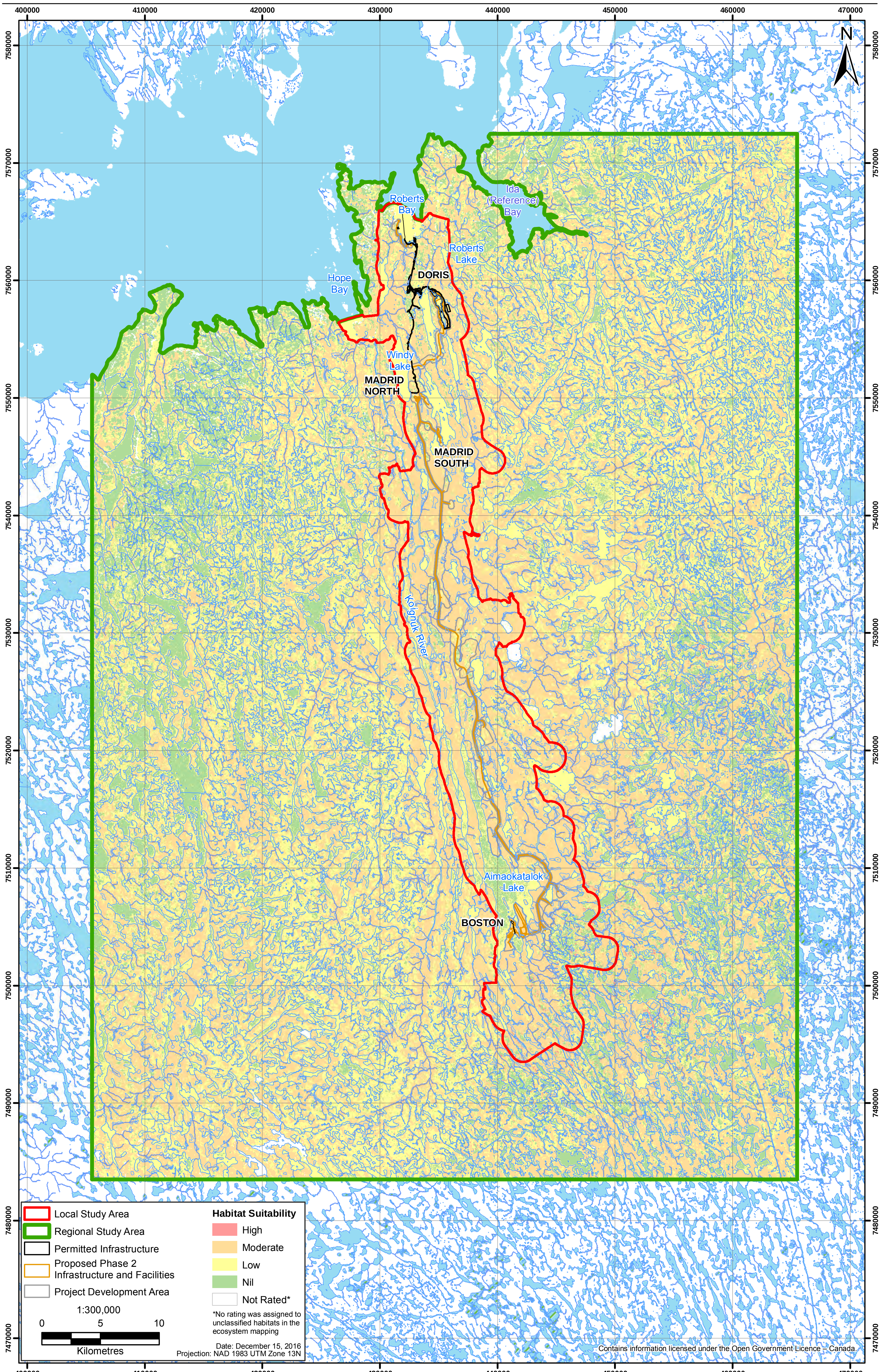
Figure 9.2-27
Grizzly Bear Fall Habitat Suitability in the Local Study Area and Regional Study Area



Habitat Loss

Habitat lost within the Doris Project footprint has been measured since 2009 (see Section 9.2.6.3 for further details on the evaluation of habitat loss for the Doris Project for VECs). The footprint was measured in 2015 as 78.1 ha, or 2.5% of the LSA. The majority of habitat loss occurred in habitat types rated as moderate or high for males or females with cubs: heath tundra (32.0 ha) and tussock/hummock (27.3 ha), or low and moderate for males or females with cubs: heath bedrock (3.9 ha) (Table 9.2-13). Of the 78.1 ha of habitat lost, 74.5 ha of habitat lost was classified as suitable grizzly bear habitat for both males and females with cubs. This represents an actual loss of 0.03% of the total suitable habitat identified for grizzly bear males and females with cubs within the RSA (Table 9.2-28).

