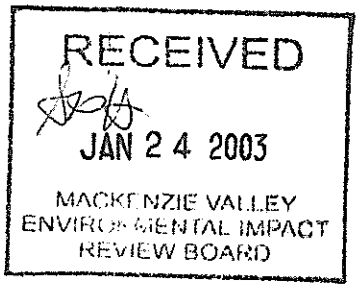
DE BEERS
A DIAMOND IS FOREVER



January 24, 2003

Glenda Fratton
Environmental Assessment Coordinator
Mackenzie Valley Environmental Impact Review Board
Box 938, 200 Scotia Centre
Yellowknife NT X1A 2N7

Dear Ms. Fratton;

Re: Submission of De Beers Snap Lake Diamond Project 2001 and 2002 Baseline and Interim Wildlife Monitoring Reports to the Public Registry

Please find enclosed one CD copy of each of the above noted documents for submission to the public registry, as requested during the MVEIRB's Technical Sessions. We will provide the remaining CD's for distribution to intervenors on Monday, January 27, 2003.

Yours sincerely,

SNAP LAKE DIAMOND PROJECT

Robin Johnstone
Senior Environmental Manager

DE BEERS CANADA MINING INC.

#300 - 5102 50th AVENUE
YELLOWKNIFE NT X1A 3S8 CANADA
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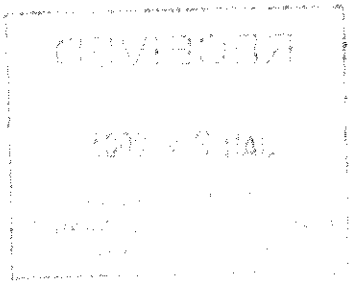

Printed from CD

REPORT ON

BASELINE WILDLIFE MONITORING
SNAP LAKE DIAMOND PROJECT
1999 TO 2001

June 2002
022-6660

De Beers Canada Mining Inc

EXECUTIVE SUMMARY

This report presents the results of wildlife monitoring at the Snap Lake Diamond Project from 1999 through 2001. The monitoring program was developed through consultation with communities and government regulators. More specifically, this report summarizes the monitoring objectives, methodology, and results for each valued ecosystem component. The wildlife valued ecosystem components for the Snap Lake Diamond Project included:

- wildlife habitat;
- caribou;
- grizzly bears;
- wolverine;
- wolves;
- raptors; and,
- upland birds.

Much of the data presented in this report (1999 to 2000) were collected during baseline studies for the environmental assessment of the Snap Lake Diamond Project (De Beers 2002). Data collected in 2001 were intended to augment baseline information, and this report will serve as a valuable record of current conditions in the study area, before construction and operation of the mine.

WILDLIFE HABITAT

The environmental assessment for the Snap Lake Diamond Project predicted that the loss of any habitat type due to the mine footprint would be less than 1% of the study area, which is largely due to the small size of the mine footprint. Monitoring during construction and operation will determine if the amount of habitat loss is equal to that predicted in the environmental assessment.

Due to the large home range size of caribou, grizzly bears and wolves, the proportion of quality forage and travel habitats (*e.g.*, heath/boulder, eskers, open spruce forest and sedge wetland) lost from the home range of an individual is expected to be less than 1%. For wolverines, the proportion of habitat lost from an individual's home range is predicted to range from 1% to 12%, and for foxes, from 23% to 37%. The loss of sedge wetland and deep-water habitats due to the mine footprint is expected to account for 9% of the home range of an individual for waterfowl species.

Depending on the home range size of raptors in the area, the loss of heath/boulder habitat (which may provide nesting sites) from the home range of an individual is anticipated to

range from 1% to 22%. Given the small home range size of upland breeding birds (0.5 ha to 5 ha), the proportional loss of suitable nesting habitat within an individual's home range is expected to be 100% for all habitats directly influenced by the core mine area. Therefore, individuals that had a home range overlapping the Snap Lake Diamond Project site will be forced to find alternative nesting habitat.

CARIBOU

The Snap Lake Diamond Project is located on the migration route of the Bathurst caribou herd. The area is also occasionally used by caribou wintering north of the treeline. Studies to date have concentrated on determining how many animals may be present in the study area during peak migration, and when and where caribou move through the study area during the northern and southern migration. In addition, the behaviour and group composition (*i.e.*, groups with and without calves) of animals has been monitored. Studies have included conducting aerial surveys during peak migration periods, documenting snow tracks and historic migration trails, and determining the number and distribution of animals along the winter access road.

Information collected during 1999 to 2001 indicated that the number of caribou within the study area varies markedly between migration periods and years, and that 91% of groups observed (N = 514) contained fewer than 50 individuals. Further studies are required to determine more precisely the timing of caribou movement through the study area. Observations made during aerial surveys also indicated that behaviour changes among years, migration period and habitat type. The proportion of nursery groups (groups with calves) during the southern migration also changed significantly each year. For example, the proportion of nursery groups observed in 1999 to 2001 varied from 6% to 65%.

The location of caribou and snow tracks indicated that the western portion of the study area is used more than the eastern portion during the northern migration. In contrast, the distribution of caribou groups was relatively more unitform through the study area during the southern migration. Still, the location of two groups of 1,000 to 1,500 animals and the number and location of historic trails suggests that most caribou travel north and west of the Snap Lake Diamond Project during the southern migration.

GRIZZLY BEARS

In 1999 and 2000, surveys of all major eskers in the study area were conducted to locate grizzly bear dens. No grizzly bear dens were recorded, which is likely related to the low density of grizzly bears in the region, and restricting the search to esker habitat. As a result, a new methodology was introduced in 2001, and was based on recording sign left

by bears (such as droppings, tracks, and digs). Searches for sign were conducted near sedge wetland and riparian habitats, which represent preferred areas for grizzly bears.

Results from 2001 studies indicated that grizzly bears were present in the study area. Fresh bear sign was found in 64% of the 42 plots surveyed. Furthermore, several incidental observations were made of grizzly bears in the study area. Results also indicated that black bears used the study area. Continued monitoring of bear sign is required to determine if grizzly bear activity in the area changes with construction and operation of the mine.

WOLVERINE

Snow track surveys were used to monitor the presence of wolverines in the study area. Three surveys were conducted in late March or early April during 1999 through 2001. Field crews, including one aboriginal observer followed a predetermined route of 100 kilometres around the Snap Lake Diamond Project. All wolverine tracks observed along the route were recorded, and the track density estimates have increased annually since 1999. Furthermore, incidental observations of wolverines were recorded by field crews from April through August, 1999 to 2001.

WOLVES

Wolf dens have been located and monitored since 1999. Dens known to have been active in a previous year were visited in subsequent years. Because dens may not be active each year, several years are required to identify all of the potential wolf dens in the study area. As a result, the number of known dens has increased from two in 1999, to six in 2001. Five of these six dens were active in 2001; however, pups have yet to be observed at any of the active den sites visited since 1999.

RAPTORS

Gyrfalcon and peregrine falcon nest sites have been located and monitored since 1999. Similar to wolves, several years of surveys are required to identify all potential nest sites within the study area. In 1999, five gyrfalcon and four peregrine falcon nest sites were located, and two additional peregrine nest sites were found in 2000. No additional nest sites were located in 2001, and eight of the 11 nest sites were occupied in the spring. Visits to the nest sites in summer of 2000 and 2001 indicated that production of young was higher in 2000 than 2001. For example, five nests produced 11 chicks in 2000, while two nests produced three young in 2001. Mean brood size for productive nests was 2.2 and 1.5 young in 2000 and 2001, respectively.

UPLAND BIRDS

The density, diversity, and species richness of upland breeding birds (including passerines, ptarmigan and shorebirds) was estimated from 19 plots over three years. Plots were categorised according to their proximity to the Snap Lake Diamond Project (*i.e.*, control or mine sites) and habitat type (heath tundra, sedge wetland, and riparian shrub). Plots were surveyed during early morning in mid-June, from 1999 through 2001. Only breeding birds (*i.e.*, those with nests or displaying territorial behaviour) were included in the analysis.

Upland bird surveys identified a total of 23 species breeding in the study area. Because the area is near the treeline, a combination of tree nesting (warblers, grosbeak, blackbirds) and tundra nesting species (redpolls, plovers, buntings, ptarmigan) were identified. The number of species detected on control and mine sites was similar among years, but the total number detected was lower in 1999 and 2001 than in 2000. Analysis indicated that species density, diversity and richness varied significantly among years, but was not different between control and mine sites.

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1.0 INTRODUCTION

The Snap Lake Diamond Project is owned by De Beers Canada Mining Ltd., and is located approximately 220 km northeast of Yellowknife in the Lockhart River drainage basin. The Project is about 25 km south of MacKay Lake, between Camsell Lake and Lac Capot Blanc (Figure 1.1). The Snap Lake Diamond Project represents the third diamond mining development in the region and is currently in the permitting phase. Baseline studies have been carried out since 1999, and are part of an Environmental Assessment (EA) and monitoring program designed to:

- meet the Terms of Reference established by the Mackenzie Valley Environmental Impact Review Board (MVEIRB);
- determine if the residual impacts predicted from the EA are accurate;
- determine if the mitigation measures are effective;
- determine potential environmental effects during construction and operation; and,
- contribute to the regional database for assessing and managing potential cumulative effects.

The Snap Lake Diamond Project is situated in the Slave Geological Province where wildlife, such as caribou, are important to the culture and health of communities in the area. Therefore, it was particularly appropriate to include traditional knowledge in the study of baseline conditions (De Beers 2002).

Because it is not economically or logistically possible to study the potential impacts of mining activities on all wildlife species, a group of valued ecosystem components (VECs) were selected. Criteria for choosing VECs were based on the ecological, social, cultural, and economic aspects of the ecosystem. This focused wildlife studies towards caribou, barren-ground grizzly bears, wolves, foxes, wolverines, upland breeding birds (passerines, shorebirds, ptarmigan), raptors (peregrine falcon, gyrfalcon) and waterfowl (De Beers 2002). Important habitats utilized by these species were also assessed in the EA (De Beers 2002).

In 2001, the continuation of baseline studies (*i.e.*, monitoring) has focused on caribou, grizzly bears, wolves, wolverines, upland breeding birds and raptors, and habitats important to these species. Information relating to studies conducted on foxes and waterfowl, which are not included in the current monitoring program, are presented in the Snap Lake Diamond Project Environmental Assessment Report (De Beers 2002).

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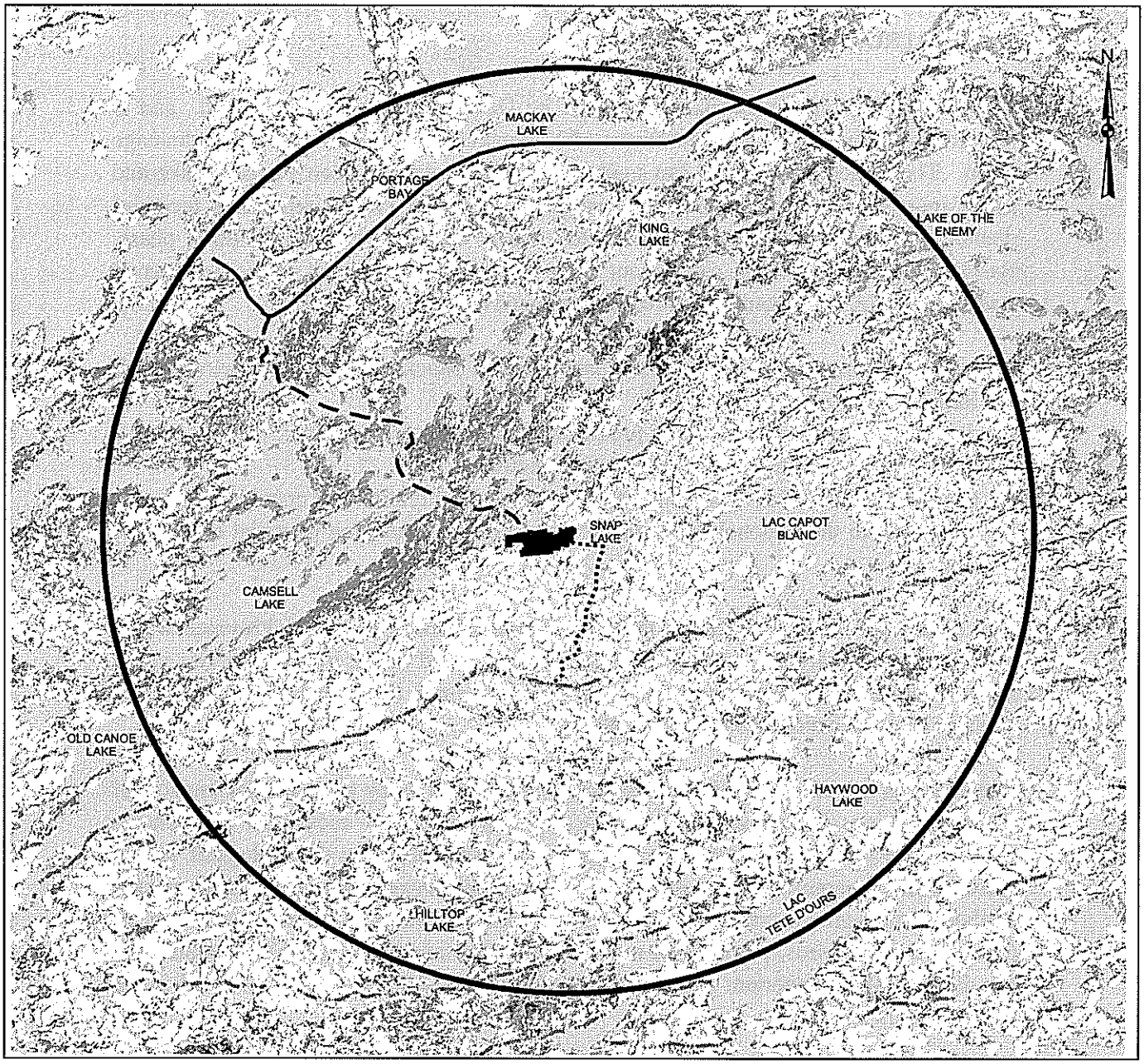


LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

- Heath Tundra
- Heath Bedrock (30 - 80% Bedrock)
- Heath Boulder (30 - 80% Boulder)
- Boulder Association (>80% Boulders)
- Bedrock Association (>80% Bedrock)
- Spruce Forest
- Spruce Forest
- Mixedwood Forest
- Birch Seep
- Shallow Water (<1.5 metres)
- Deep Water (>1.5 metres)
- Tussock / Hummock
- Sedge Wetland
- Riparian Tall Shrub
- Esker Complex
- Burn

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base
(NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12 Landsat TM (Bands 5.4,3) Aug 2, 1994

PROJECT

De Beers

TITLE

FIGURE 1.2-1. HABITAT TYPES WITHIN AND ADJACENT TO SNAP LAKE DIAMOND PROJECT STUDY AREA

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370		SCALE AS SHOWN	REV. 3
DESIGN	JV	29 Apr. 2002	
GIS	RDG	1 May 2002	
CHECK	JV	1 May 2002	
REVIEW	JV	1 May 2002	

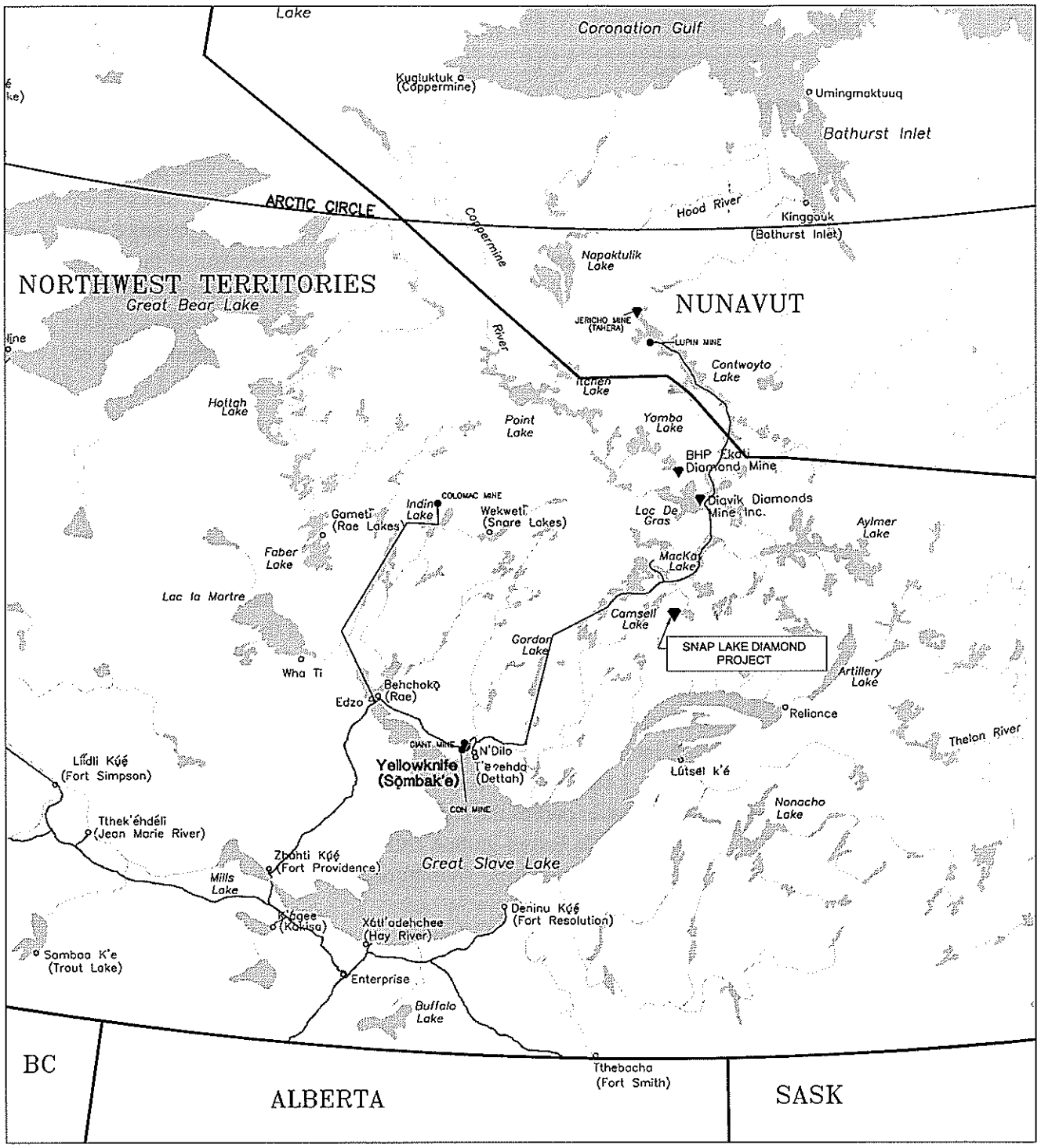
n:\active\66000\022-6660 de beers-2002 monitoring-nwt\gis\mapping\aprs\project.apr

1.1 Baseline and Environmental Effects Studies

Studies from 1999 through 2001 constitute baseline studies as the mine is in the permitting phase. Therefore, the objectives of this phase of the program focused on determining the current state of wildlife in the study area (*i.e.,* determine the presence and distribution of wolves in the study area). During construction and operation of the mine, baseline studies will end, and environmental effects studies will begin. At this stage, the objectives of the monitoring program will change to measuring the potential effects of the mine on wildlife and wildlife habitat (*i.e.*, determine if the presence and distribution of wolves in the study area is influenced by the mine).

