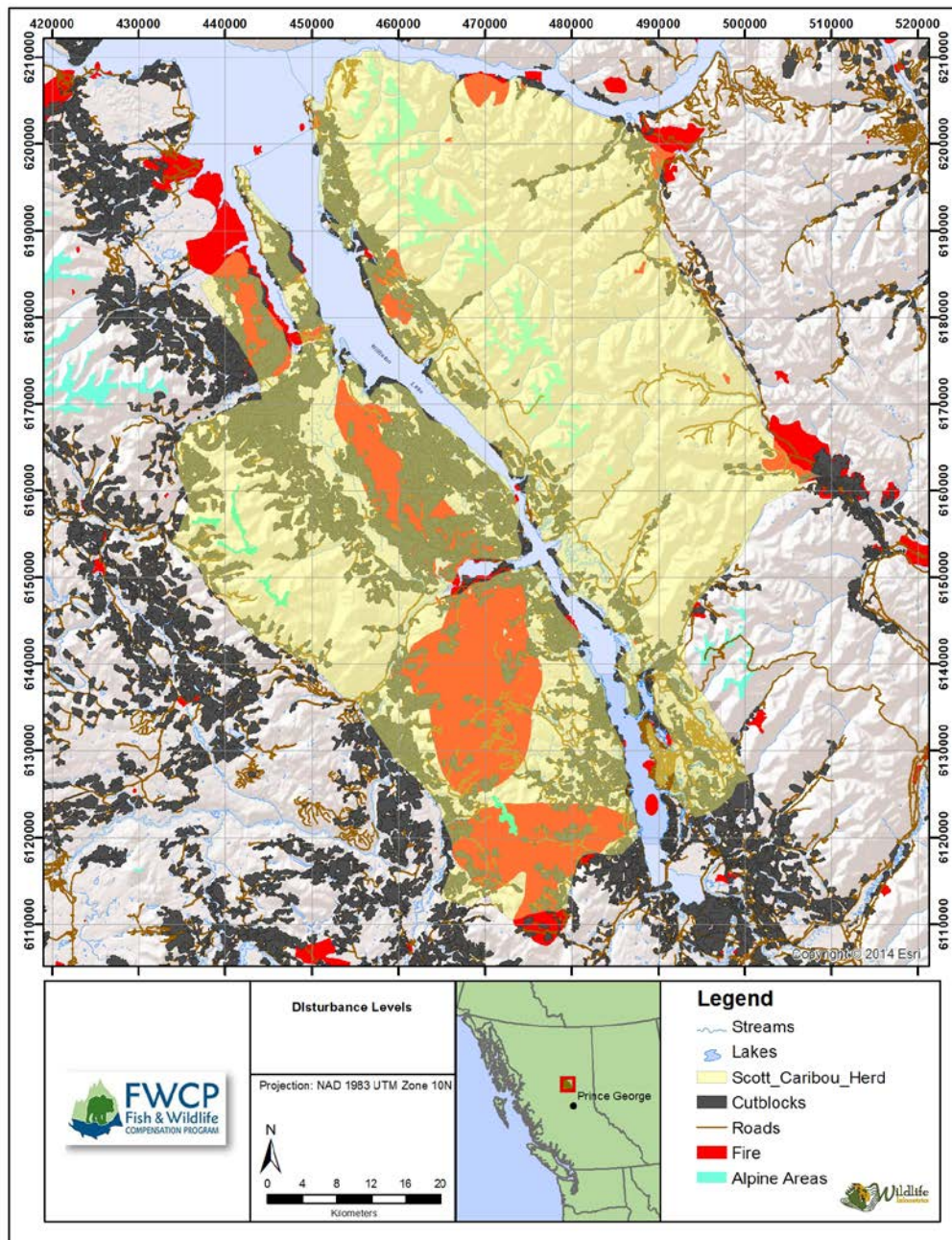


Figure 6. Location of disturbance features (roads, cut blocks and wild fire) in the Scott caribou herd area.

DISCUSSION

Based on the results of the various approaches taken in this study, we conclude that there are so few, if any, caribou left in the Scott West subpopulation, that despite our efforts over the last 3 years, detecting the remaining individuals has become very difficult (McNay and Rooke 2015; Sittler and McNay 2016). Asking for help from the public in sighting or tracking caribou has helped spread the word about the conservation of caribou, and without a doubt it increased the likelihood of caribou sightings being detected. The use of citizen science is not new for detecting and monitoring trends in wildlife. The annual Christmas Bird Count is probably the longest running successful example¹. In 2015, the British Columbia Government initiated a moose winter tick monitoring program and is asking the public to report observations of infested moose, and to thus help establish a baseline measure of the extent of the moose tick infestation². More recently, the provincial government launched a Moose Tracker App³ which is encouraging hunters to upload information on the number, sex and location of moose they encounter, and using that information to help monitor moose populations. Public response to the Scott West project and survey process was positive, and although the sightings of caribou and/or their tracks were few, we hope that this project has increased the public's awareness and interest in caribou conservation.