Table 9.2-28. Area of Suitable Habitat Disturbed for Grizzly Bear

		Amount of Suitable[1] Habitat in RSA[2]		Actual Disturbed Suitable Habitat	
Species	**Season**	**Total (ha)**	**% of RSA[2]**	**Total (ha)**	**% of RSA[3]**
Grizzly Bear	Male	248,955	66.6	74.5	0.03
	Female with Cubs	248,955	66.6	74.5	0.03

[1] Suitable Habitat does not include Nil-rated habitat in study area.
[2] Calculations based on: RSA area of 374,052 ha for Caribou, Grizzly Bear and Wolverine;
[3] Calculations based on total amount of suitable habitat in RSA

Sensory Disturbance

The WMMP evaluates the potential for grizzly bears to be disturbed by Doris Project activities and avoid the Doris Project site. Since 2012, this program has included using remote, motion-triggered cameras. The objective of the motion-triggered cameras program is to monitor for wildlife interactions with Doris Project infrastructure, comparing observations near Doris Project infrastructure to observations in control areas at a greater distance from the Doris Project. This monitoring protocol provides a basic measure of whether a ZOI is present.

Generalized additive mixed models were used to test whether there were differences in the number of grizzly bear events recorded per month by cameras set up in Treatment locations (< 1 km from the Doris Project) and Control locations (>1 km). This analysis followed the same procedure as described for caribou in Section 9.2.6.3 (ERM 2016a). This analysis indicated that the probability of observing grizzly bear within 1 km of the Doris Project was lower than compared to control areas at greater than 1 km ($\beta = -1.67$, $p < 0.001$, significant). However, a detailed spatiotemporal statistical analysis for Doris indicated that the camera data may be confounded in its ability to determine effects related to Doris due to the correlation of bear density with distance to the coast; the cameras near to Doris infrastructure were nearer to the coast than most of those cameras further from Doris infrastructure (ERM 2016a). Hence, it cannot be concluded that grizzly bears are avoiding the Doris site.

In general, grizzly bear events were recorded at both on-site and off-site cameras during all survey periods except at on-site cameras during the winter period of 2013/2014. These data indicate that despite the presence of infrastructure for the Doris Project, grizzly bears still use the site and can move east-west along the shoreline.

Since the remote camera data were collected, a re-design of the camera program was requested to address a variety of comments from regulators including the KIA and GN DOE on their placement and use. In February 2016, TMAC met with the KIA and GN DOE and re-designed the camera monitoring program to address these limitations and the camera locations were changed accordingly during summer 2016 and will be described, in detail, in the upcoming 2016 WMMP. The redesigned camera program will increase the robustness of spatial and temporal analysis of grizzly bear detections by remote camera, and will better evaluate ZOI-type effects of sensory disturbance. Caution should therefore be applied to interpreting camera results to-date for the effects of sensory disturbance on grizzly bear (ERM 2016c).

Attraction to the Doris Project

The WMMP evaluates if grizzly bears are attracted to camps. Attraction to the Doris Project and human-bear interactions have been monitored on an annual basis and reported in the annual WMMP report in order to maximize wildlife and human safety, and identify any possible effects the Doris Project may have on grizzly bears.

In the years that personnel have been at the Doris Project site (2006 - 2016), the number of grizzly bear incidents and interactions were generally low (range one to seven incidents per year), with the exception of 2009 (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a). During 2009 there was a spike in grizzly bear activity and observations near infrastructure. The main source of attractants was identified as improper garbage disposal at the Windy camp, following the hurried closure of Windy camp in late 2008. During the summer of 2009, frequent bear activity was reported at the vacated Windy camp in the late winter (May) and throughout the Roberts Bay-Airstrip-Doris Site areas during summer. Bears were deterred from these areas with the use of bear bangers, rubber and beanbag bullets, propane cannons, sirens, and helicopters. The Cambridge Bay Conservation Officers were kept informed of repeat events and the GN DOE Conservation Officer and Doris Project environment and social responsibility (ESR) staff assisted with deterring bears from Windy camp by snowmobile.

Efforts to remove attractants from Windy camp began in 2009. Potential attractants were identified, sorted and removed for incineration or secure storage until shipment off site. As additional preventative measures, a wildlife-attractant-conscious waste management plan was drafted and implemented in 2009. Camp personnel were briefed on wildlife attractant management practices. A Bearwise representative, was also brought to site twice in 2009, and in each of the five subsequent years to audit site bear safety conditions, provide recommendations for improvement, assess various bear fencing options, and to provide bear responder training to separate cross-shifts of on-site staff.

Following 2009, the number of reports of bears fell sharply, but remained above pre-2009 levels during 2010 and 2011. This decline was likely a consequence of improved waste management practices. For instance, in 2010 grizzly bears were observed by camp personnel near footprint areas on 36 occasions. On 11 of these occasions a wildlife response team member investigated the sightings. Noise deterrents (bear bangers, honking of vehicles' horns) were used on four occasions to deter bears, and on two occasions helicopters were used. In the other cases no actions were taken apart from monitoring the behaviour of the bears and their direction of movement.