1.2 Study Area

Since 1999, wildlife studies have occurred within a 3,019 km^2 area surrounding the Snap Lake Diamond Project (Figure 1.2-1). The Project is located in the Taiga Shield Ecozone and is characterized by short, cool summers and long, cold winters. The study area primarily consists of heath tundra/boulder habitat interspersed with lakes (Figure 1.2-1). Heath bedrock and boulder bedrock associations mainly dominate the eastern portion of the study area while the western portion largely consists of heath tundra, heath tundra/boulder, spruce and mixedwood forest stands. A coniferous forest is located along the east side of Camsell Lake, approximately 5 to 10 km to the west of Snap Lake (Figure 1.2-1). Vegetation includes sedges and grasses, and heath mat with low shrubs such as dwarf birch, willow, Labrador tea, crowberry, bog cranberry, and bearberry. Small black spruce stands also cover part of the landscape. Animals inhabiting the region during part or all of the year include barren-ground caribou, moose, grizzly bears, black bears, wolves, foxes, wolverines, songbirds, shorebirds, waterfowl and raptors (*e.g.,* peregrine falcons and gyrfalcons).



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LEGEND

- ALL-WEATHER HIGHWAYS
- WINTER ROADS
- COMMUNITY
- DIAMOND MINE
- GOLD MINE

REFERENCE

SELECTED MINERAL DEPOSITS OF THE NORTHWEST TERRITORIES, DEPARTMENT OF ENERGY, MINES AND RESOURCES, MINERAL INITIATIVES 1991 TO 1996 REVISED OCTOBER, 1996

PROJECT

DE BEERS

TITLE

FIGURE 1.1
LOCATION OF SNAP LAKE DIAMOND PROJECT NORTHWEST TERRITORIES

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 012-6492.5900			FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
CADD	SIB	27/11/01		
CHECK				
REVIEW				

N:\Active\6600\022-6660 De Beers-2002 Monitoring-NWT\cad\ Drawing file: 6660-FIG.1.1.DWG Jul 16, 2002 - 1:49pm

012-6492\CAD\5900\ACCEFF-FIG1.DWG

2.0 WILDLIFE HABITAT

The EA for the Snap Lake Diamond Project predicted that the loss of any habitat type due to the mine footprint would be less than 1% of the study area which is largely due to the small size of the mine footprint (Table 2.1). Although the proportional loss of habitat is diluted by the scale of the study area, it is biologically relevant to consider the loss of habitat on wildlife at this level, particularly for species that have a large home range size or the ability to effectively disperse over large distances.

Due to the large home range size of caribou, the proportion of quality forage and travel habitats (*e.g.*, heath/boulder, open spruce forest and sedge wetland) lost from the home range of an individual is expected to be less than 0.01% (De Beers 2002). Similarly, the cumulative fraction of suitable habitat types (heath/boulder, open spruce forest, birch seep, sedge wetland) lost from the home range of grizzly bears and wolves is anticipated to be less than 1%. For wolverines, the proportion of habitat lost from an individuals home range is predicted to range from 1% to 12%, and for foxes, from 23% to 37% (De Beers 2002). The loss of sedge wetland and deep-water habitats due to the mine footprint is expected to account for 9% of the home range of an individual for waterfowl species.

Depending on the home range size of raptors in the area, the loss of heath/boulder habitat (which may provide nesting sites) from the home range of an individual is anticipated to range from 1% to 22% (De Beers 2002). In addition, the proportional loss of open spruce forest from an individual's home range, which likely contains small mammal prey, is expected to approach 2%.

Given the small home range size of upland breeding birds (0.5 to 5 ha), the proportional loss of suitable nesting habitat within an individual's home range is expected to be 100% for all habitats directly influenced by the core mine area (De Beers 2002). Baseline data indicated that heath tundra and riparian shrub habitat (which will not be impacted) contained the highest estimates of species diversity.

Table 2.1 Expected Direct Loss or Alteration of Existing Habitat Types in the Study Area Due to the Snap Lake Diamond Project

Habitat Type	Pre-development Study Area		Loss/Alteration of Study Area Due to Snap Lake Diamond Project	
	(ha)	%	(ha)	%
Bedrock	99.3	<0.1	0.0	0.0
Boulder	1,991.9	0.7	0.0	0.0
Heath/bedrock	716.6	0.2	0.0	0.0
Heath/boulder	137,530.4	45.6	433.6	0.3
Esker complex	552.0	0.2	0.5	0.1
Heath tundra	8,743.4	2.9	0.2	<0.1
Open spruce forest	18,169.8	6.0	47.8	0.3
Closed spruce forest	1,520.2	0.5	0.0	0.0
Mixedwood deciduous forest	0.4	<0.1	0.0	0.0
Birch seep	2,661.6	0.9	5.9	0.2
Riparian tall shrub	0.2	<0.1	0.0	0.0
Tussock-hummock	15,011.8	5.0	57.1	0.4
Sedge wetland	7,240.0	2.4	12.4	0.2
Burn	47.6	<0.1	0.0	0.0
Deep water	107,229.7	35.5	85.6	0.1
Shallow water	201.9	0.1	0.0	0.0
Unclassified	0.2	<0.1	0.0	0.0
Disturbed	172.1	0.1	0.0	0.0
Total	**301,889.1**	**100.0**	**643.2**	**0.2**

3.0 CARIBOU

3.1 Objectives

Information from 1999 to 2001 was used to address the following objectives:

- determine the number and distribution of caribou within the study area during the peak northern and southern migration periods;
- determine the behaviour of caribou groups within the study area;
- determine the composition of caribou groups (*i.e.*, nursery and non-nursery) within the study area during the southern migration; and,
- obtain baseline data on the number and distribution of caribou along the winter access road during the northern migration.

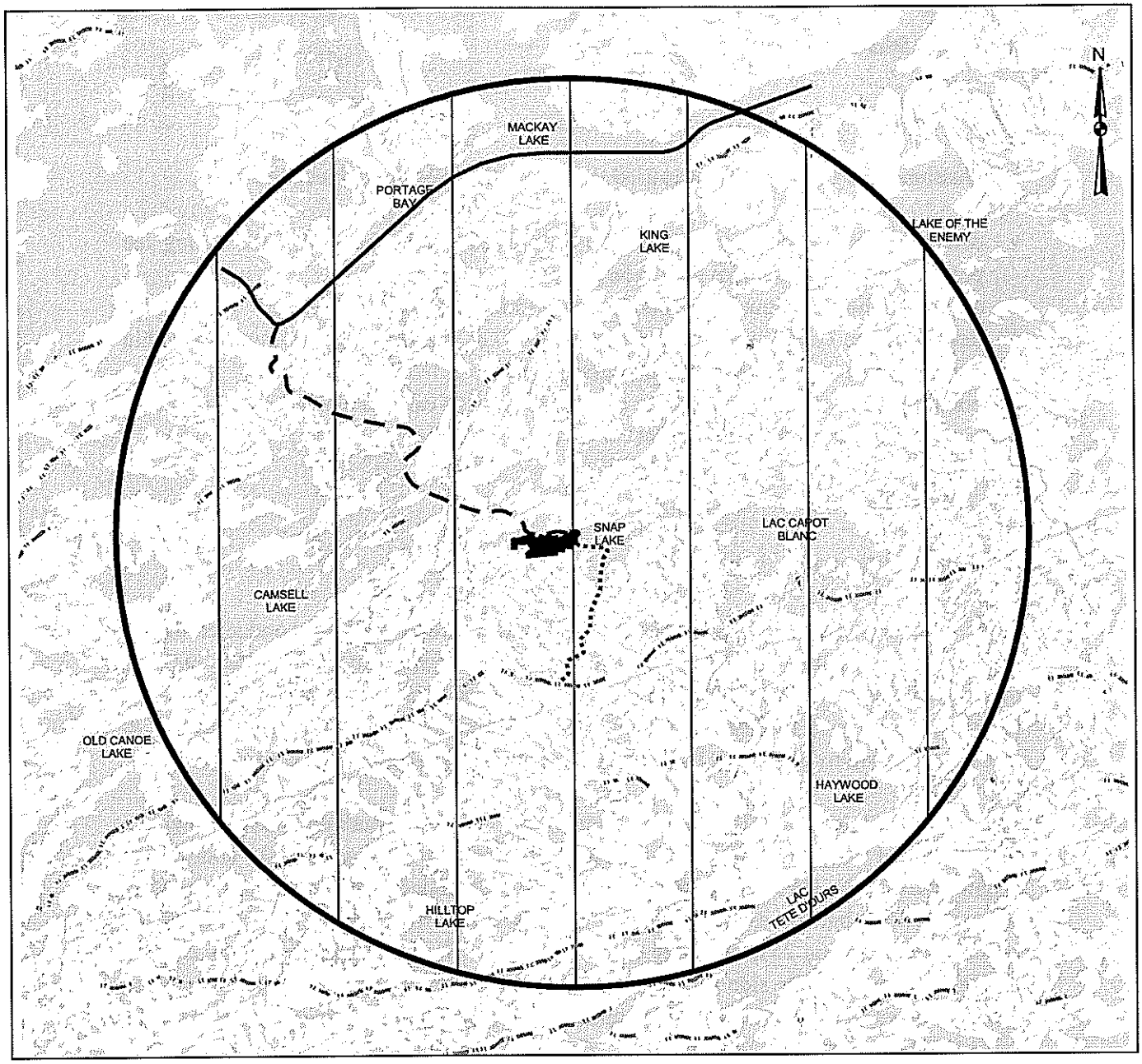
3.2 Methods

3.2.1 Aerial Surveys

Since 1999, systematic aerial surveys within the study area have been conducted during the peak northern and southern migration periods. Movements of satellite collared caribou (provided by Judy Dragon, Resources, Wildlife and Economic Development [RWED]) were used to identify peak caribou movements in the region, in addition to ground observations of caribou by pilots in the region and at MacKay Lake Lodge.

Seven transect lines, spaced 8 km apart, were flown in a north-south direction following a predetermined flight path using global positioning system (GPS) coordinates (Figure 3.2-1). In 1999 and 2000, surveys were unbounded (*i.e.*, all animals observed were recorded), but the estimated survey width was 2 km (1 km on either side of the helicopter), providing 25% coverage of the study area. Beginning in 2001, only caribou within 600 m on either side of the helicopter were counted, reducing the coverage to 15%. Surveys were conducted by helicopter at 120 m to 180 m above ground level (agl), and 145 to 160 kilometres (km) per hour. Caribou observations off-transect (past the end of transect lines) were not recorded.

The location of caribou groups, and associated habitat type, were recorded using a GPS unit. Composition of the group during southern (post-calving) migration was classified as nursery (groups with calves) or non-nursery (groups without calves). Caribou behaviour (feeding, bedded, standing, walking, trotting or running) and direction of movement was recorded based on the dominant activity and travel direction of the group.



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- Aerial Transects

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT

DE BEERS

TITLE

FIGURE 3.2-1. AERIAL SURVEY TRANSECTS FOR CARIBOU, 1999 TO 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	29 Apr. 2002		
CHECK	JV	29 Apr. 2002		
REVIEW	JV	29 Apr. 2002		

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For analysis, the behaviour of each caribou group was classified as feeding/resting (feeding, bedded, standing) or moving (walking, trotting, running). The northern migration included all observations prior to 30 June, and the southern migration included all observations after 30 June. For each migration period, a log-likelihood test was used to analyze the effect of year on behaviour (*i.e.*, feeding/resting or moving activity). After pooling data from 1999 to 2001, differences in behaviour among habitats was analysed using a log-likelihood test.

Incidental observations, including bears and bear dens, wolves and wolf dens, wolverines, raptors and raptor nest sites, and large herds of caribou off-transect or out of the study area were also recorded.

3.2.2 Snow Tracks and Historic Trails

In 1999 and 2000, estimates of caribou snow-track densities were obtained during spring aerial surveys. At two minute intervals (approximately every 4 km), observers reported the number of trails observed during the previous two minutes as none (no tracks observed), low (occasional single tracks), moderate (frequent single tracks and tracks from groups), or high (continuous single tracks and tracks from groups). This information was used to help determine the pattern of movement of caribou through the study area during the northern migration.

On 18 August 2000, point locations of historic caribou trails were recorded along transects during the aerial survey of study area. Trail density was classified as low (less than five trails), medium (6 to 20 trails), or high (greater than 20 trails). Information on trails was used to determine the historic distribution of caribou movement through the study area during the southern migration period.

3.2.3 Winter Access Road

To provide baseline information on the distribution of caribou along the winter access road, aerial surveys of the winter access road were carried out in April and May 2000, and 11 May 2001. These surveys were performed on the same day as systematic surveys of the entire study area. All caribou within 600 m of each side of the road were recorded. All data recorded during the systematic surveys were recorded during the road survey (*i.e.*, location, group size, behaviour, composition and habitat type).

In addition, snow tracking was conducted along the winter road route on 12 to 14 April 2000. The winter road was followed by snowmachines, one on each side of the road. All tracks within 10 m of the snow bank were recorded. Tracks were categorized as single (one track), group (2 to 20 tracks) or trail (>20 tracks).

3.3 Results

3.3.1 Caribou Numbers and Distribution

During 1999, surveys were conducted on 20 March, 2 April, and 21, 22, and 23 July. During 2000, aerial surveys were flown on 11 and 14 April, 4, 7 and 10 May, 21 July, and 17 August. During 2001, surveys were flown on 11, 16 and 21 May, 8, 11 and 16 August, and 24 October.