We received two reports of two caribou this year, and in previous years the only other lead was a report of tracks of two individuals. The anecdotal information indicates that caribou have not been present in large numbers within the Scott West herd area since 2008. There have been a few recorded instances of radio-collared caribou moving off the Wolverine Range east, to lower elevations within the Scott herd area where, on one occasion at least, this resulted in a caribou being killed by wolves (Unpubl. data; Wildlife Infometrics Inc.; Mackenzie, BC).

Fate of the Scott West Herd

This is the final year of the 3-year project aimed at finding caribou from the Scott West herd; from the aerial survey, public reports, and 2 years of camera trapping we were not successful in confirming any sightings of caribou over that time. With so few remaining animals, detection becomes challenging and requires intensive effort. We did receive a few reports of a few animals (or tracks), but nothing to suggest there is still a local population thriving in the Scott West.

Over the last 30 years all of the central mountain caribou herds (Scott, Moberly (Klinseza), Burnt Pine Kennedy Siding, Quintette and Bearhole-Redwillow) have experienced a high rate of development on their traditional range, from a large number of resource sectors (forestry, agriculture, oil and gas exploration, wind energy and coal mining; Nitschke 2008). There is a strong correlation between population declines and habitat loss/alteration in these caribou herds, with the primary cause of the decline attributed to increased predation associated with the various forms of industrial activity (BCMOE

¹ <http://www.audubon.org/conservation/science/christmas-bird-count>

² <http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-health/wildlife-health-matters/moose-health/moose-winter-tick-survey>

³ <http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-health/wildlife-health-matters/moose-health/bc-moose-tracker>

2014; COSEWIC 2014; Johnson et al. 2016). Threat assessments were developed to gauge the impact, scope, severity and timing of different threats (BC MOE 2014). The most immediate threats to the Scott West caribou include logging/wood harvesting, followed by road construction (BC MOE 2014). The current reservoir is considered a permanent, irreparable barrier to this seasonal migration of the Scott herd (Environment Canada 2014) and is therefore not included in the threat assessment. Recent forest harvesting has been targeting and salvaging dead pine stands, many of which were formerly high quality, low elevation pine-lichen caribou habitats. The current road density across the Scott West herd range is 1.26 km/km². In Alaska, Nellemann and Cameron (1998) demonstrated caribou density was inversely related to road density, and road densities greater than 0.6 to 0.9 km/km² resulted in declines of up to 86% in caribou density. Wildfires can have direct impacts on caribou by reducing lichen abundance (Joly et al. 2010). Although there appears to be a large footprint of burns in the area, 98% of that area burned prior to 1950, and the remaining burns would have minimal impact on caribou in the region.

Johnson et al. (2016) hypothesized that we are currently witnessing the extinction of the central mountain caribou herds and suggested that, at the current rates of habitat loss and population declines, these caribou are unlikely to persist. The last known individual in the Burnt Pine herd was a male observed in 2012, and the herd is now presumed to be extirpated (Seip and Jones 2013). Extreme management efforts (wolf control and maternal penning) are now in place to slow and reverse these negative population trends (Seip and Jones 2016; McNay et al. 2016). Unfortunately for the Scott West, after 3 years of searching for caribou, we are confident that there is no longer a viable local sub-population remaining.

Recommendations

We recommend that the population estimate be down-graded to “of trace occurrence” with the high likelihood of extirpation. There is a low probability of recovering this sub-population based on the current apparent population size and levels of habitat disturbance.

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APPENDIX A -

Road Sign Approval from the Mackenzie District



File: 11250-03

June 21, 2016

Line Giguere
Wildlife Infometrics Inc.
P.O. Box 308
Mackenzie, British Columbia
V0J 2C0

Dear Line Giguere:

Re: Request to Place a Sign at 32 km on the Finlay Forest Service Road

Permission is hereby granted under Section 6(3) of the Forest Service Road Use Regulation, to install a Scott West Caribou Survey Sign at the above location.

Should you have any questions please contact Knut Herzog, Engineering Officer, at (250) 997-2200.

Yours truly,

David G. Schwarz
District Manager
Mackenzie Forest District
Ministry of Forests, Lands and Natural Resource Operations

Ministry of Forests, Lands
and Natural Resource
Operations

Mackenzie Forest District

Location:
#1 Cicada Road
Mackenzie, British Columbia

Mailing Address:
Box 2260
Mackenzie BC V0J 2C0
Tel: (250) 997-2200
Fax: (250) 997-2236

Survey Brochure

Front Side

Please report any sightings of caribou or their tracks to:

Wildlife Infometrics Inc.
 Phone: 250-997-5700
 Email: wild_info@wildlifeinfometrics.com
 Facebook: Wildlife Infometrics



Chu Cho Environmental
 Phone: 250-598-8989
 Email: info@chuchoenvironmental.com



Caribou Reporting

Date (yyyy:mm:dd): _____

Location
 Road Name: _____ km: _____
 Coordinate: (Long/E) _____
 (Lat/N) _____

☐ Tracks (direction): N E S W

☐ Visual ☐ Male # _____
 ☐ Female # _____
 ☐ Juvenile # _____
 ☐ Unknown # _____



FWCP
 Fish & Wildlife
 COMPENSATION PROGRAM

This project is funded by the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations, and Public Stakeholders who work together to conserve and enhance fish and wildlife impacted by existing BC Hydro dams.