By 2012, the annual Bearwise report concluded that conditions have greatly improved on site largely due to the proper closure of Boston camp, ongoing decommissioning of Windy camp, and Doris Project-wide improvements to waste management practices. Since 2013, bear activity in the Doris Project area has been minimal, likely due to continued good waste management practices (Table 9.2-24). Only one bear incident was reported in 2014, when a bear was observed in close proximity to an exploration drill during August. Following established procedures for close grizzly proximity to a worksite, a helicopter was used to successfully divert the animal away from areas where personnel were working. All of the interactions since 2013 were successfully resolved by using bear deterrents, removing personnel from the area, "pushing" the bear with a vehicle or helicopter, or waiting for the grizzly bear to leave the area before resuming work.

These results indicate that there has been an effect of attraction on grizzly bears due to the Doris Project. Following improvements in landfill waste management procedures and a successful site-wide training and education program, the effects of attraction specific to grizzly bears have been minimized (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a). In 2009, the Doris Project reported several grizzly bear interactions that triggered the development and implementation of new waste and wildlife attractant management procedures. These procedures included identifying, sorting, and removing all wildlife attractants, and instructing site personnel on proper wildlife attractant management practices. These measures continue to be used and are effective in reducing bear presence at the Doris Project.

Direct Mortality

Any wildlife mortality, including grizzly bear that have been observed by onsite personnel were reported immediately to the ESR Department and reported in the annual WMMP report. Mortality of large fauna, or mortality resulting from potential interaction with Doris Project activity is reported directly to GN DOE and KIA, as necessary.

Since 2006, there have been no incidents of grizzly bears being involved in vehicle or aircraft strikes. The on-site speed limit for vehicles is a maximum of 50 km/h, thereby limiting the chance for direct mortality to grizzly bear.

Grizzly bears were prevalent at the Doris Project in 2009, following attractants and improper garbage disposal at Windy camp. Bears were deterred from the Doris Project site successfully using non-lethal means (e.g., bear bangers, helicopters) during 2009 and thereafter. However, in 2016 a juvenile bear, likely the newly independent yearling of a female grizzly that frequents the fish fence on Roberts Creek, was observed repeatedly at the Doris site. Camp cleanliness and waste management procedures were reviewed and the bear deterred, but it became clear that the bear was habituated and posed a safety risk to Doris Project personnel. After conferring with the KIA and the Cambridge Bay DOE conservation officer, the bear was destroyed and the meat delivered to the Cambridge Bay Wellness Center food bank.

Environmental Media Quality

The human health and ecological risk assessment (Volume 6, Section 5) evaluated potential changes in the quality of environmental media (e.g., soil, vegetation, and water) due to the Doris Project. This assessment determined that effects of the Doris Project on environmental media quality were negligible, thus there is no potential increase in risk of adverse health effects on grizzly bear due to Doris Project activities.

9.2.9 Characterization of Baseline Conditions for Wolverine and Furbearers

9.2.9.1 Introduction

Furbearers are any small or medium-sized predators that can be trapped or hunted for their fur. Of these, the wolverine (*Gulo gulo*) is sensitive to disturbances and as such was chosen as a representative species. Wolverine are members of the mustelid family, which includes weasels, badgers, and marten. Like other mustelids, wolverines are carnivorous, and are both scavengers and predators on a wide range of prey (COSEWIC 2014b). Very large home ranges, low population densities and lack of hibernation are characteristics of this solitary species (Persson, Wedholm, and Segerstrom 2010; Inman et al. 2012). Recent advances in camera trapping and DNA analysis have resulted in new information on population dynamics, including more rigorous and potentially higher estimates of population densities (Mulders, Boulanger, and Paetkau 2007; Royle et al. 2011). The wolverine is ranked as Secure in Nunavut (CESCC 2010), but the Canadian population as a whole was designated as Special Concern (COSEWIC 2014b).

Inuit have generally regarded wolverines as pests because they cause damage to caches, destroy property, and steal food (Banci and Spicker 2016). Wolverine pelts were used as fur mats when hunting seals, otherwise wolverines were historically seldom hunted. Their status as pests has changed because the value of their pelts has increased, leading to a dramatic increase in trapping and hunting of wolverines by Inuit (Banci and Spicker 2016). The use of wolverine fur as trim on parkas is a relatively recent custom, and very important to the Inuit (Banci and Spicker 2016). Inuit TK indicates that wolverines use the RSA (Banci and Spicker 2016). Data from wolverine harvests indicate that Bathurst Inlet is a main site for wolverine hunting in the West Kitikmeot (Mulders 2000).

For furbearers other than wolverine, grey wolf were chosen as the representative species for the EIS. The grey wolf (*Canis lupis*) is the largest member of the Canis genus and is widespread throughout much of northern Canada, including the West Kitikmeot region of Nunavut. Three subspecies of grey wolf occur in Nunavut — all of which may be found within the wildlife RSA (Chambers et al. 2012); the northern timber wolf (*Canis lupis occidentalis*), the plains wolf (*Canis lupis nubilus*), and the Arctic wolf (*Canis lupis arctos*). The northern timber wolf and plains wolf subspecies are listed as “Not at Risk” by COSEWIC, while the Arctic wolf subspecies is listed as “Data Deficient” (COSEWIC 2012a). The grey wolf is listed as Secure in Nunavut (CESCC 2010). For this purposes of this EIS, wolves are discussed at the species, rather than subspecies, level except where indicated.