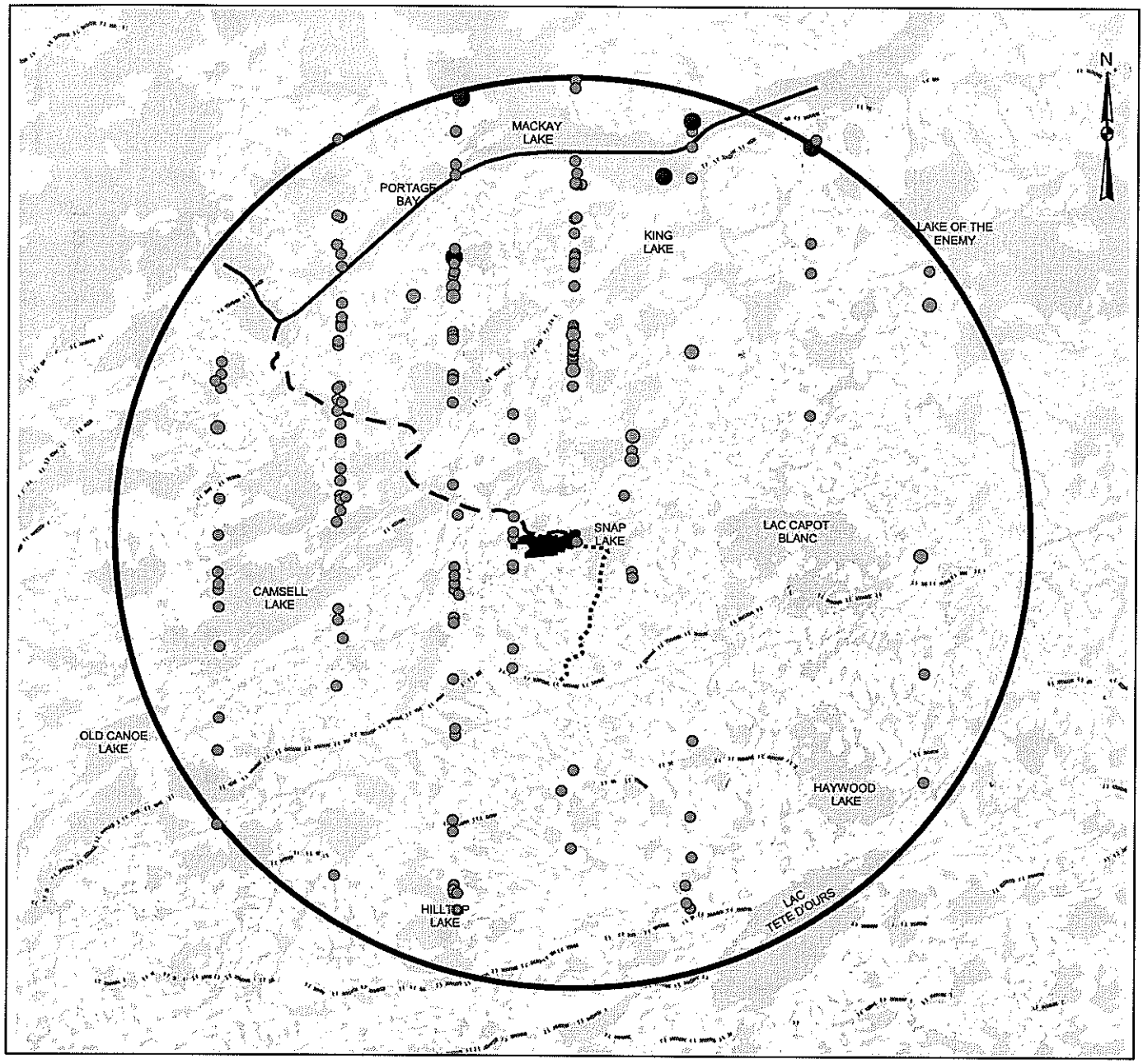
Aerial surveys in 1999 through 2001 recorded 514 caribou groups. Most of the groups (91%) were composed of less than 50 animals. For example, 39% (N = 200) of the groups observed consisted of one or two individuals. Seventeen groups (3%) were observed to contain 100 to 500 animals.

The estimated number of caribou (*i.e.*, number observed divided by proportion of study area surveyed) in the study area has varied widely between years and migration periods. For example, less than 1,500 caribou were in the study area during the northern migration in 1999 and 2001 (Table 3.3-1). In contrast, almost 30,000 animals were in the study area during the southern migration in 1999, and the northern migration in 2000. However, because of the variation in the number of surveys completed among years, a direct comparison of the year-to-year estimates can not be performed.

Table 3.3-1 Estimated Number of Caribou in the Snap Lake Diamond Project Study Area during the Northern and Southern Migration, 1999 to 2001

Year	Northern Migration	Southern Migration
1999	4	27,804
2000	27,906	1,997
2001	1,059	5,179

Observations of caribou from 1999 – 2001 suggest that most groups travel west and north of the Snap Lake Diamond Project during the northern migration (Figure 3.3-1). Relatively few caribou were observed in the eastern portion of the study, except around MacKay Lake. A large number of caribou observations were recorded between Camsell Lake and MacKay Lake. Similarly, medium and high caribou snow track density locations were more common along transects in the western portion of the study area (Figure 3.3-2 and 3.3-3), particularly in 2000 when a large number of caribou was estimated in the study area (Table 3.3-1).



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- 1 - 50
- 51 - 100
- 101 - 500

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT: DE BEERS

TITLE: FIGURE 3.3-1. CARIBOU NUMBERS ALONG TRANSECTS DURING THE NORTHERN MIGRATION, 1999 TO 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	30 Apr. 2002		
CHECK	JV	30 Apr. 2002		
REVIEW	JV	30 Apr. 2002		

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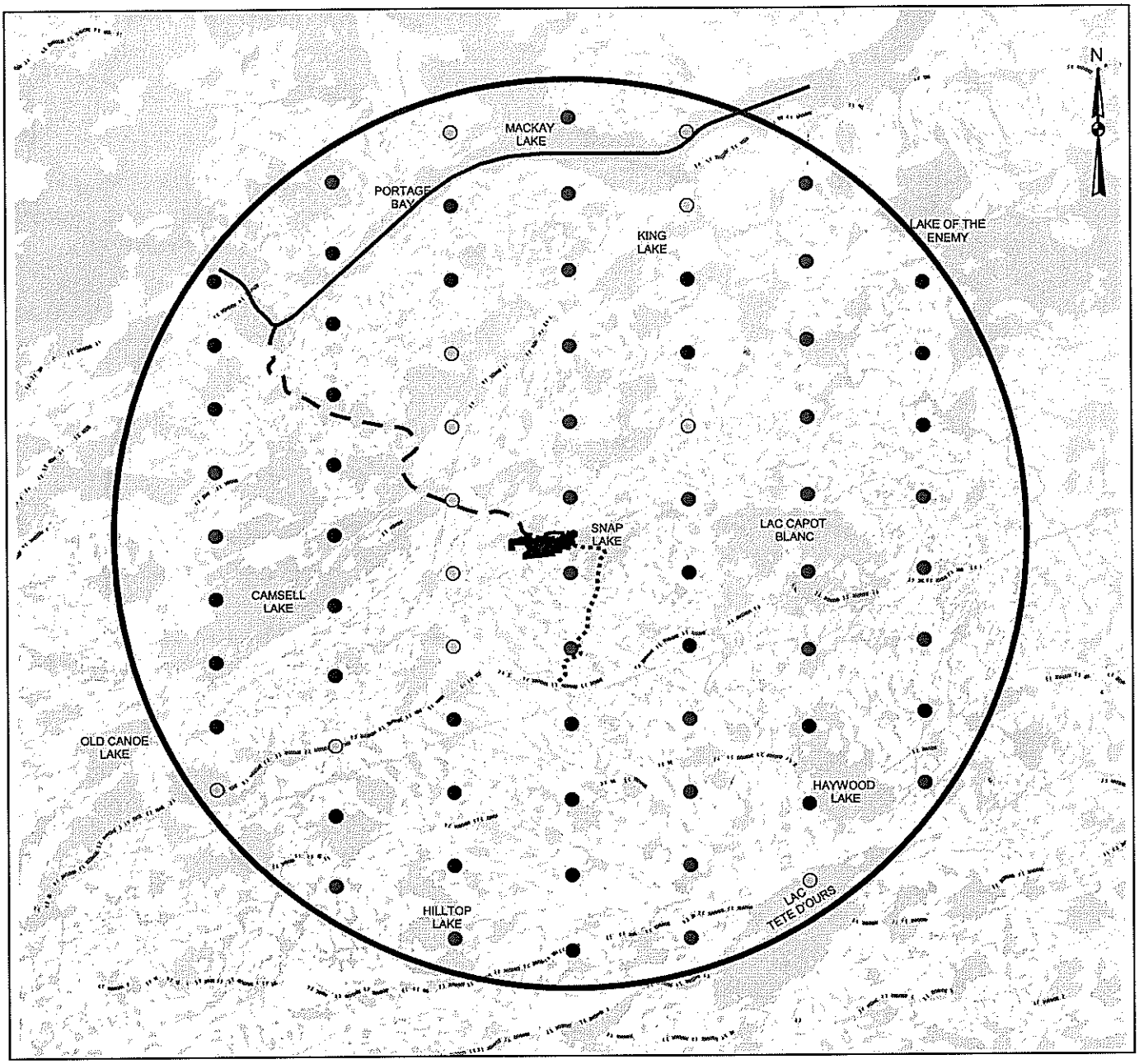

LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- Low
- Moderate
- High

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

10 0 10
Scale 1:400,000 Kilometres

PROJECT
De Beers

TITLE
FIGURE 3.3-2. CARIBOU SNOW-TRACK DENSITY (NUMBER/4 KM) ALONG TRANSECTS DURING THE NORTHERN MIGRATION, 2000

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370		SCALE AS SHOWN	REV. 6
DESIGN	JV	30 Apr. 2002	
GIS	RDG	30 Apr. 2002	
CHECK	JV	30 Apr. 2002	
REVIEW	JV	30 Apr. 2002	

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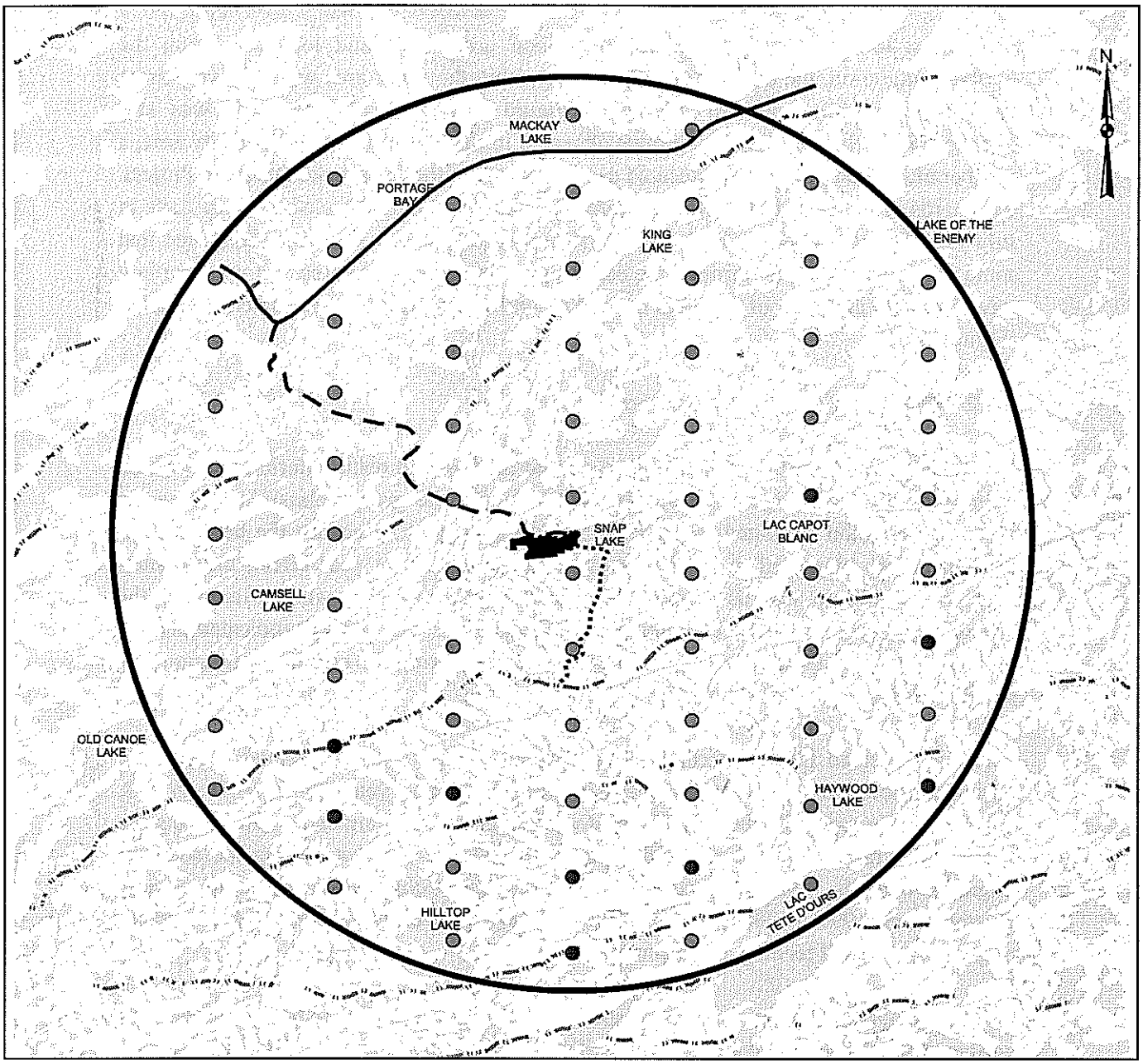


LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- None
- Low
- Moderate

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

10 0 10
Scale 1:400,000 Kilometres

PROJECT
DE BEERS

TITLE
FIGURE 3.3-3. CARIBOU SNOW-TRACK DENSITY (NUMBER/4 KM) ALONG TRANSECTS DURING THE NORTHERN MIGRATION, 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 6
DESIGN	JV	30 Apr. 2002		
GIS	RDG	30 Apr. 2002		
CHECK	JV	30 Apr. 2002		
REVIEW	JV	30 Apr. 2002		

n:\active\6600\ac-6660 de beers-2002 monitoring-nwt\gis\mapping\aprs\project.apr

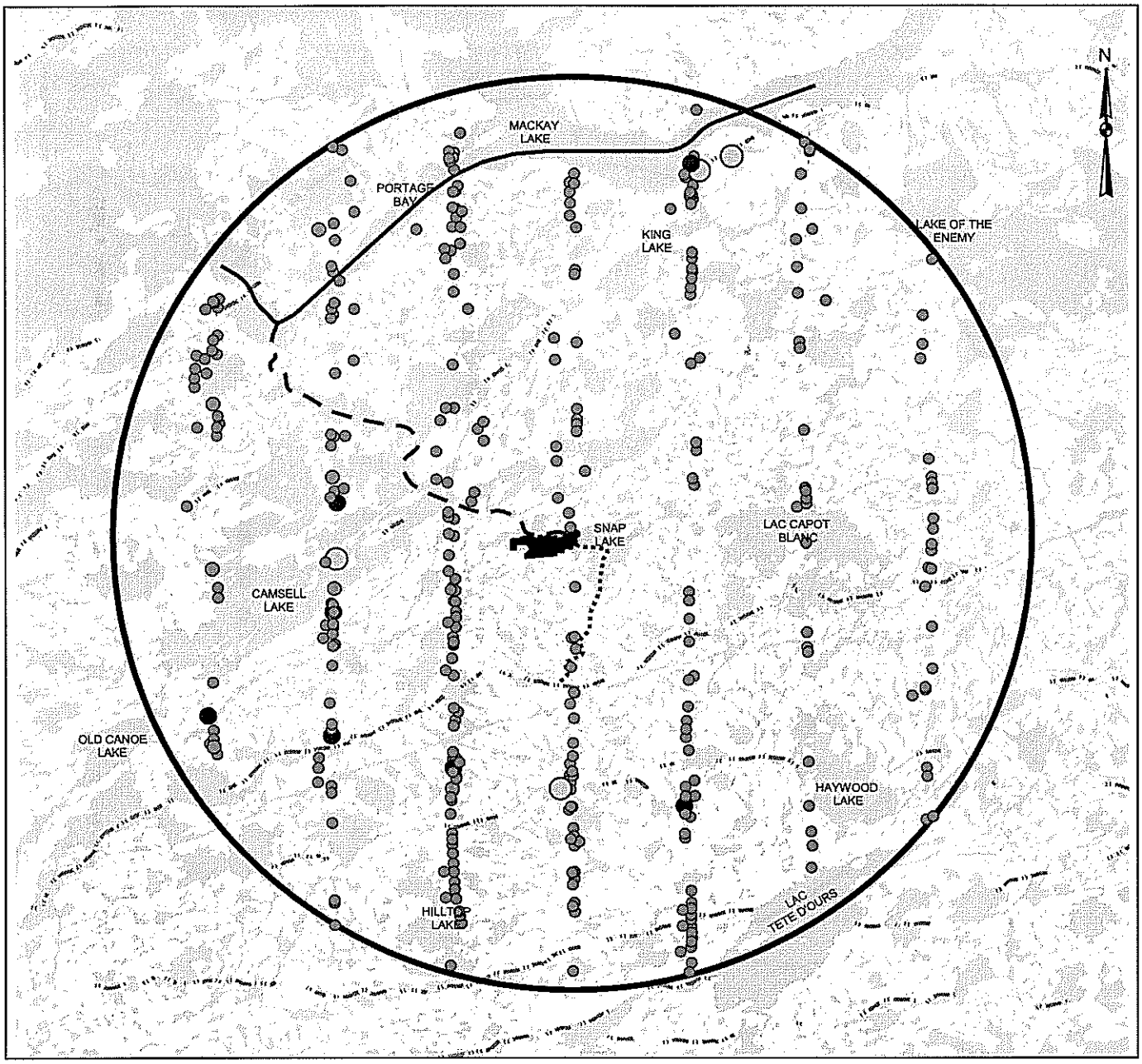
In contrast to information collected on caribou group size and location during the northern migration, the distribution of animals within the study area was relatively more uniform during the southern migration (Figure 3.3-4). Although there was still disproportionately more caribou groups observed in the western part of the study area, a number of caribou groups were located east and south of the Snap Lake Diamond Project. Two herds of 1,000 to 1,500 animals were seen near the south shore of MacKay Lake in July 1999 (Figure 3.3-4). The location and number of historic trails also indicated that some movement occurred through the eastern portion of the study area, but most caribou travelled north and west of the Snap Lake Diamond Project during the southern migration (Figure 3.3-5).

3.3.2 Behaviour and Group Composition

In 2001, the fraction of caribou groups observed feeding and resting during the northern migration was 50% (Figure 3.3-6). In 2000, 63% of the groups classified during the northern migration exhibited feeding and resting behaviour. Because the behaviour of caribou groups classified in 2001 was too small to test for a year effect, the Mantel-Haenszel procedure was used to control for the effect of year while examining the proportion of groups that were feeding/resting or moving. The analysis indicated that the number of caribou groups feeding/resting and moving during the northern migration was similar ($\chi^2 = 0.78$, $df = 1$, $P = 0.38$).