**Scott West
Caribou
Survey**



**Have you seen
any caribou?**

Wildlife Infometrics Inc. and Chu Cho Environmental are seeking information on any sighting (recent or historical) on the Scott caribou herd. Your observation of the western population will contribute to understanding the status of the herd.

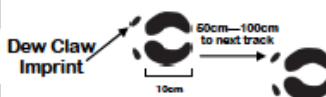
Inside

Woodland Caribou

Woodland Caribou are considered a species of Special Concern in BC and across Canada. In BC, caribou are classified into three ecotypes - Mountain, Northern and Boreal - which are based primarily on behavior and how they use their habitat. Both male and female caribou can have antlers.

The Scott Herd are considered a Northern Caribou Ecotype because they migrate long distances between their winter habitat, on top of the mountains and their summer habitat, in pine forests.

Caribou Tracks



Scott Herd

Anecdotal information from aboriginal sources and other long-time residents of the Mackenzie area, indicate that the Scott caribou herd historically migrated seasonally from the mountains around the headwaters of Scott Creek and other adjacent drainages across the Parsnip River to what is now the Manson Peninsula. Since installation of the W.A.C. Bennett hydroelectric dam and flooding of the Williston Reservoir, the migration pattern has, overtime, become essentially non-existent leaving remnant parts of the original herd on both sides of the reservoir.



In 2006, there were an estimated 60 caribou in the Scott herd. Recent survey reports suggest that there are only 22 caribou left in the Scott Eastern population. Almost nothing is known about the western population. This western population has been excluded from management plans, however there are designated winter ranges established for them. The last confirmed report of a caribou in the Scott West area was in 2012.



Photo: John Deal

The goal of this project is to determine if there are any caribou left in the Scott West sub-population. We are asking for your help in reporting any sightings, either recent or historic of caribou in the Scott West area.

APPENDIX B – 2014-2017 13 REPSONSES FROM THE COMMUNITIY REGARDING SCOTT WEST CARIBOU

Year	Season	Location	#Seen	Comment
2016	Fall	~32 km on Finlay FSR	2	Driving early in the morning (~2-3am) two caribou were observed along the road
2016	Fall	~28 km on the Finlay FSR	2	Driving - two caribou were observed along the road
2015	Fall	Near the Manson Dump	0	Tracks: Report from a forester of tracks of two caribou in a cutblock near the Manson dump.
2015	Late Winter	Near Williston around 66km	0	Tracks: Report from harvesting crew of tracks within cutblock. Two separate reports made on January 27 and February 17. There was a later report that a herd of elk were observed in the cutblock. Track ID error.
2014	Fall	Burden Lake-66km	0	Tracks: Saw tracks around km mark 66 (Finlay FSR), close to power line. Off the powerline, up an older cutblock where powerline crosses it. He didn't know what kind of tracks they were, but described them to people doing survey, and they stated they were likely caribou and recorded them as such.
2014	Fall	Manon Peninsula	0	Tracks – unclear from data sheet if this observation was made in 2014 or prior. Contact number incorrect, could not confirm. Not mapped.
2013	Fall	143 Finlay Main	1	In Wolverine Herd area, just north of Scott West
2012	Fall	98km Finlay	1	Bull
2012	Spring	129 Finlay Main	1	In Wolverine Herd area, just north Scott West
2008	Fall	98 Finlay Main	28	
2002	Summer	15 Mile Swamp	1	Wildlife Infometrics capture/collar animal – Bull. Single animal.
1988	May	Manson Dump Road	2	Calving in spring on pine flat
Historic	Winter	Reservoir		Driving the ice breaker – did not see any caribou.
Historic	Winter	Between Manson and Blackwater		Early wintering between Manson and Blackwater Creeks, in big marshy area. Never saw any west of Finlay FSR. Usually in black spruce wetlands, lower part of Blackwater Creek, and in transition to dry pine between Blackwater and Manson Creek. Did lots of forest development in the early days - first

saw caribou in late fall 1971 swimming across the lake. Difficult due to debris. Found 12 caribou carcasses - drowned due to debris. Saw groups of 12-15. Especially difficult for them to cross when it started to freeze. Estimate 30-40 seen going across the lake in 1971, but there were more. Late January/February '73, saw animals going across the lake from west to east - 76-77 animals. Probably saw a total of 130 animals. Caribou spent most of November-January in black spruce/pine flats eating arboreal and ground lichens. Biggest impact = reservoir. Not much good early winter habitat to the east. Would occasionally see a couple animals in small pine flats to the east, but majority migrated. Logging development and mountain pine beetle is next concern.