Prior to the fur trade, wolf pelts were used by Inuit for trim on clothing, pups used for breeding with their sled dogs, and the meat was either thrown away or fed to dogs (Banci and Spicker 2016). After the inception of the fur trade, wolves became even more highly valued and continue to be highly valued by the Inuit as the pelts from these animals are sold at high prices.

<u>Population Trends and Conservation</u>

Wolverine

Wolverine populations in the central Arctic appear to fluctuate, although for the most part they are believed to be stable or even increasing in some areas of Northwest Territories and Nunavut (COSEWIC 2014b). The total population size of wolverines in Nunavut is estimated to be 2,000 to 2,500 individuals (Slough 2007; COSEWIC 2014b).

Due primarily to low reproductive rates and low population densities, wolverines are susceptible to population declines (Slough 2007; Inman et al. 2012). Food availability, especially during winter, is thought to be the main factor limiting reproduction and influencing the population dynamics of wolverines (Persson 2005). There are five different wolverine management areas in Nunavut; the wolverine population in the RSA occurs within the W/01-KT management area, and is considered to be an abundant, breeding population (GN DOE 2007).

The GN DOE recommends an annual Total Allowable Harvest (TAH) of 160 wolverines for the W/01-KT management area (GN DOE 2007). In addition, recommendations that wolverine not be trapped after April 15 or shot after April 30 until October 31 minimizes the potential effects of harvest of young wolverines (GN DOE 2005).

Potential direct effects of climate change on wolverine include increasing temperatures which may cause an earlier onset of the spring melt. This could have a negative effect on den sites for wolverines because dens are located in areas that retain snow in the spring (Magoun and Copeland 1998; McKelvey et al. 2011).

Potential indirect effects include changes to caribou populations and competition for resources with other predators (e.g., grizzly bear, wolves, foxes, etc.). Wolverine and in particular the Arctic grey wolf depend on caribou for sustenance, thus negative effects on the caribou herds can have potential negative implications for either or both species. The timing of caribou migrations, size of the herd, and routes followed could be affected by earlier and/or warmer spring/summer seasons (Section 9.2.6.2). Post and Stenseth (1999) reported that several ungulate populations have declined following warmer winters and Hinzman et al. (2005) suggest a warming climate will likely have a negative population effect on the health of caribou due to overheating and increased mosquito harassment.

Grey Wolf

In Nunavut and parts of the Northwest Territories, wolf populations were thought to be stable or increasing within their range as of 1995 (Hayes and Gunson 1995). There are no recent estimates of population trends of wolves for Nunavut. However, wolf den surveys between the treeline and Contwoyto Lake (west of the RSA) from 1996 to 2009 show declines in the number of active dens in late August since 2006. Adamczewski et al. (2009) reports the decline in the number of active dens is due to high levels of pup mortality. Wolf reproductive success and population trends are largely regulated by the availability of caribou (Frame, Cluff, and Hik 2008), and reproductive success has been shown to decrease with increasing distance between dens and migration routes of caribou (Frame, Cluff, and Hik 2008). As the availability of den sites is limited due to snow cover in early spring (April) when wolves are seeking den sites to raise pups, wolves must travel back and forth to den sites each day to hunt caribou along their migration routes and summering grounds until early fall (Cluff, Walton, and Paquet 2002). The grey wolf population in the RSA is likely tied to the health and availability of the Beverly caribou herd because this is the closest herd to the RSA during the summer months.

<u>Distribution and Migration Patterns</u>

Wolverine

Wolverine are found throughout the Arctic and boreal forests of North America and Eurasia (Copeland and Whitman 2003). In North America, the geographic range of the wolverine extends from Alaska throughout most of northern and western Canada, including the West Kitikmeot region of Nunavut (Pulliainen 1968; Slough 2007; COSEWIC 2014b).

Although wolverine density is low overall, it is thought to vary across the Canadian Arctic, with higher numbers in the Yukon (5.65-10.75/1,000 km2; Banci and Harestead 1990; Golden et al. 2007) and Northwest Territories (17.2/1,000 km2; Mulders, Boulanger, and Paetkau 2007), moderate density in western Nunavut (including the Kitikmeot region; 4.8-6.5/1,000 km2 Poole unpubl. data 2013 in COSEWIC 2014b), and low in eastern Nunavut and on Arctic islands (Slough 2007; COSEWIC 2014b). Population densities of wolverine on the tundra are approximately 1.25 to 25 individuals per 1,000 km^2, depending on habitat and the availability of prey (Persson, Wedholm, and Segerstrom 2010; Inman et al. 2012). Robust estimates of population density using remote cameras and DNA analysis have confirmed previous estimates of low densities derived from winter track counts in Northwest Territories and Nunavut (10 -15 wolverines per 1,000 km2; Mulders, Boulanger, and Paetkau 2007; Royle et al. 2011).