Analysis indicated that the frequency of caribou groups observed feeding and resting during the southern migration changed significantly among years ($\chi^2 = 66.56$, $df = 2$, $P < 0.01$). For example, the proportion of caribou groups feeding and resting during the southern migration in 2001 was 29% (Figure 3.3-6). In contrast, during the southern migration of 1999, 74% of the groups were feeding and resting, while 26% were moving. Overall, from 1999 to 2001, 54% of the caribou groups classified during the southern migration exhibited feeding and resting behaviour.

The behaviour of caribou was also associated with different habitat types. During the northern migration when the lakes were still frozen, caribou moved significantly more on frozen lakes than heath tundra habitat ($\chi^2 = 18.71$, $df = 1$, $P < 0.01$). For example, 23% of the groups observed in heath tundra habitat were moving, while 56% of the groups on frozen lakes were moving (Figure 3.3-7). During the southern migration, significantly more caribou groups displayed feeding and resting behaviour in spruce forest and sedge wetland habitats than in heath tundra habitat ($\chi^2 = 76.85$, $df = 3$, $P < 0.01$). Over 60% of the groups observed in spruce forest and sedge wetland were feeding and resting, while 38% of caribou groups in heath tundra were feeding and resting (Figure 3.3-7). Similar



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- 1 - 50
- 51 - 100
- 101 - 500
- 501 - 1500

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT
De Beers

TITLE
FIGURE 3.3-4 CARIBOU NUMBERS ALONG TRANSECTS DURING THE SOUTHERN MIGRATION, 1999 TO 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 5
DESIGN	JV	29 Apr. 2002		
GIS	RDG	30 Apr. 2002		
CHECK	JV	30 Apr. 2002		
REVIEW	JV	30 Apr. 2002		

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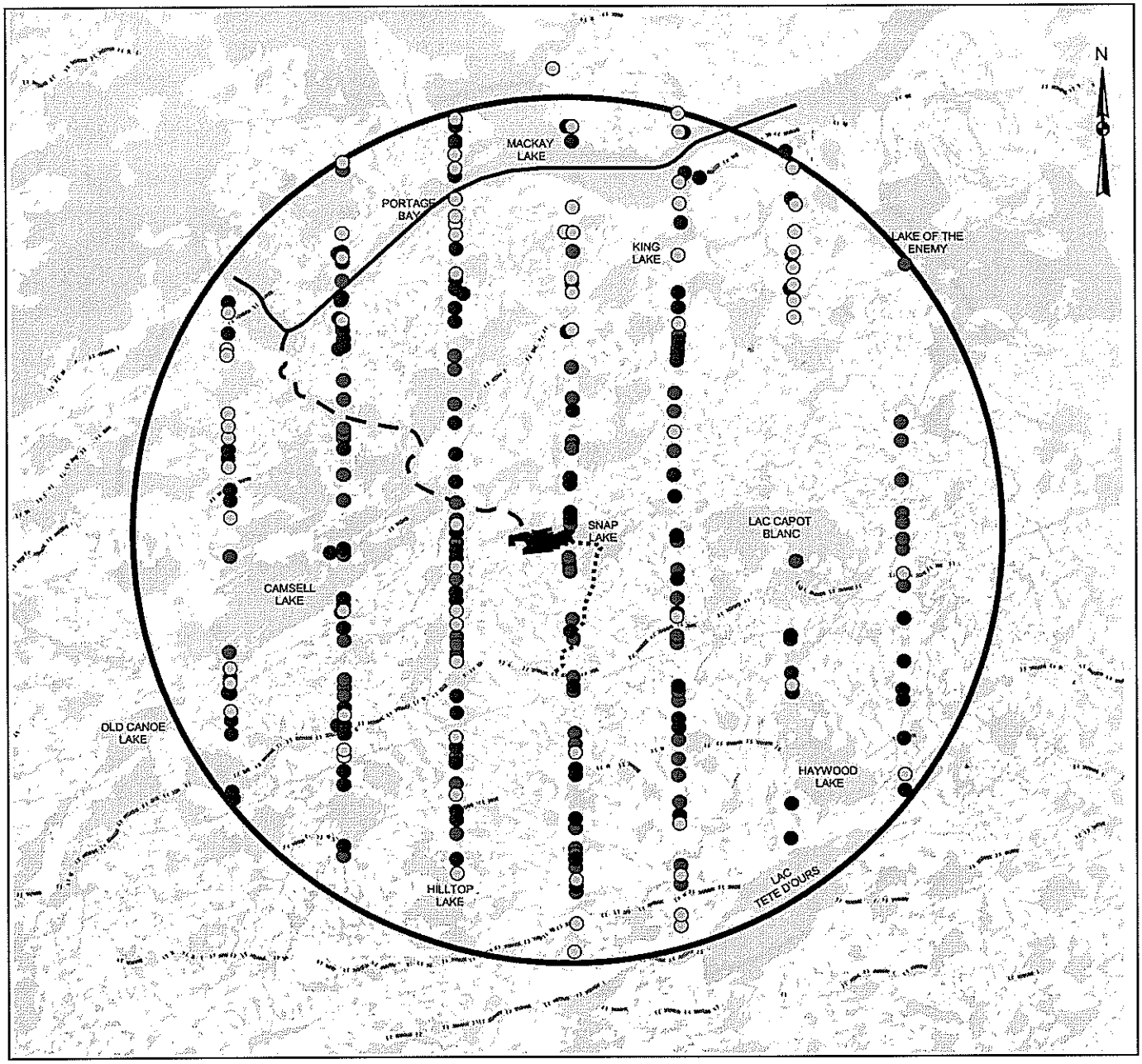

LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

- Low (≤ 5 trails)
- Moderate (6 - 20 trails)
- High (> 20 trails)

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT
De Beers

TITLE
FIGURE 3.3-5. NUMBER OF HISTORIC CARIBOU TRAILS ALONG TRANSECTS DURING THE SOUTHERN MIGRATION, 2000

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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Figure 3.3-6 Percent of Caribou Groups Displaying Feeding and Resting Versus Moving Behaviour Among Years During the Northern and Southern Migration

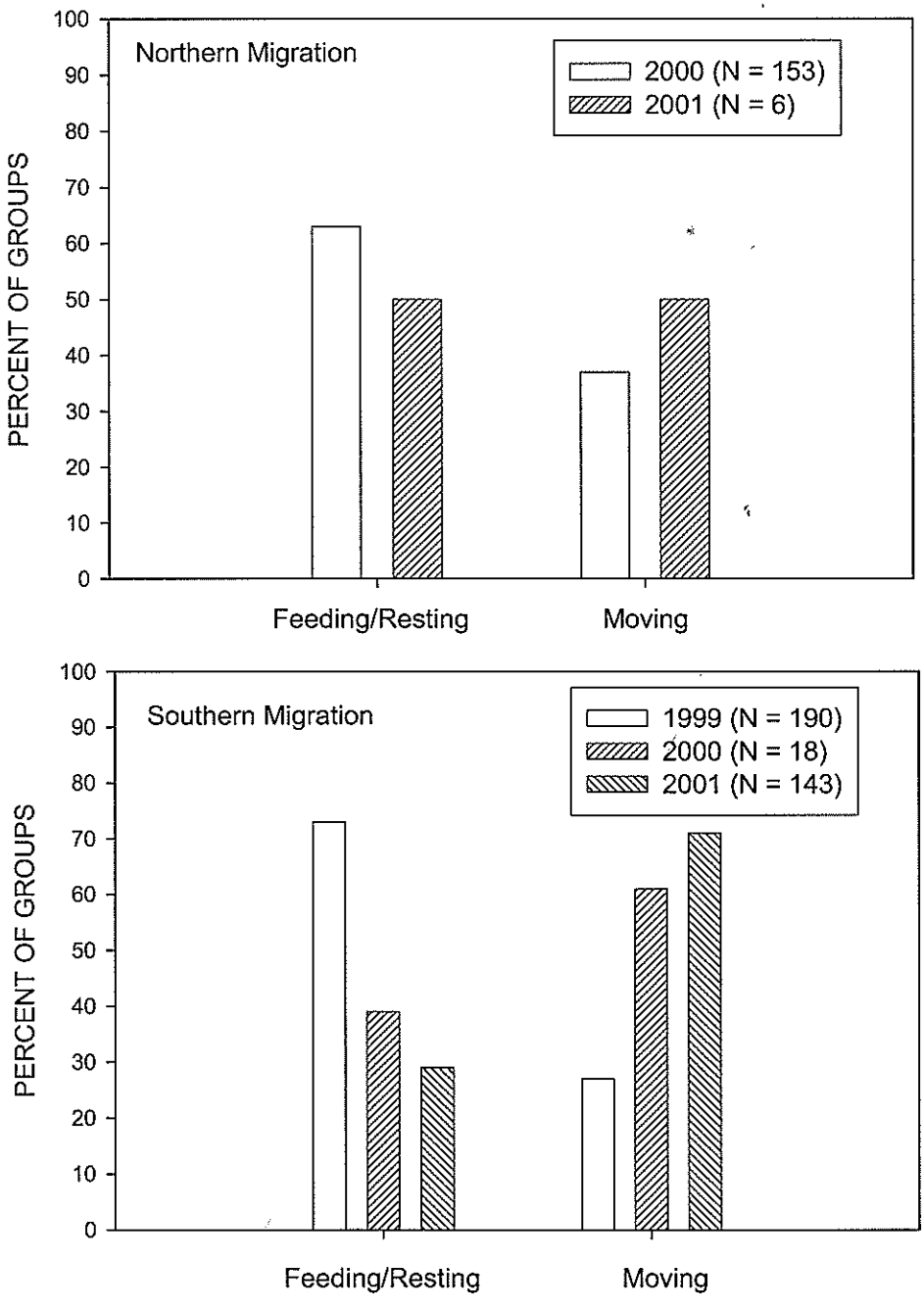
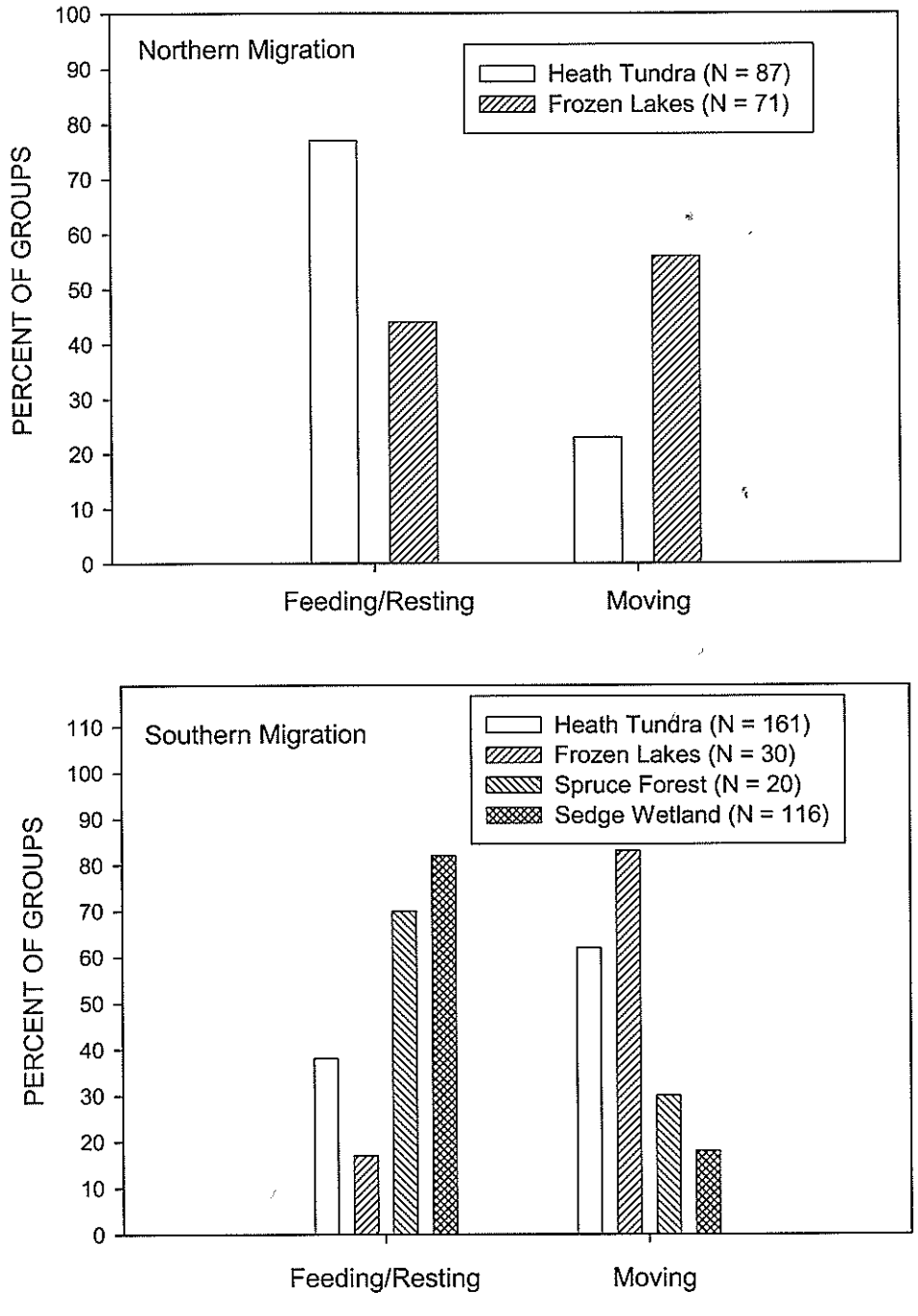


Figure 3.3-7 Percent of Caribou Groups Displaying Feeding and Resting Versus Moving Behaviour Among Habitats During the Northern and Southern Migration

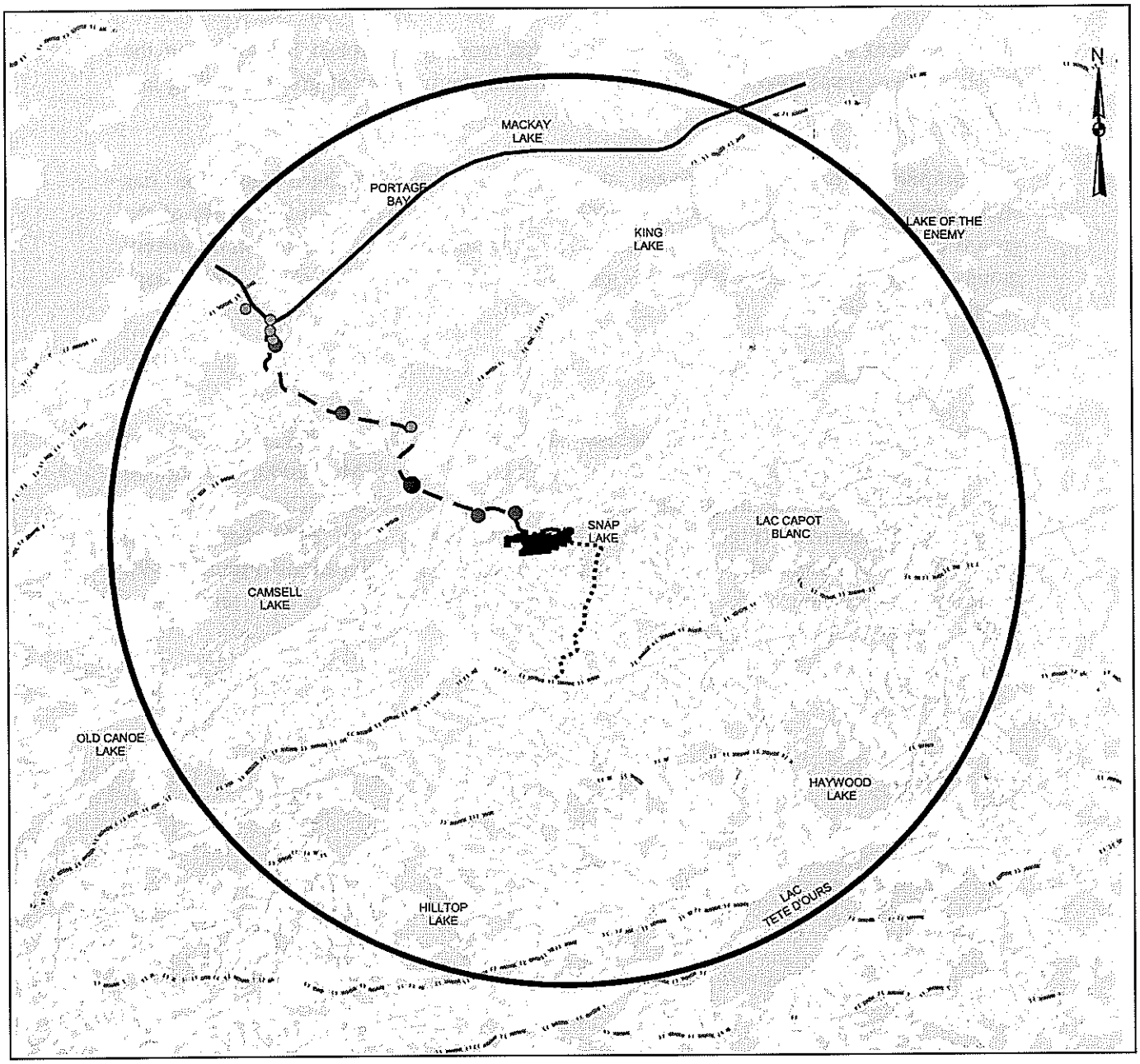


to the northern migration, the number of groups moving on frozen lakes (during the October survey) was disproportionately greater than the number of groups feeding and resting.