Wolverines are non-migratory. They occupy home ranges that can shift in location and vary in size over their lifetime. Home ranges of male wolverine are on average at least four times larger than female home ranges (Mulders, Boulanger, and Paetkau 2007; Persson, Wedholm, and Segerstrom 2010), ranging from 100 km^2 for an adult female to over 600 km^2 for an adult male (Copeland and Whitman 2003). Male home ranges overlap those of several females, in accordance with a polygynous (multiple females per male) mating system, but adult male-male and female-female home ranges rarely overlap due to territorial behaviour (Persson, Wedholm, and Segerstrom 2010).

Grey Wolf

The grey wolf is widespread throughout much of northern Canada, including the West Kitikmeot region of Nunavut. Densities of grey wolf on the tundra are tied to caribou distributions, however, due to their habitat requirements and timing of pupping they tend to be more concentrated near the treeline, with lower densities further north (Heard and Williams 1992; Cluff, Walton, and Paquet 2002). According to Inuit TK, wolves were found wherever there were caribou. Inuit generally hunted the two species at the same time (Banci and Spicker 2016).

Annual home range sizes average 63,000 ± 13,000 km^2 for males and 45,000 ± 7,500 km^2 for females (Walton et al. 2001). The annual home ranges of wolves on the tundra are much larger than those of wolves in more southern latitudes because their main prey are the migratory caribou, which they follow (Walton et al. 2001; Cluff, Walton, and Paquet 2002). During the spring, wolves follow the caribou herds north and select den sites near the treeline, south of the calving grounds (Heard and Williams 1992). This strategy likely optimizes the availability of caribou during summer and alternative food resources for rearing pups (Walton et al. 2001).

<u>Habitat Use</u>

Wolverine

Wolverine habitat selection is largely driven by the requirements for denning. Wolverines usually choose den sites within rocky boulder fields in snowdrifts where a deep insulating layer of snow will be maintained throughout the denning period (February to April). Dens and den sites are often used for consecutive years (Lee and Niptanatiak 1996; Magoun and Copeland 1998). Typically, wolverine dens are built under at least 1 to 5 m of snow and consist of long, complex snow tunnels that lead down to boulder fields, rock overhangs, or large cracks in rocks (Magoun and Copeland 1998; Inman et al. 2012; May R. et al. 2012). Proximity to habitat that provides small mammal prey for kits may also be an important factor in den site selection.

Food caching is an important survival strategy for wolverine, especially in winter, and may drive reproductive rate (Magoun 1987; Mulders 2000; Thorpe et al. 2001; Inman et al. 2012). Characteristics of cache sites are structures that prevent access by other scavengers, and allow cold storage to prevent cached prey spoilage in spring and summer. Wolverines will use a variety of habitats while searching for food (Mulders 2000; Thorpe et al. 2001; COSEWIC 2014b) but are often associated with rocky boulder fields which provide good sites for caching food (Johnson C. et al. 2005; Inman et al. 2012).

Wolverine foraging strategies switch from mostly scavenging and caching during winter, to hunting for birds and small mammals during summer (Inman et al. 2012). During the summer, wolverine occurrence is strongly related to the presence of sedge habitat, possibly because of the abundance of small mammals (Johnson C. et al. 2005).

Grey Wolf

Migratory wolves winter below the treeline and arrive at denning sites on the tundra in late April and give birth shortly thereafter (Walton et al. 2001). Less is known of the denning ecology of tundra-wintering wolves, but the timing of denning is likely similar. Wolves are territorial during denning and migratory wolves in the Kitikmeot region show strong fidelity to den sites (Walton et al. 2001).

Traditional Knowledge indicates that wolves make their dens where it is easier to dig, such as eskers and sandy glacial deposits along riverbanks (Banci and Spicker 2016). Esker habitats are granular and sandy, likely facilitating soil excavation and water drainage for dens in a landscape dominated by bedrock, boulders, standing water, and permafrost (McLoughlin et al. 2004). Eskers comprise 1 to 2% of Nunavut landscape (McLoughlin et al. 2004) and are a determining factor in locations of dens (McLoughlin et al. 2004).

Pups are weaned in the den and the immediate area surrounding the den. Pups are often moved from natal den sites to rendezvous sites, which, similar to natal dens, are re-used in consecutive years (Frame, Cluff, and Hik 2007). Wolves leave the den site when the young are able to travel with adults, usually in September or October (Walton et al. 2001). Pups are usually cared for cooperatively at communal dens (Frame et al. 2004).

9.2.9.2 Baseline Data for Wolverine and Furbearers

Five baseline studies were conducted to document the activity of wolverine and furbearers in the RSA:

1. population estimation surveys using DNA mark-recapture techniques;
2. motion triggered camera monitoring;
3. snow track surveys;
4. carnivore den surveys; and
5. habitat suitability modeling.

In addition, incidental observations of wolverine and furbearers were recorded during other studies conducted in the RSA and by site personnel.