The proportion of nursery groups observed during the southern migration has significantly varied across years (χ^2 = 100.36, df = 2, P < 0.01). In 2001, 6% of the groups classified (N = 87) contained calves. In 1999 and 2000, the proportion of nursery groups observed was 23% (N = 13 groups classified) and 65% (N = 190 groups classified), respectively.

3.3.3 Winter Access Road

In 2000, aerial surveys of the winter access road were conducted on 11 and 14 April, and 5 May. In 2001, one survey was conducted on 11 May. On 5 May 2000, 410 caribou were observed within 600 m of either side of the winter access road. Group size ranged from 2 to 200 animals (Figure 3.3-8). Ground surveys in April 2000 also recorded caribou tracks and trails adjacent to the winter access road at 11 locations (Figure 3.3-9). No caribou or caribou tracks were observed along the winter access road on 11 May 2001.



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

- 1 - 10
- 11- 100
- 101 - 500

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT: DE BEERS

TITLE: FIGURE 3.3-8. DISTRIBUTION OF CARIBOU GROUP SIZE ALONG WINTER ACCESS ROAD, 2000

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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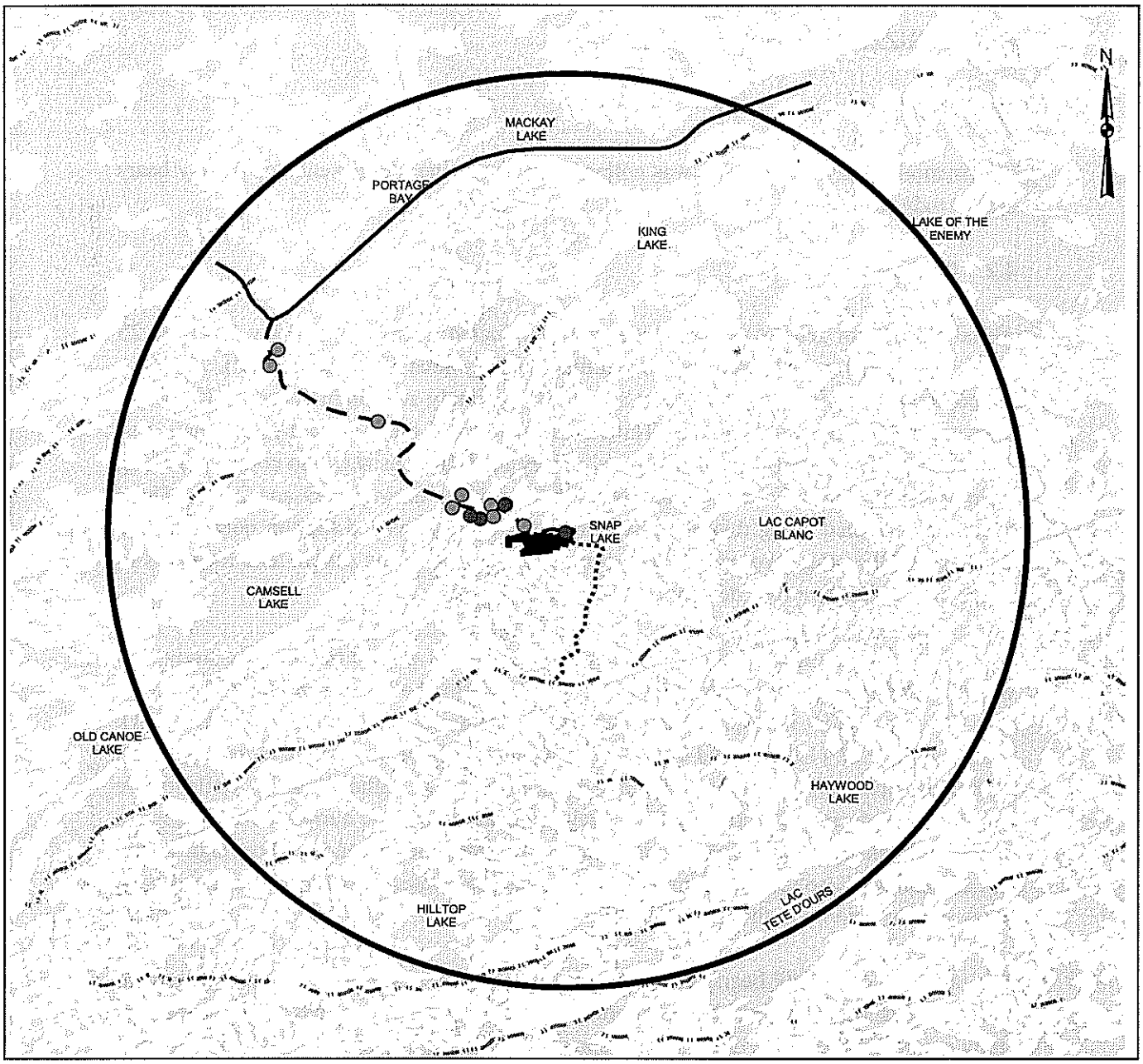

LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

- Single (1 track)
- Group (2-20 tracks)

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT

De Beers

TITLE

FIGURE 3.3-9. DISTRIBUTION OF CARIBOU SNOW TRACKS ALONG WINTER ACCESS ROAD, 2000

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 3
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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4.0 GRIZZLY BEARS

4.1 Objectives

Information from 1999 to 2001 was collected to determine the presence of grizzly bears in the study area.

4.2 Methods

Aerial surveys for grizzly bear den sites were conducted from 28 to 30 May 1999 and 25 to 26 May 2000 on all main eskers within the study area (De Beers 2002). Using a helicopter, each side of the esker was surveyed separately at a flight speed of 80 km per hour and an altitude of 30 m agl. The crew consisted of the pilot and two technicians. Subsequent to the aerial surveys, a ground survey for bear dens was also conducted along a single esker approximately 10-km south of Snap Lake during 1999 and 2000. Three technicians walked along this esker system; one person surveyed the top portion of the esker, while the other two people each surveyed one side of the esker. The locations of all active and inactive bear dens were recorded.

In 2001, the survey method for measuring the presence of grizzly bears in the study area was changed to account for the low density of bears in the Slave Geological Province, and the associated low probability of discovering active den sites (BHP 2001). McLoughlin *et al.* (1999) found that barren-ground grizzly bears spend a large proportion of the non-hibernating period in esker and riparian habitats. Although sedge wetlands are less preferred during the active seasons, they are likely important during the spring, when tender and nutritious sedges and grasses have emerged. The presence of bear sign within and adjacent to these seasonal high quality habitats (*i.e*, preferred habitats) was used as an index of bear activity in the study area.

The presence of grizzly bears around the mine footprint was monitored through ground surveys of randomly selected plots (containing at least 30% preferred habitat) with the study area (Figure 4.2-1). Each plot encompassed a 250 m x 250 m area, but searching was not restricted to the area of the plot and included an approximate 1 km buffer from the initial starting point. Surveys of each plot were standardized to 1 hour and conducted by two people experienced in identifying bear sign. An additional person served as a "look-out" and remained vigilant towards potential bear encounters at all times. If the center point of a plot fell within open water, then searching began from the nearest shoreline. For safety reasons, thick willows that may conceal a bear were not searched.

Plots in sedge wetland habitat (N=26) were surveyed between 26 June and 4 July 2001 while plots in riparian habitats (N=16) were surveyed between 7 August and 10 August.

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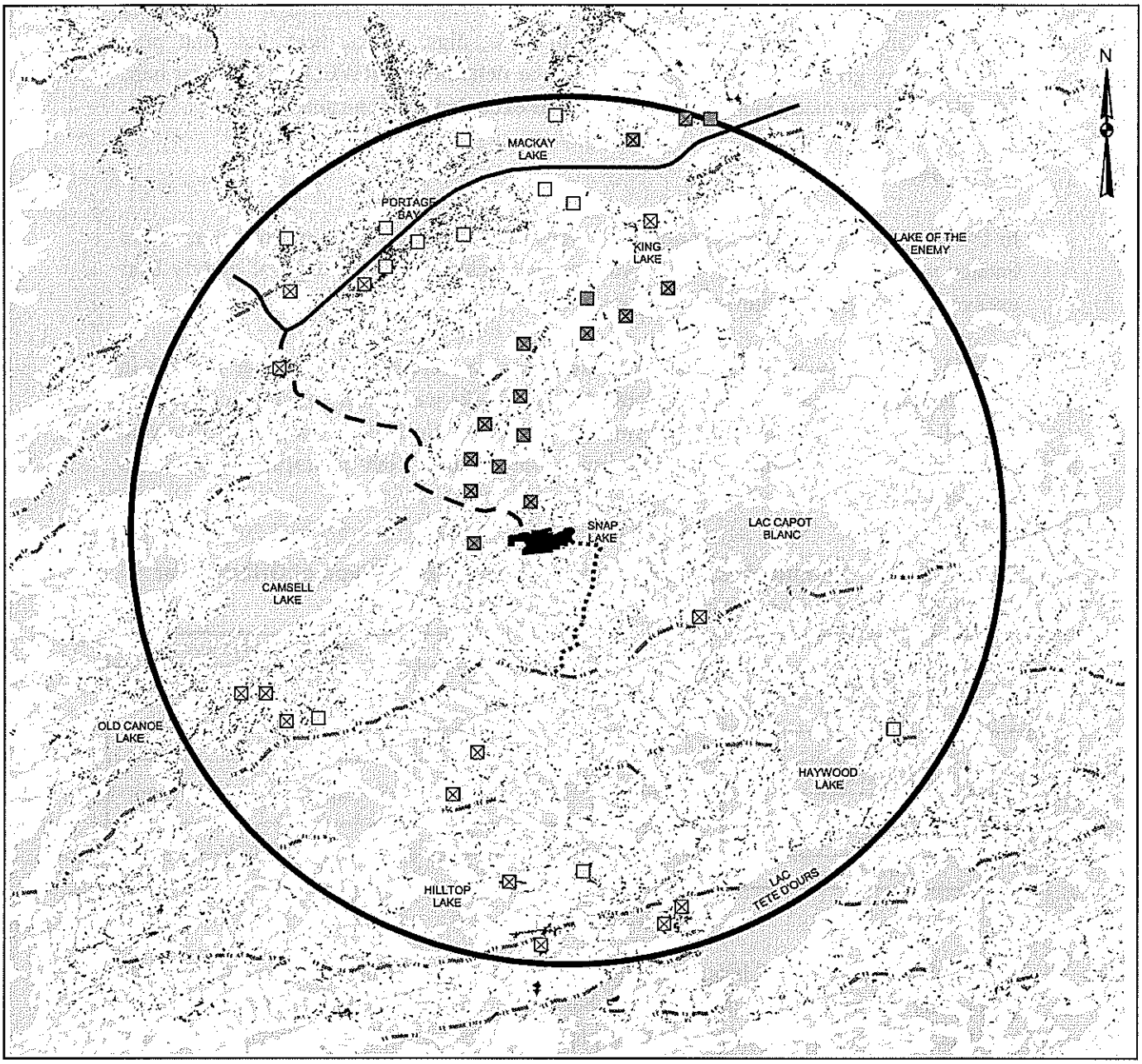
The presence of grizzly bears around the mine footprint was monitored through ground surveys of randomly selected plots (containing at least 30% preferred habitat) with the study area (Figure 4.2-1). Each plot encompassed a 250 m x 250 m area, but searching was not restricted to the area of the plot and included an approximate 1 km buffer from the initial starting point. Surveys of each plot were standardized to 1 hour and conducted by two people experienced in identifying bear sign. An additional person served as a "look-out" and remained vigilant towards potential bear encounters at all times. If the center point of a plot fell within open water, then searching began from the nearest shoreline. For safety reasons, thick willows that may conceal a bear were not searched.

Plots in sedge wetland habitat (N=26) were surveyed between 26 June and 4 July 2001 while plots in riparian habitats (N=16) were surveyed between 7 August and 10 August.



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- Sedge Wetland/Riparian Vegetation
- Riparian Plots
- Sedge Wetland Plots
- × Denotes presence of bear sign

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

10 0 10
Scale 1:400,000 Kilometres

PROJECT: DE BEERS

TITLE: FIGURE 4.2-1. LOCATION OF SEDGE WETLAND AND RIPARIAN SAMPLE PLOTS FOR GRIZZLY BEARS, 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 3
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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Bear sign included separate observations of beds, digs, tracks, scat, hair and prey remains. Any grizzly bear hair collected was be delivered to RWED. Except for hair, bear sign that was made in the previous year was excluded from the analysis.

4.3 Results

In 1999 and 2000, no active bear dens (*i.e.*, dens used during the most recent winter) were located within the study area. However, recent tracks, feces, and sign of grizzly bear excavations for ground squirrels were observed.

In 2001, 55 separate observations of grizzly bear sign were recorded among 42 plots in sedge wetland and riparian habitat (Table 4.3-1). Tracks were most common, comprising 85% of sign, followed by scat, prey remains and digs. No beds or hair were observed. Four cub tracks were found in or near sedge wetland plots, but no tracks of cubs were observed in riparian plots.

Table 4.3-1 Number of Separate Observations for Each Type of Grizzly Bear Sign Found in Wetland and Riparian Plots, 2001

Type of Sign	Wetland (N=26 plots)	Riparian (N=16 plots)
Tracks	24	23
Scat	2	2
Digs	1	1
Prey remains	0	2
Bed	0	0
Hair	0	0
Total	27	28

Although the number of bear sign in wetland and riparian habitats was similar, the proportion of plots containing grizzly bear sign was moderately different between habitats. For example, 54% of wetland plots and 81% of riparian plots contained bear sign (Figure 4.2-1; Table 4.3-2). Wetland plots with most sign were usually within 1 km of an esker. Riparian plots with the most sign were typically adjacent to a waterbody with hills and cliffs.

Table 4.3-2 Number of Wetland and Riparian Plots containing Grizzly Bear Sign, 2001

	Wetland	Riparian
Number of plots with sign	14	13
% Plots with sign (95% CI)	54 (33 to 73%)	81 (54 to 96%)
Number of plots surveyed	26	16

Note: 95% CI based on binomial distribution.

Incidental observations by all personnel at the Snap Lake Diamond Project reported one grizzly bear in August 2000, and four observations of grizzly bears during May 2001. Although not a VEC, black bears were observed incidentally within the study area on several occasions from 1999 to 2001. In addition, black bear tracks were observed in both sedge wetland (N = 5) and riparian (N = 4) habitats during surveys in 2001.

5.0 WOLVERINES

5.1 Objectives

Information was collected from 1999 to 2001 to determine the presence of wolverines in the study area.

5.2 Methods

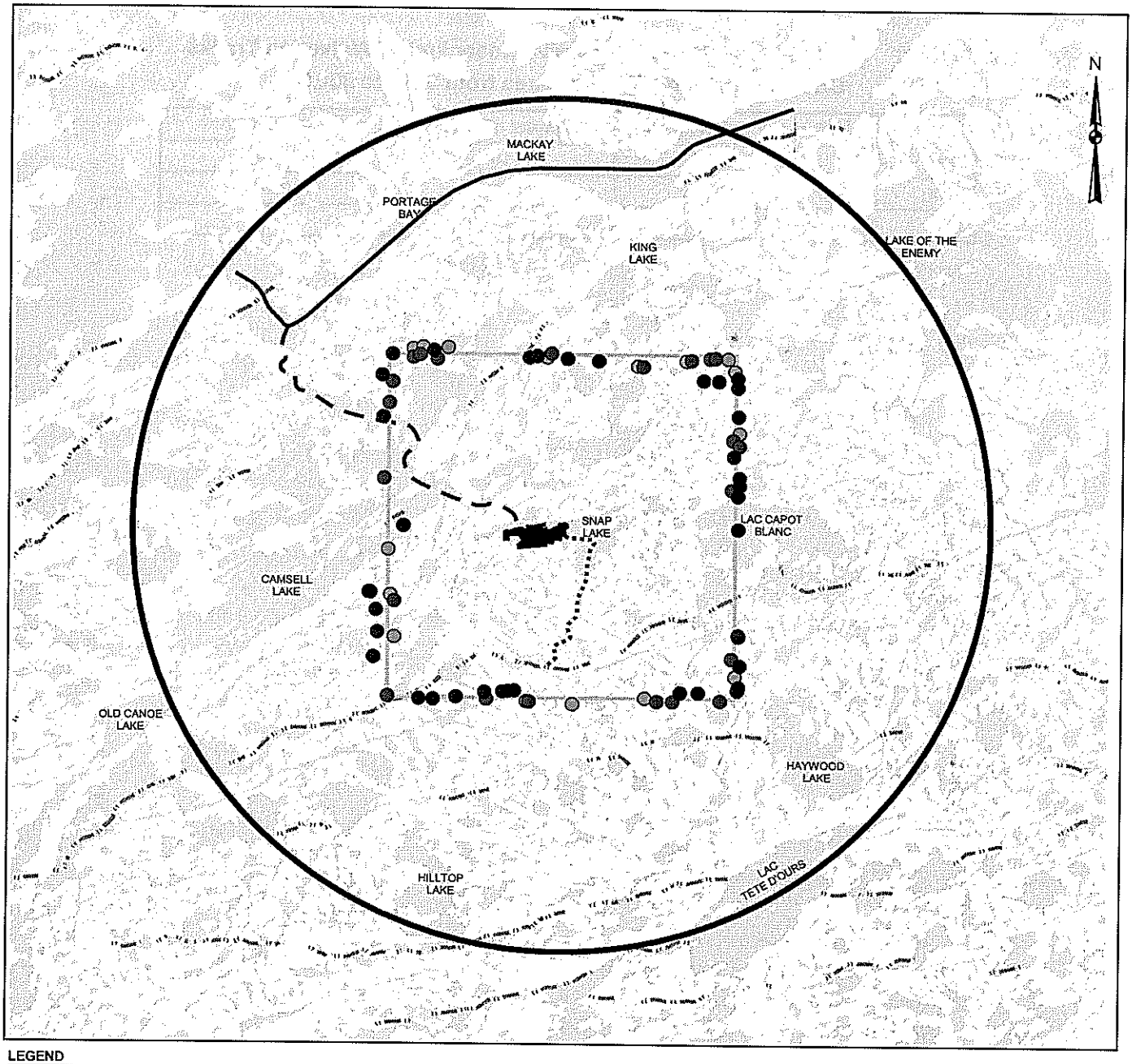
During late-winter of 1999 to 2001, field staff, including one aboriginal observer, traveled a pre-determined route of approximately 100 km by snowmobile around the mine footprint. The survey route was driven slowly to minimize the potential for missing tracks. Two observers drove parallel to each other, separated by a distance of approximately 25 m. Terrain dictated the exact travel route and spacing between observers. Surveys were conducted within 1 to 10 days of a fresh snowfall. If weather conditions were unsuitable for tracking, the survey was postponed. Beginning in 2001, the exact distance traveled was recorded from the snowmobile odometer.