<u>DNA Mark-Recapture</u>

The application of DNA mark-recapture studies is discussed in Section 9.2.8.2. Similar to grizzly bears, DNA mark-recapture studies on wolverine can be used to determine a super-population estimate of wolverine in a given area (Mulders, Boulanger, and Paetkau 2007; Fisher et al. 2009).

Methods

A wolverine DNA study was conducted in 2010 and 2011 for the Hope Bay Project (Rescan 2011f). The wolverine study area was 925 km^2 in the northern part of the RSA (Figure 9.2-28). The survey grid consisted of 37 cells, each 5 km × 5 km. A baited hair-snagging post wrapped in barbed wire was deployed within each cell. A long-distance scent lure was used to attract wolverine and a piece of fish was used as an incentive for wolverines to climb the posts. There were three sampling sessions in mid to late winter of each year, timed approximately 10 days apart. Individual wolverine were identified from DNA in the sampled hairs. Details of the methods are reported in the 2011 Wildlife Mitigation and Monitoring Program Report (Rescan 2011f).

Results

A total of 42 wolverine hair samples were collected during the 2010 field program. DNA was successfully extracted from seven samples and assigned to five individuals (four males and one female). In 2011, 23 hair samples were collected and DNA was successfully extracted from 10 samples and assigned to six individuals (four males, and two females). None of the individuals identified in 2011 were the same individuals identified in 2010. Overall, a total of 8 males and 3 females were detected in the study area in 2010 and 2011. Sample sizes and capture rates were too small to calculate a super-population estimate.

The low detection rates during the DNA study likely reflect low densities of wolverine in the RSA. Note that because DNA studies do not assume a closed population in the study area, that true density estimates cannot be calculated, however relative density estimates can be compared between similar studies. The wolverine DNA study reported 5.4-6.4 wolverine per 1,000 km^2. Other studies in Nunavut also reported low numbers of wolverines, including only 23 individuals (15 individuals in a grid of 1,692 km^2 and seven in a grid of 1,800 km^2) at Back River for relative densities of 8.8 and 3.8 wolverine per 1,000 km^2 (Rescan 2014).

In contrast, studies conducted by Boulanger and Mulders (2007) further to the south closer to the treeline reported higher relative densities, including: i) 38 wolverine in the 2,556 km^2 Daring Lake study (14.8/1,000 km^2), ii) 24 wolverine in the 1,269 km^2 Diavik study (18.9/1,000 km^2), and iii) 21 in the 1,062 km^2 Ekati study (19.7/1,000 km^2).

The lower numbers of wolverine reported in Nunavut may reflect fewer caribou available, compared to closer to treeline. The RSA only marginally overlaps a portion of the summer range of the Beverly caribou herd, and to some extent the winter range and northern migration route of the Dolphin and Union caribou herd. While wolverine can exploit a diverse diet, caribou has been found to be the primary food item in the central Arctic year round (Mulders 2000).

<u>Camera Monitoring</u>

Methods

Wolverine and grey wolf activity in the RSA was recorded using motion triggered remote cameras from September 2012 to August 2015. Camera methodology was identical to those for caribou and are described in Section 9.2.6.2. On-site cameras were located within 1 km of Doris infrastructure, while off-site cameras were located at a greater distance from infrastructure.

For wolverine and grey wolf camera monitoring information was used to:

1. Characterize wolverine and furbearer activity in the RSA;
2. Examine seasonal use of areas within the RSA; and
3. Document the potential interaction with existing Doris Project infrastructure.

Results

A total of 44 to 59 cameras were deployed in the RSA between September 2012 and August 2015, for a total observation time of 1,041 camera-days. In general, wolverine and grey wolf events on photos from motion-triggered cameras were rare, with a total of only 52 wolverine and 156 grey wolf events during those 1,041 days (Tables 9.2-29 and 9.2-30)..

Most observations of furbearers were of single individuals; 96% of wolverine events and 95% of wolf events. It is important to note that the total individuals recorded across events do not necessarily represent detections of unique individuals, as it is likely that the same individual(s) was recorded across multiple events. Observations also do not necessarily capture all individuals in a group; only those within the field of view of the camera.

Figure 9.2-28
Wolverine DNA Study Grid, 2010-2011

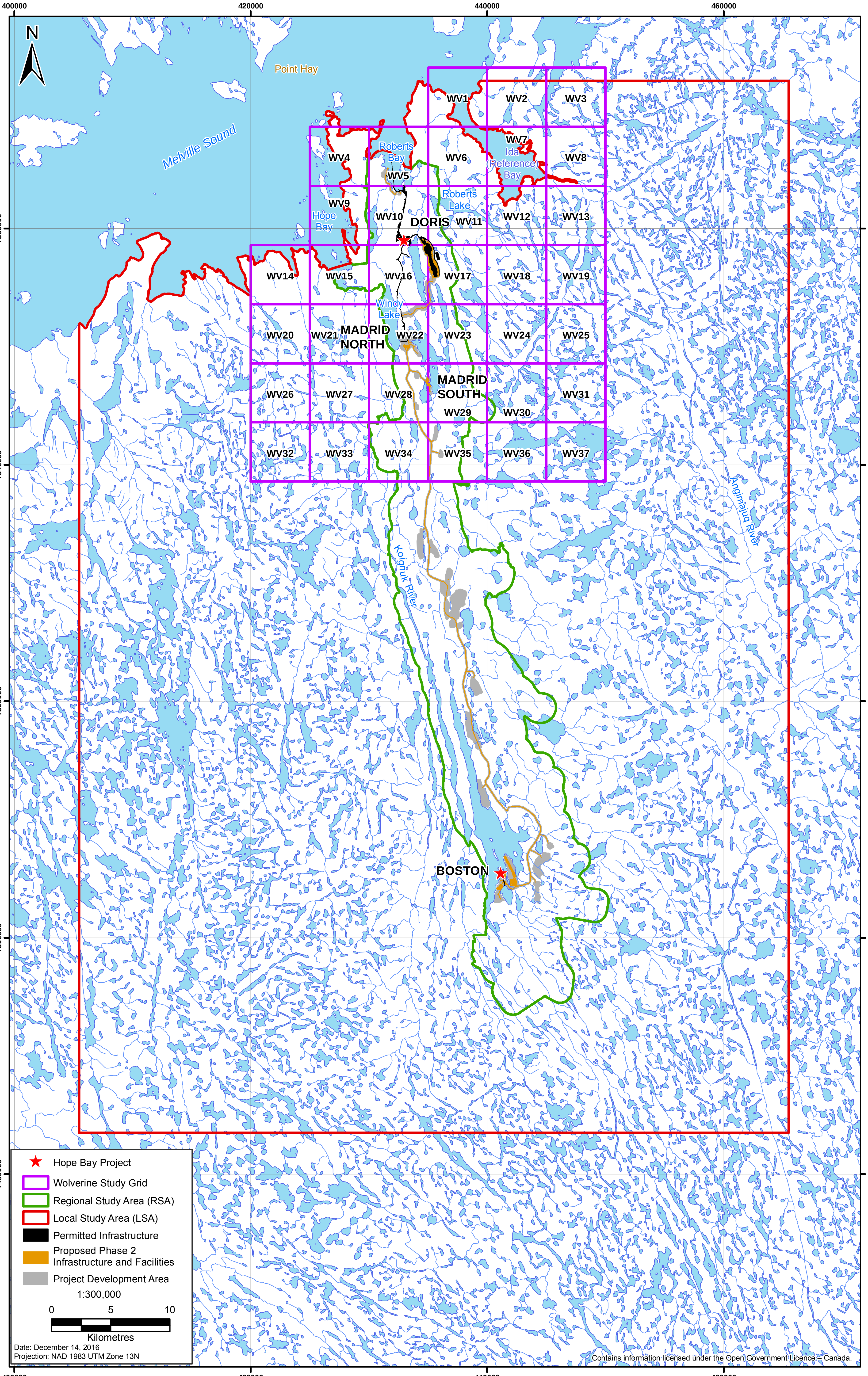


Table 9.2-29. Summary of Wolverine Detection Summary across All Cameras, September 2012 - August 2015

Survey Period	Camera Location	No. Events	No. Events/camera/day	No. Ind. Recorded On Events[1]
Winter 2012/ 2013	On-site	1	0.0001	1
	Off-site	1	0.0003	1
	All Cameras	**2**	**0.0002**	**2**
Summer 2013	On-site	0	0	0
	Off-site	11	0.0034	12
	All Cameras	**11**	**0.0019**	**12**
Winter 2013/ 2014	On-site	0	0	0
	Off-site	27	0.0033	28
	All Cameras	**27**	**0.0019**	**28**
Summer 2014	On-site	0	0	0
	Off-site	6	0.0024	6
	All Cameras	**6**	**0.0013**	**6**
Winter 2014/ 2015	On-site	1	0.0001	1
	Off-site	5	0.0006	5
	All Cameras	**6**	**0.0004**	**6**
Summer 2015	On-site	0	0	0
	Off-site	0	0	0
	All Cameras	**0**	**0**	**0**

[1] Does not represent total number of individuals recorded across all events, as multiple events can be of the same individual utilizing the area surrounding the remote camera.

Table 9.2-30. Summary of Grey Wolf Detection Summary across All Cameras, September 2012 - August 2015

Survey Period	Camera Location	No. Events	No. Events/ camera/day	No. Ind. Recorded On Events[1]
Winter 2012/ 2013	On-site	1	0.0001	1
	Off-site	12	0.0032	13
	All Cameras	**13**	**0.0011**	**14**
Summer 2013	On-site	14	0.0057	19
	Off-site	78	0.0241	78
	All Cameras	**92**	**0.0162**	**97**
Winter 2013/ 2014	On-site	3	0.0005	3
	Off-site	6	0.0007	7
	All Cameras	**9**	**0.0006**	**10**
Summer 2014	On-site	4	0.0020	4
	Off-site	16	0.0063	17
	All Cameras	**20**	**0.0044**	**21**
Winter 2014/ 2015	On-site	11	0.0016	13
	Off-site	4	0.0005	4
	All Cameras	**15**	**0.0010**	**17**

Survey Period	Camera Location	No. Events	No. Events/ camera/day	No. Ind. Recorded On Events[1]
Summer 2015	On-site	3	0.0015	3
	Off-site	4	0.0018	4
	All Cameras	**7**	**0.0016**	**7**

[1] Does not represent total number of individuals recorded across all events, as multiple events can be of the same individual utilizing the area surrounding the remote camera.