Since 1999, there have been three surveys completed in the study area. Dates for these surveys were 30 March to 1 April 1999, 12 to 15 April 2000, and 13 to 15 April 2001.

5.3 Results

Fifty-one wolverine tracks were observed along the survey route at 42 locations in 2001 (Figure 5.3-1). These tracks were observed over a distance of 114.7 km, resulting in an estimated track density of 0.44 tracks per km, which was higher than in 1999 and 2000 (Table 5.3-1). In 1999 and 2001, snow tracking conditions were good as the surveys were completed within six days after a fresh snowfall. In 2000, conditions were considered fair because the survey could not take place until 10 days after a snowfall due to extreme wind.

In 1999, four wolverines were observed incidentally during fieldwork from April through July. One animal was observed in 2000, and three observations of wolverines were recorded during ground and aerial surveys during the 2001 field season.



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Wolverine Survey Route
- Project Footprint
- 1999
- 2000
- 2001

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT
DE BEERS

TITLE
FIGURE 5.3-1. LOCATION OF WOLVERINE TRACKS ALONG SURVEY ROUTE, 1999 TO 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 3
DESIGN	JV	29 Apr. 2002	
GIS	RDG	1 May 2002	
CHECK	JV	1 May 2002	
REVIEW	JV	1 May 2002	

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Table 5.3-1 Number and Density (Tracks / Linear km) of Wolverine Tracks Observed Within the Study Area from 1999 to 2001

Year	Distance Travelled (km)	Number of Tracks	Density
1999	100[1]	19	0.19
2000	100[1]	26	0.26
2001	114.7	51	0.44

[1] Approximate distance.

6.0 WOLVES

6.1 Objectives

Information was collected from 1999 to 2001 to determine the presence of wolf dens in the study area.

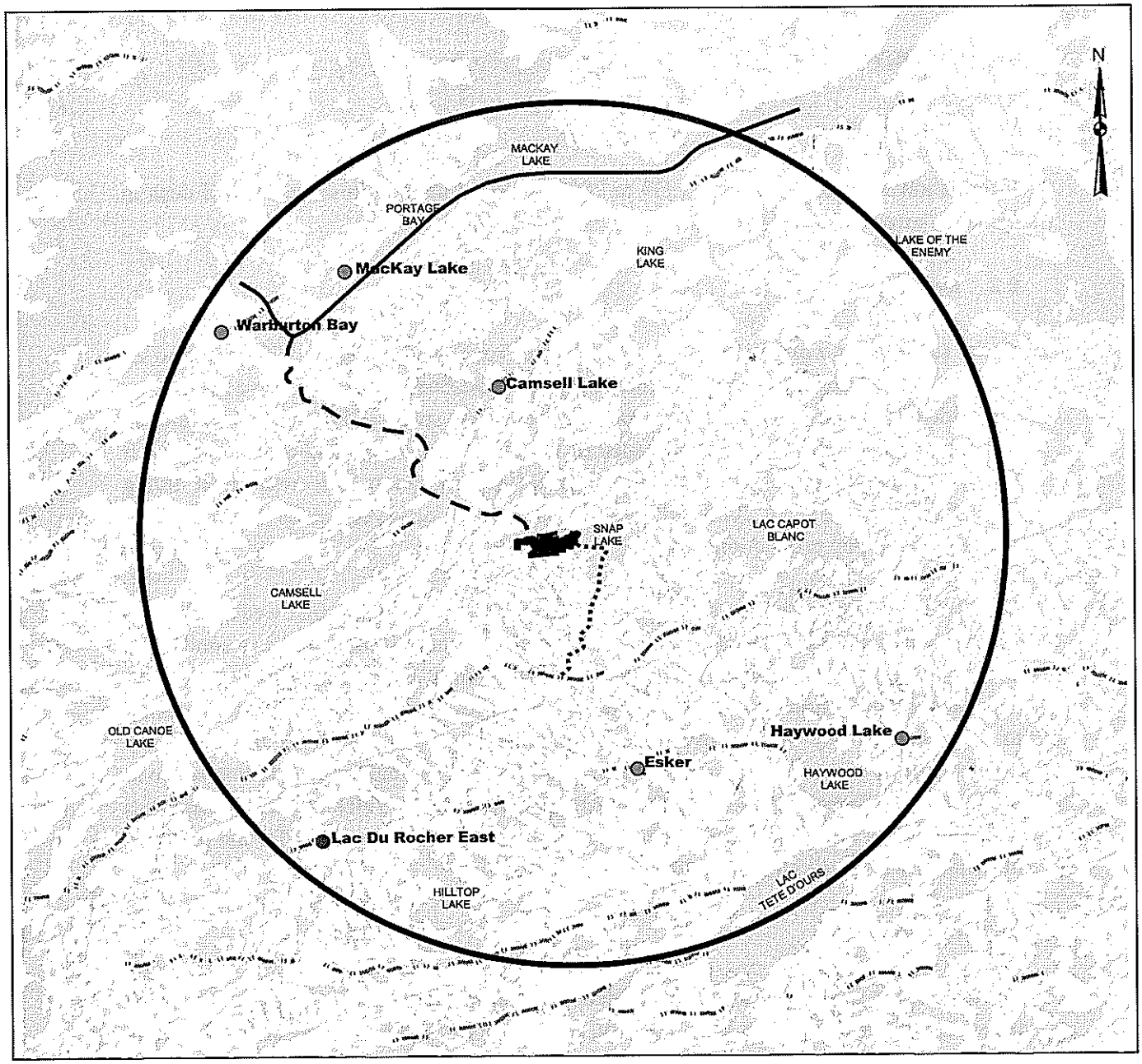
6.2 Methods

Aerial surveys for wolf den sites were conducted from 28 to 30 May 1999 and 25 to 26 May 2000 on all main eskers within the study area (De Beers 2002). Using a helicopter, each side of the esker was surveyed separately at a flight speed of 80 km per hour and an altitude of 30-m agl. The crew consisted of the pilot and two technicians. Active wolf dens were subjected to minimum disturbance (*i.e.*, minimum time was spent flying around the den site). In 2000, all active dens were re-surveyed on 26 July to record occupancy and pup production.

In 2001, wolf dens located in 1999 and 2000 were visited during the first week of June to determine occupancy. Aerial searches of all major esker systems were not conducted. Dens were classified as active if wolves were observed at the den or if there was fresh sign such as tracks and scat. All active dens were checked twice throughout the summer to determine if they were active, and to document pup production (6 July) and pup survivorship (8 August). Pup counts were made from the ground with a spotting scope to minimize disturbance and acquire the most accurate counts. Telemetry equipment was mounted on the helicopter during the first survey (1 to 2 June) to check for the presence of collared wolves within the study area.

6.3 Results

Since 1999, six wolf dens have been located in the study area, and five were active during the spring of 2001 (Figure 6.3-1). In 1999, two active dens were located within the study area. A survey in the spring of 2000 located three new den sites, while an additional den site was found during surveys for grizzly bear sign in sedge wetland habitat in 2001 (Table 6.3-1). The distance between den sites and the mine footprint ranges from 10.9 km (Camsell Lake den) to 27.1 km (Haywood Lake den).



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

- Active Wolf Dens
- Inactive Wolf Den

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base
(NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT

DE BEERS

TITLE

FIGURE 6.3-1. LOCATION OF WOLF DEN SITES, 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370		SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002	
GIS	RDG	1 May 2002	
CHECK	JV	1 May 2002	
REVIEW	JV	1 May 2002	

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Table 6.3-1 History of Active Wolf Dens Located Within the Snap Lake Study Area

Den Site	1999	2000	2001
Warburton Bay	Yes	Yes	Yes
Camsell Lake	Yes	Yes	Yes
Lac Du Rocher East	-	Yes	No
MacKay Lake	-	Yes	Yes
Esker Wolf	-	Yes	Yes
Haywood Lake	-	-	Yes

- Not located.

Summer den occupancy and pup production could not be assessed in 1999 as surveys were conducted only in spring. In 2000, a survey on 26 July with RWED carnivore biologist Dean Cluff (RWED) and furbearer biologist Robert Mulders (RWED) indicated that all five dens located in the spring were unoccupied (Table 6.3-2). Similarly, in 2001, surveys on 6 July and 8 August indicated that all six den sites occupied in the spring were not active. No adults, pups or fresh sign were observed at the dens.

Table 6.3-2 Number of Known, Active, and Productive Dens in the Snap Lake Study Area, 1999 to 2001

	1999	2000	2001
Known dens	2	5	6
Active dens	2	5	5
Productive dens	-	0	0
Number of adults	1	8	7
Number of pups	-	0	0

- Not assessed.

In 2001, seven adult wolves were recorded at den sites during the spring survey, and five wolves were observed on four separate occasions during fieldwork. No collared wolves were located in the study area during the spring survey.

7.0 RAPTORS

7.1 Objectives

Information from 1999 to 2001 was used to determine the presence and productivity of raptors in the study area.

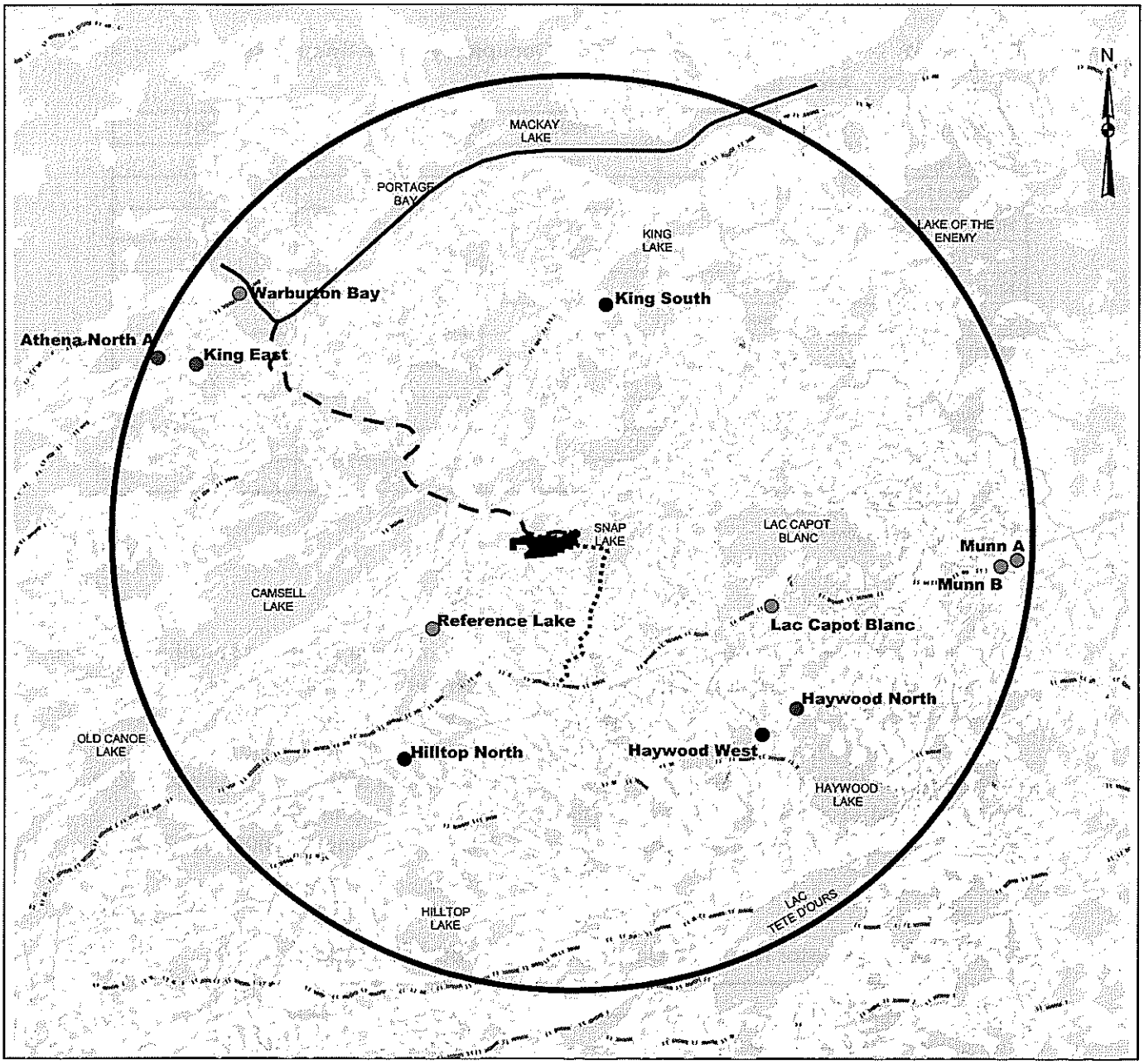
7.2 Methods

Raptor monitoring within the Snap Lake study area began in 1999, when observations of raptor (gyrfalcons and peregrine falcons) nest sites were recorded during aerial surveys in late May. On 26 July 2000 an intensive survey within an 11-km radius of the mine footprint for raptors was conducted. Transect lines, running in a north-south direction, were flown every 2 km within the 11-km radius. All other nest sites were also surveyed to determine occupancy and chick production. In 2001, all known nest sites were visited on 3 June to determine occupancy, and 19 July to determine nest success (*i.e.*, occupancy and chick production).

Nest sites were classified as occupied if a pair of birds was observed at a nest site, eggs were seen in a nest, or a single bird was exhibiting incubation behaviour. If a nest was not immediately obvious and only a single bird was perched on a cliff, then observers landed near the site and verified the presence of a nest. If a nest could not be located quickly, then rather than further disturb the nest it was assumed that a breeding attempt was occurring when the adult exhibited defensive behaviour.

7.3 Results

Since 1999, 11 raptor nest sites have been located in the study area (Figure 7.3-1), and the distance from nest sites to the mine footprint ranges from 7.5 km (Reference Lake) to 29.4 km (Munn A). Surveys conducted in 1999 identified 5 gyrfalcon and 4 peregrine nests, while two additional peregrine nest sties were located in 2000 (Table 7.3-1). In 2001, three gyrfalcon nests and five peregrine falcon nests were occupied during the spring survey (Table 7.3-1; Figure 7.3-1). To date, King East is the only site that has been recorded to alternate between the two species among years.



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

Raptors

- Peregrine falcon nest sites
- Gyrfalcon nest sites
- Inactive historic nest sites

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT: DE BEERS

TITLE: FIGURE 7.3-1. LOCATION OF GYRFALCON AND PEREGRINE FALCON NEST SITES, 2001

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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Table 7.3-1 History of Raptor Nest Site Occupancy in the Snap Lake Study Area, 1999 to 2001

Nest Site	Species	1999	2000	2001
Athena North A	Gyrfalcon	Yes	Yes	Yes
Haywood North	Gyrfalcon	Yes	No	Yes
Haywood West	Gyrfalcon	Yes	Yes	No
Hilltop North	Gyrfalcon	Yes[1]	No	No
King East	Gyrfalcon	Yes	Yes[2]	Yes
King South	Peregrine	Yes	Yes	No
Munn A	Peregrine	Yes	-	Yes
Reference Lake	Peregrine	Yes	No	Yes
Warburton Bay	Peregrine	Yes	No	Yes
Lac Capot Blanc	Peregrine	-	Yes	Yes
Munn B	Peregrine	-	Yes	Yes

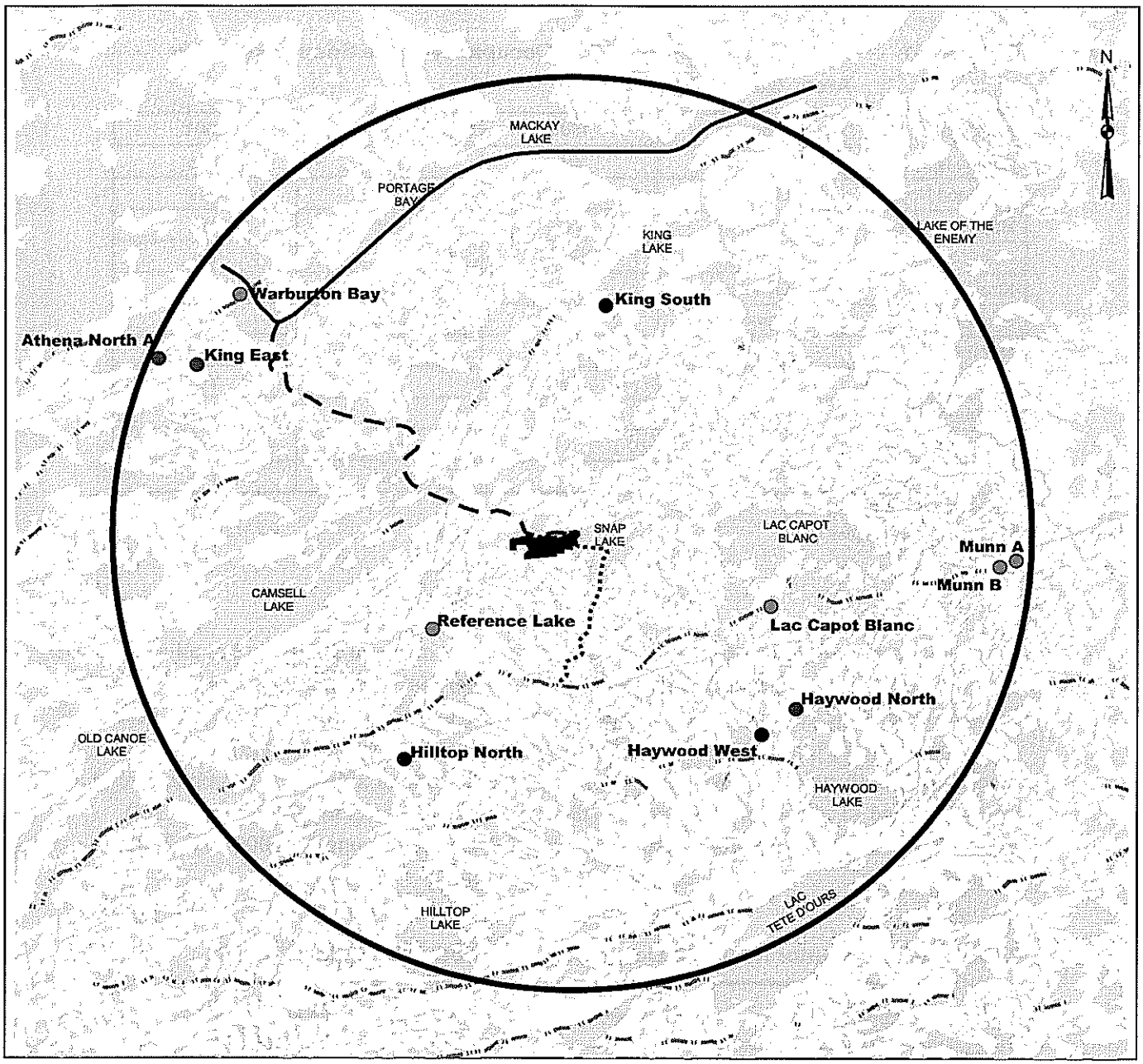
[1] Located incidentally on 21 July.
[2] Occupied by a peregrine falcon.
- Not located.

Summer surveys of raptor sites to determine nest success began in 2000, but not all nests were surveyed in the spring, which precludes an analysis of summer occupancy rate between years. In 2001, summer occupancy rates for gyrfalcons was 33% (N = 3 nest occupied in spring), and 40% (N = 5 nests occupied in spring) for peregrine falcons. Considering both species, productivity was higher in 2000 than 2001. For example, five nests produced 11 chicks in 2000, while 2 nests produced 3 chicks in 2001 (Table 7.3-2). Mean brood size for the productive nests was 2.2 and 1.5 young in 2000 and 2001, respectively.

Table 7.3-2 Raptor Nest Site Occupancy and Productivity, 2000 to 2001

	2000	2001
Total sites	10	11
Occupied in summer	6	3
Productive	5	2
Total young produced	11	3
Young per site	1.1	0.3
Mean brood size[1]	2.2	1.5

[1] Based on productive nests.



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint

Raptors

- Peregrine falcon nest sites
- Gyrfalcon nest sites
- Inactive historic nest sites

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT: DE BEERS

TITLE: FIGURE 7.3-1. LOCATION OF GYRFALCON AND PEREGRINE FALCON NEST SITES, 2001

Golder Associates Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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Table 7.3-1 History of Raptor Nest Site Occupancy in the Snap Lake Study Area, 1999 to 2001

Nest Site	Species	1999	2000	2001
Athena North A	Gyrfalcon	Yes	Yes	Yes
Haywood North	Gyrfalcon	Yes	No	Yes
Haywood West	Gyrfalcon	Yes	Yes	No
Hilltop North	Gyrfalcon	Yes[1]	No	No
King East	Gyrfalcon	Yes	Yes[2]	Yes
King South	Peregrine	Yes	Yes	No
Munn A	Peregrine	Yes	-	Yes
Reference Lake	Peregrine	Yes	No	Yes
Warburton Bay	Peregrine	Yes	No	Yes
Lac Capot Blanc	Peregrine	-	Yes	Yes
Munn B	Peregrine	-	Yes	Yes

[1] Located incidentally on 21 July.
[2] Occupied by a peregrine falcon.
- Not located.

Summer surveys of raptor sites to determine nest success began in 2000, but not all nests were surveyed in the spring, which precludes an analysis of summer occupancy rate between years. In 2001, summer occupancy rates for gyrfalcons was 33% (N = 3 nest occupied in spring), and 40% (N = 5 nests occupied in spring) for peregrine falcons. Considering both species, productivity was higher in 2000 than 2001. For example, five nests produced 11 chicks in 2000, while 2 nests produced 3 chicks in 2001 (Table 7.3-2). Mean brood size for the productive nests was 2.2 and 1.5 young in 2000 and 2001, respectively.

Table 7.3-2 Raptor Nest Site Occupancy and Productivity, 2000 to 2001

	2000	2001
Total sites	10	11
Occupied in summer	6	3
Productive	5	2
Total young produced	11	3
Young per site	1.1	0.3
Mean brood size[1]	2.2	1.5

[1] Based on productive nests.

8.0 UPLAND BIRDS

8.1 Objectives

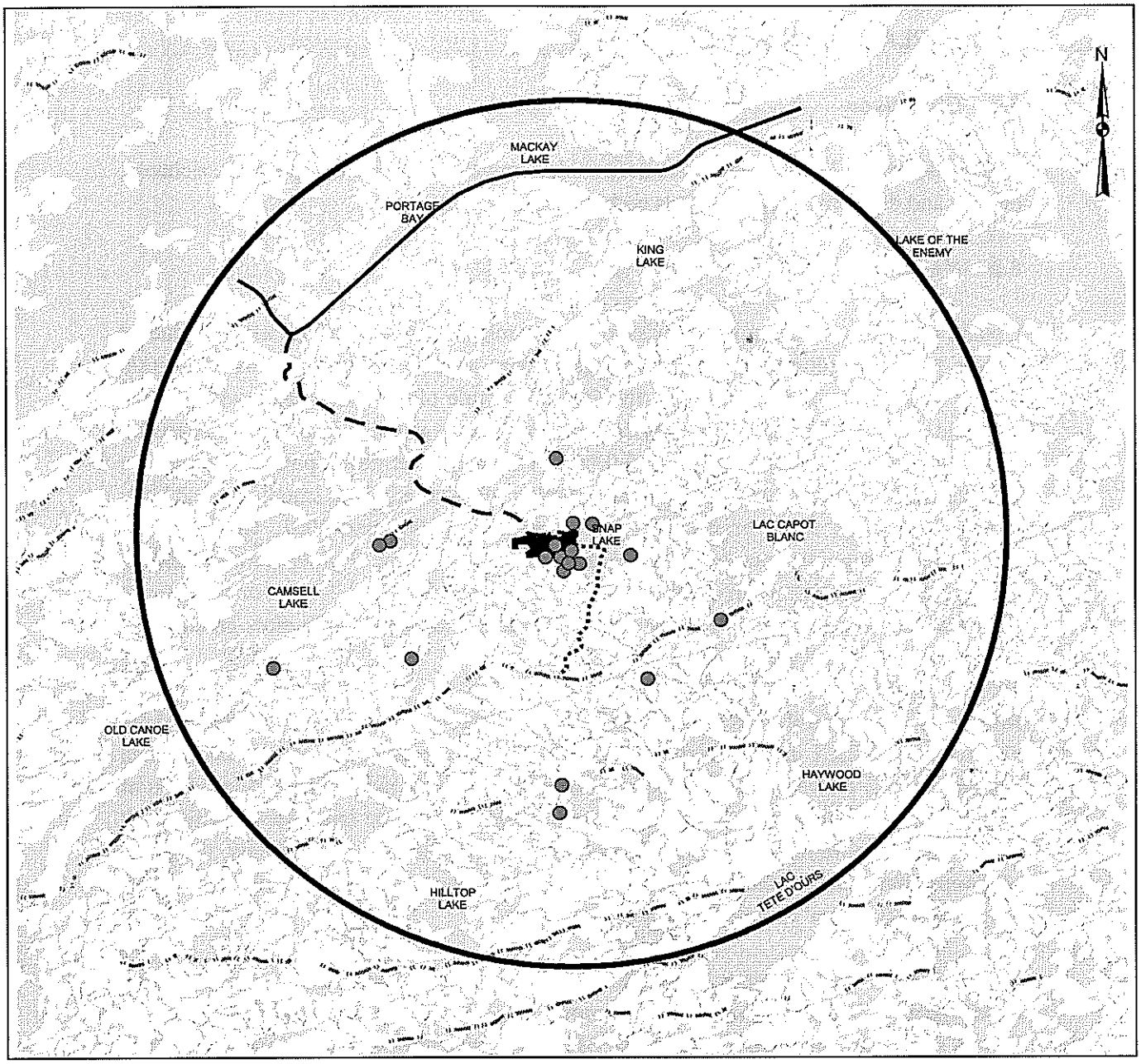
Information from 1999 to 2001 was used to determine the species composition, richness, density and diversity of upland birds within the study area.

8.2 Methods

Upland bird surveys (including all passerines, ptarmigan, and shorebirds) were conducted among 19 sample plots from 9 June through 16 June 1999, 7 June through 13 June 2000 and 15 June through 19 June 2001. In 1999, 11 sample plots were located within 4 km from the project footprint (0.1 to 4.0 km) and 8 plots were established at distances greater than 5 km from the footprint (5.2 to 19.0 km). Due to project development in 2000, one plot within the footprint was removed, and another plot was added to sample upland birds greater than 5 km from the project. Subsequently, in 2000 and 2001, 10 plots were located an average distance of 0.9 km from the mine site, and 9 plots were located an average distance of 12.3 km from the project footprint (Figure 8.2-1). For this report, plots within 4 km of the footprint are referred to as "mine" sites, while plots greater than 5 km from the project are "control" sites.

Mine sites and control sites were stratified across three habitat types (ecological land classification [ELC] units): heath tundra (30% to 80% boulders), sedge wetland, and riparian shrub. However, due to the characteristically small size and irregular shape of habitat patches in the area, many of the heath tundra plots were interspersed with small patches of sedge wetland, riparian shrub, or spruce forest habitat. Accordingly, the shape of sample plots were either square, rectangular, or irregular. The size of sample plots ranged from 0.01 km^2 to 0.25 km^2 (*i.e.,* 1 to 25 ha).

In 1999 and 2000, surveys were carried out by one aboriginal trainee and two experienced technicians. Within each sample plot, 100-m long transects were surveyed by two observers separated by a distance of 50 m. Thus, each observer surveyed a 25-m strip on either side, and the entire sample plot was censused. For irregular shaped plots, the length and distance between transects were adjusted to accommodate smaller areas, but the entire area was still censused. At 100-m intervals along each transect, observers would check the distance between them to ensure that survey width was consistent. Upon reaching the end of a transect, observers turned and surveyed the next transect parallel to the first while ensuring that the outside observer on the previous transect adopted the inside position on the adjacent transect. The purpose of maintaining these



LEGEND

- Regional Study Area Boundary
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Project Footprint
- Survey Plots

10 0 10
Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum: NAD 83
Projection: UTM Zone 12

PROJECT: DE BEERS

TITLE: FIGURE 8.2-1. LOCATION OF SURVEY PLOTS FOR UPLAND BREEDING BIRDS

Golder Associates Saskatoon, Saskatchewan

PROJECT No. 022-6660.5370			SCALE AS SHOWN	REV. 4
DESIGN	JV	29 Apr. 2002		
GIS	RDG	1 May 2002		
CHECK	JV	1 May 2002		
REVIEW	JV	1 May 2002		

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positions between observers was to prevent double counting of breeding birds and minimize bias in parameter estimates. Surveys were conducted between 4 a.m. and 10 a.m.

In 2001, three experienced technicians carried out the surveys. Transects within the plot were traversed by three observers walking abreast, covering a 100-m wide strip. The spacing between the observers was 33 to 34 m thus each observer surveyed a 16.75-m wide strip, and the entire sample plot was censused. Temporary pin flags were used to avoid overlap between transects and picked up as the next parallel transect was surveyed.

The following criteria were used to identify breeding birds within a sample plot: territorial displays, territorial calls, feeding, and/or visual location of a nest with adults. For each observation, the species, number of individuals, behaviour and ELC unit were recorded. Birds identified outside the sample plot (*e.g.*, fly-overs) were recorded as incidental observations and not included in parameter estimates. However, incidental observations were used to generate a complete list of all avian species observed in the study area.

Data were used to estimate species composition, density (number of birds/0.25 km^2), species richness (number of different species), and diversity (Shannon-Wiener index) within and between mine and control sites. Analysis of covariance (ANCOVA) was performed to test the effect of site on each parameter, while statistically controlling for variation in plot size. The models also included year and interaction (site*year) effects.

8.3 Results

During 1999 to 2001, 23 upland bird species have been identified as breeding within the study area of the Snap Lake Diamond Project (Table 8.3-1). For some species (*e.g.*, hoary redpoll, yellow warbler, yellow-rumped warbler, white-crowned sparrow), there was a high degree of variation in density within control and mine sites. Much of this variation reflects the year-to-year change in the number of individuals recorded for each species, and the associated distribution of plot size. Sixteen species were identified as breeding on both control and mine sites, while the common snipe, lesser yellowlegs, lesser golden plover and rose-breasted grosbeak were unique to control sites (Table 8.3-1). Species unique to mine sites included the rusty blackbird, snow bunting, and spotted sandpiper.

Table 8.3-1 Mean (±1SE) Annual Density (Individuals / 0.25 km2) of Upland Breeding Bird Species from 1999 to 2001 on Control and Mine Sties

Species	Control	Mine
American pipet	2.3 ± 1.8	4.0 ± 2.0
American robin	2.6 ± 1.7	8.1 ± 2.5
American tree sparrow	15.5 ± 5.4	25.3 ± 8.0
Blackpoll warbler	36.2 ± 18.7	16.2 ± 2.5
Common redpoll	4.1 ± 2.4	8.4 ± 6.4
Common snipe*	6.3 ± 6.3	N.O.
Grey-cheeked thrush	13.3 ± 6.7	10.6 ± 3.2
Harris' sparrow	11.7 ± 2.6	28.3 ± 5.0
Horned lark	4.0 ± 0.2	5.2 ± 2.8
Hoary redpoll	9.0 ± 8.0	8.3 ± 8.3
Lapland longspur	28.0 ± 8.2	40.1 ± 5.3
Least sandpiper	4.5 ± 1.0	21.2 ± 3.0
Lesser yellowlegs*	0.3 ± 0.3	N.O.
Lesser golden plover*	1.0 ± 1.0	N.O.
Rose-breasted grosbeak*	8.3 ± 8.3	N.O.
Rusty blackbird*	N.O.	8.3 ± 8.3
Savannah sparrow	8.8 ± 1.1	30.4 ± 3.7
Snow bunting*	N.O.	0.7 ± 0.7
Spotted sandpiper*	N.O.	0.3 ± 0.3
White-crowned sparrow	25.0 ± 13.0	6.8 ± 1.9
Willow ptarmigan	1.0 ± 0.6	3.3 ± 3.3
Yellow warbler	33.2 ± 22.0	77.8 ± 30.0
Yellow-rumped warbler	14.6 ± 14.6	6.9 ± 5.5

* Species unique to control or mine sites.
N.O. = Never observed.
Values represent the grand (unweighted) mean.

The number of species detected on control and mine sites was similar among years, but the total number detected was lower in 1999 and 2001 than in 2000 (Table 8.3-2). Species detected in 2000, but not 1999 or 2001, included the lesser yellowlegs, lesser golden plover, rose-breasted grosbeak, rusty blackbird, snow bunting, common snipe and spotted sandpiper.