Seasonal Differences

Comparing all years combined, wolverine were detected by cameras similarly during the summer (0.0011 ± 0.0006 events/camera/day) relative to the winter (0.0008 ± 0.0005 events/camera/day), after correcting for the number of cameras and days within the season. Wolverine were recorded in relatively similar numbers in every month of the year, except December-February, which may represent lower activity during these months. Comparing all years combined, grey wolves were detected by cameras just slightly more frequently during the summer (0.007 ± 0.004 events/camera/day) relative to the winter (0.001 ± 0.002 events/camera/day) after correcting for the number of cameras and days within the seasons. Grey wolf events were recorded in every month except for December through February and April.

Snow Track Surveys

Methods

Snow track surveys were conducted in the RSA from 2006 to 2008 as part of monitoring for Doris to provide an index of wolverine activity in the study area. With the assistance of Inuit hunters from Kugluktuk, survey plots 4 km^2 in size were located in areas that contained higher value habitat for wolverine (i.e., heath tundra – boulder associations, shoreline, and wetland habitats; Johnson and Boyce 2004).

A single 4 km transect line was surveyed in each plot. Transects were surveyed by two observers on snowmobile in late winter (Table 9.2-31). Snowmobiles were spaced approximately 25 m apart to either side of the transect line and driven at less than 15 km/hr. Wolverine tracks were documented by handheld GPS. The direction of travel, age of track, and snow and weather conditions was also recorded. A total of 27 to 49 transects were surveyed annually and covered northern areas of the RSA and areas surrounding Boston.

Table 9.2-31. Survey Dates for Snow Track Surveys Conducted in the RSA between 2006 and 2008.

Year	Survey Dates	Number of Transects Surveyed
2006	May 2 to May 5	41
2007	April 24 to May 3	49
2008	May 15 to May 22	27

A detailed description of the survey methods and data analyses is provided in the 2006, 2007 and 2008 baseline studies for the Doris Project (Golder 2007, 2008a, 2009).

Results

The highest number of tracks was observed in 2007 due to greater coverage (Table 9.2-32); however, the proportion of transects with tracks was highest in 2008 (Table 9.2-32). After correcting for survey distance and days since threshold wind or snowfall (where tracks may become covered and undetected), the tracks/kilometre/day (TKD) index was similar among years. The majority of tracks observed during the study were from individual wolverine. One pair of tracks was observed in 2007. Overall, the distribution of tracks was widespread, but wolverine activity was highest near the coast in the north end of the RSA (Golder 2007, 2008a, 2009).

Table 9.2-32. Summary of Snow-tracking Transects Containing Wolverine Tracks, 2006 to 2008

	2006	2007	2008
Distance Surveyed (km)	164	196	104
Number of Transects Surveyed	41	49	27
Number of Tracks Observed	24	39	31
Number of Transects with Tracks	12	17	17
% Transects with Tracks	29%	35%	63%
TKD[1] ± 2SE	0.08 ± 0.06	0.17 ±0.13	0.19 ± 0.11

[1]*Mean number of tracks per km surveyed per days since last weather threshold*

Carnivore Den Surveys

Carnivore den surveys were conducted in 2014 in the area surrounding the Boston site and the proposed all-weather road. Surveys were flown by helicopter at an altitude of 50 to 100 m above ground level and at speeds between 30 to 80 km/h. The areas surveyed included eskers, riverbanks, and other landscape features which offered well drained soils and some vertical relief.

No wolf, wolverine or fox dens were observed during this dedicated carnivore den survey. However, several wolf and wolverine dens were identified by incidental observations (See Section on Incidental Observations; Figure 9.2-29).

Incidental Observations

Methods

Methods for incidental collection of wildlife are identical to those for caribou and are discussed in Section 9.2.6.2. Incidental observations of wolverine and furbearers were recorded when:

1. observed by Doris mine personnel from 2009 and 2015 and recorded in the Wildlife Sighting Log for the Doris Project; and
2. observed by field personnel (wildlife biologists and other environmental personnel) recorded spatially or temporally outside of targeted VEC studies when conducting baseline and monitoring program surveys in the RSA between 2006 and 2015.

Results

Incidental Observations of Wolverine and Grey Wolves by Site Personnel

Wolverine and grey wolves were recorded in the wildlife sightings log in all years between 2009 and 2015 (Tables 9.2-33 and 9.2-34). When data are combined, wolverine were observed during most months of the year except July, September and October (Table 9.2-33) and grey wolves were detected in all months except November, December and January (Table 9.2-34). Among years, wolverine were more commonly detected between February and May relative to the summer months, likely due to their high visibility against the snow and longer time in search of food (Table 9.2-33).