Table 8.3-2 Number of Species Detected Within Control and Mine Sites, and Total Number of Species Detected Among Years

Year	Control	Mine	Total
1999	13	14	16
2000	19	18	22
2001	12	13	14

Results of the ANCOVA models indicated that density, species richness and diversity were correlated with plot size ($F_{1,50} \geq 4.25$, $P \leq 0.04$). After statistically controlling for the effect of plot size, analysis indicated that year-to-year changes in density, species richness and diversity were similar between control and mine sites (*i.e.*, year-site interaction term was not significant; $F_{2,50} \leq 1.01$, $P \geq 0.37$). Although average density estimates appeared higher for mine sites in 1999 and 2000, and lower on mine sites in 2001 (Table 8.3-3), the difference was not statistically significant ($F_{1,50} = 0.19$, $P = 0.67$). Similarly, there was no statistical difference in species richness and diversity between control and mine sites ($F_{1,50} \leq 0.74$, $P \geq 0.39$; Table 8.3-4 and 8.3-5).

Table 8.3-3 Mean (± 1SE) Density (Individuals/0.25 km^2) of Upland Breeding Birds on Control and Mine Sites From 1999 – 2001

YEAR	CONTROL	MINE
1999	85.0 ± 28.3 (8)	123.0 ± 23.7 (11)
2000	151.5 ± 26.0 (9)	173.2 ± 24.7 (10)
2001	102.5 ± 26.0 (9)	71.3 ± 24.7 (10)

Note: Values represent the mean after controlling for plot size. ( ) = number of plots.

Table 8.3-4 Mean (± 1SE) Species Richness of Upland Breeding Birds on Control and Mine Sites From 1999 to 2001

Year	Control	Mine
1999	5.3 ± 0.7 (8)	6.2 ± 0.6 (11)
2000	6.6 ± 0.6 (9)	6.9 ± 0.6 (10)
2001	4.1 ± 0.6 (9)	4.1 ± 0.6 (10)

Note: Values represent the mean after controlling for plot size. ( ) = number of plots.

Table 8.3-5 Mean (± 1SE) Species Diversity of Upland Breeding Birds on Control and Mine Sites From 1999 to 2001

Year	Control	Mine
1999	1.27 ± 0.15 (8)	1.49 ± 0.13 (11)
2000	1.40 ± 0.14 (9)	1.58 ± 0.14 (10)
2001	1.10 ± 0.14 (9)	1.01 ± 0.14 (10)

Note: Values represent the mean after controlling for plot size. ( ) = number of plots.

As expected, density, species richness and diversity varied significantly among years ($F_{2,50} \geq 4.90$, $P \leq 0.01$). For example, estimates for all three parameters were highest in 2000, and generally lowest in 2001 (Table 8.3-3 to 8.3-5). Much of this difference is likely associated with the greater number of species detected in 2000 relative to 1999 and 2001 (Table 8.3-2).

9.0 REFERENCES

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10.0 CLOSURE

We trust that this report meets your requirements. If you have any questions or require additional details, please contact the undersigned.

Respectively submitted,

GOLDER ASSOCIATES LTD.

Damian Panayi
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Senior Wildlife Ecologist

DP/CP/JV/bh

Printed From CD

REPORT ON

BASELINE AND INTERIM WILDLIFE MONITORING SNAP LAKE DIAMOND PROJECT 2002

Submitted to:

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5102 – 50th Avenue, Suite 300
Yellowknife, Northwest Territories
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Attention: Mr. Kevin LeDrew

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January 2003 **022-2903**

EXECUTIVE SUMMARY

INTRODUCTION

Wildlife monitoring was conducted at the Snap Lake Diamond Project from 1999 to 2002. This monitoring program was developed through consultation with communities and government regulators. This report summarizes the monitoring objectives, methodology, and results for the following valued ecosystem components of the Snap Lake Diamond Project monitored in 2002:

- wildlife habitat;
- caribou;
- grizzly bears;
- wolverine;
- wolves; and,
- falcons.

Some of the data presented in this report (1999 to 2000) were collected during baseline studies for the Snap Lake Diamond Project Environmental Assessment. Data collected in 2001 and 2002 were intended to increase baseline information. The differences observed from year to year are most likely due to natural variation, as the disturbance caused by the current exploration camp is limited and should still be considered as baseline conditions. The four years of data presented in this report will therefore serve as a valuable record of current conditions in the study area, before construction and operation of the mine.

CARIBOU

The Snap Lake Diamond Project is located on the migration route of the Bathurst caribou herd and the area is also occasionally used by caribou wintering north of the treeline. Information from 1999 to 2002 was used to monitor caribou numbers and locations as they move through the study area during the northern and post-calving migration. Additional information was collected on the behaviour of these caribou groups (*i.e.*, feeding/resting or moving) and their composition (*i.e.*, groups with and without calves) during the post-calving (southern) migration.

Caribou were monitored by flying aerial surveys during different times of the year. These surveys were flown by helicopter along seven transect lines, 8 km apart, running north-south. Usually, two to four surveys were conducted during the peak migration periods, for both the northern and post-calving migration. During these surveys, the number, composition (males, females, and calves),

behaviour, travel direction, and location of caribou groups were recorded with the help of aboriginal observers. During the northern migration, the density of caribou tracks in the snow and location of feeding craters was also recorded.

Since 1999, 668 caribou groups have been observed during aerial surveys. Most of these groups were made up of 50 or less caribou. The number of caribou observed during each of the migration periods (the northern and post-calving migrations from 1999 to 2002) has varied greatly.

During the northern migration, the location of most caribou groups and the density of snow tracks showed that most caribou use the areas near MacKay Lake and between Lac Capot Blanc and Lac Tete d'Ours. During the post-calving migration, caribou tend to be observed throughout the study area, but similarly, the western portion of the study area appears to contain more caribou, particularly between Hilltop Lake and Camsell Lake.

Caribou behaviour during the migration periods has varied from year to year. The number of caribou observed feeding and resting has been relatively constant among years during the northern migration. The behaviour of caribou groups was different in different habitat types. Caribou groups located on frozen lakes were more likely to be moving than groups located on heath tundra during the northern migration.

During the post-calving migration, the percentage of caribou groups that are moving or feeding and resting has changed from year to year. In 2002, more groups were feeding and resting than were moving. The behaviour of caribou groups was also different in different habitat types. Caribou were more likely to be feeding and resting in spruce forest and sedge wetland habitats than they were in all other habitat types. During the post-calving migration, observers recorded whether caribou groups contained calves. The number of nursery (with calves) and non-nursery (without calves) groups has been very different from year to year. In 2002, 20% of the groups observed contained calves, while in 2001, approximately 3% of caribou groups contained calves.

GRIZZLY BEARS

In 1999 and 2000, surveys of all major eskers in the study area were conducted to locate grizzly bear dens. Although eskers are the habitat in which grizzly bear dens are most likely to be found, based on availability of eskers, no grizzly bear dens were located. This is likely related to the low density of grizzly bears in the Slave Geological Province. As a result, a new method was introduced in 2001 (and continued in 2002) based on recording sign left by bears (such as scats, tracks, and digs). Searches for sign were conducted near sedge wetland and

riparian habitats, which are important habitat types for grizzly bears. There are 26 plots in the wetland habitat that are surveyed once in the spring, and 16 plots in the riparian habitat that are surveyed once in the summer. Two observers, including one aboriginal observer, conducted the search.

Results from 2002 studies indicated that grizzly bears were present in the study area. Less riparian plots had bear sign in 2002 than the previous year, but the number of sedge wetland plots with bear sign was similar in both years. The lower numbers of grizzly bear sign in the summer of 2002, may have been a result of the particularly wet weather in June and July. Heavy rains may have destroyed many tracks in the area, leaving only other types of sign such as scat, digs, or beds. Several observations were made of grizzly bears and black bears in the study area.

WOLVERINE

Snow track surveys were used to monitor the presence of wolverines in the study area from 1999 to 2002. Surveys were conducted in late winter, by snowmobile. Two observers drove a 100-km route around the Snap Lake Diamond Project. One Aboriginal observer was present on the surveys to aid in the identification of tracks. When tracks were found, the location, direction, and number were recorded. The number of days since the last snowfall was also recorded. One survey was conducted per year.

Only one set of wolverine tracks was observed at each of nine locations during the 2002 survey. This is fewer tracks than were observed in previous years. But snow-tracking conditions were poor in 2002 due to high winds and recent snowfall. When snow conditions are considered, the number of tracks seen this year was similar to previous years. Outside of the wolverine survey, in 2002 wolverines were observed four times in the study area.

Results show that wolverines are present in the Snap Lake study area. Unfortunately, tracks do not distinguish between individuals, so the number of wolverine in the study area is unknown. Track surveys must also account for the effect of snow and wind which can erode tracks. This can make comparisons between years difficult, as the number of tracks observed may be more dependent upon weather than the number of wolverine within the study area. Regardless, this technique allows for the monitoring of broad trends in wolverine activity within the study area.

WOLVES

Wolf dens have been monitored since 1999. Because dens may not be active each year and move from year to year, several years are required to identify all of

the potential wolf dens in the study area. New dens are added to the monitoring program as they are discovered, and this has happened every year since 1999.

In 1999 and 2000, both sides of all esker systems within the study area were surveyed by helicopter in late-May to locate wolf dens. In 2001, the known wolf dens identified in previous years were visited on three occasions, and surveys of eskers were not conducted. The first visit was in early June, to determine which dens were being used by wolves. The second was in early July, to determine which dens produced pups and how many, and the last survey was in early August, to determine how many pups had survived the summer. In 2002, wolf monitoring within the study area was conducted by biologists from Resources, Wildlife and Economic Development and the University of Alberta. Following an initial survey to determine occupancy in early June, intense observations of the dens took place. Furthermore, radio collars were deployed by Resources, Wildlife and Economic Development at active den sites within the study area on 22 June.

The number of known dens has increased from two in 1999, to seven in 2002. Two of these were active in 2002, and at least two dens have been active in the study area every year since monitoring began. Pups have only been observed once since 1999, when three pups were observed at a den in August 2002. Incidental observations of 34 wolves were made on 12 occasions this year.

Recent research shows that wolves usually return to the same area to den each year, although not necessarily to the same den. The four years of data presented here constitute a valuable baseline with which to measure any future impacts.

FALCONS

Falcons (gyrfalcons and peregrine falcons) were monitored within the Snap Lake study area from 1999 to 2002 to determine if they were present, and how many young they produced in the study area. Monitoring began in late May 1999 with a survey to locate falcon nests. Six gyrfalcon and four peregrine nests were found, with adult birds in each. In late July 2000, a second survey was conducted to search the area 11 km around the Snap Lake Diamond Project for raptor nests. No nest sites were found within 11 km of the camp, but two new nests were found within the study area. The total number of nests known within the study area now includes five gyrfalcon and seven peregrine nest sites.

Occupancy of falcon nests was greatest in 2002, when eleven nest sites had falcons, and one had a raven. Nest success, or the ratio of occupied nests in which young are observed, has been similar for peregrines and gyrfalcons between 2000 and 2002, as has the number of young per occupied nest sites.

Both the nest success rate and the average number of young per occupied site at Snap Lake was slightly lower when compared to studies of gyrfalcons near Bathurst Inlet, and peregrines near Rankin Inlet. This shows that both peregrines and gyrfalcons have successfully produced young in the Snap Lake area but that weather conditions and habitat quality may have limited their productivity.

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1 INTRODUCTION

1.1 OBJECTIVES AND SCOPE

The Snap Lake Diamond Project is owned by De Beers Canada Mining Inc., and is located approximately 220 km northeast of Yellowknife in the Lockhart River drainage basin. The Project is about 25 km south of MacKay Lake, between Camsell Lake and Lac Capot Blanc (Figure 1.1-1). The Snap Lake Diamond Project represents the third diamond mining development in the region and is currently in the assessment phase. Baseline studies have been carried out since 1999, and are part of an Environmental Assessment (EA) and monitoring program.

The objectives of these studies are as follows:

- to meet the EA Terms of Reference established by the Mackenzie Valley Environmental Impact Review Board (MVEIRB);
- to contribute to the baseline data available for assessing and managing future, potential environmental effects;
- to determine if the residual impacts predicted from the EA are accurate;
- to determine if the mitigation measures are effective;
- to determine potential environmental effects during construction and operation; and,
- to contribute to the regional database for assessing and managing potential cumulative effects.

Studies from 1999 and 2000 constitute baseline information while studies from 2001 and 2002 represent interim monitoring that contributes to the baseline data. Therefore, the objectives of this phase of the program focused on determining the current state of wildlife in the study area (*e.g.*, determine the occupancy and distribution of wolf dens in the study area). During construction and operation of the mine, baseline studies will end, and environmental effects studies will begin. At this stage, the objectives of the monitoring program will change to focus on measuring the potential effects of the mine on wildlife and wildlife habitat (*e.g.*, determine if the occupancy and distribution of wolf dens in the study area is influenced by the mine).

The Snap Lake Diamond Project is situated in the Slave Geological Province where wildlife species, such as caribou, are important to the culture and health of communities in the area. Therefore, it was particularly appropriate to include traditional knowledge in the study of baseline conditions, monitoring programs

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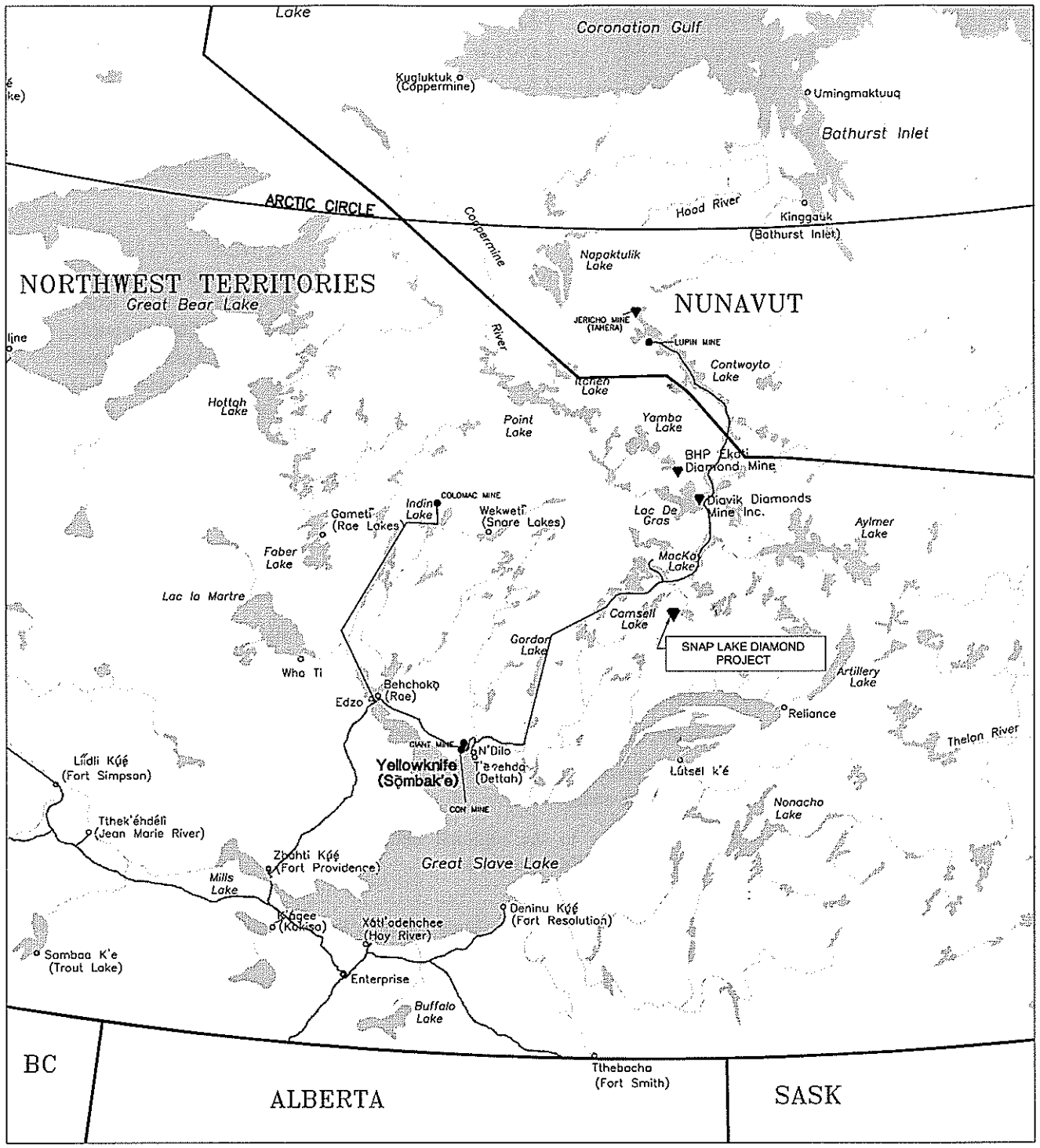

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LEGEND

- ALL-WEATHER HIGHWAYS
- WINTER ROADS
- COMMUNITY
- DIAMOND MINE
- GOLD MINE

REFERENCE

SELECTED MINERAL DEPOSITS OF THE NORTHWEST TERRITORIES, DEPARTMENT OF ENERGY, MINES AND RESOURCES, MINERAL INITIATIVES 1991 TO 1996 REVISED OCTOBER, 1996

PROJECT

DE BEERS

TITLE

FIGURE 1.1-1
LOCATION OF SNAP LAKE DIAMOND PROJECT, NORTHWEST TERRITORIES

Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 012-6492.5900			FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
CADD	SIB	18/12/01		
CHECK				
REVIEW				

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012-6492\CAD\5900\ACCEFF-FIG1.DWG

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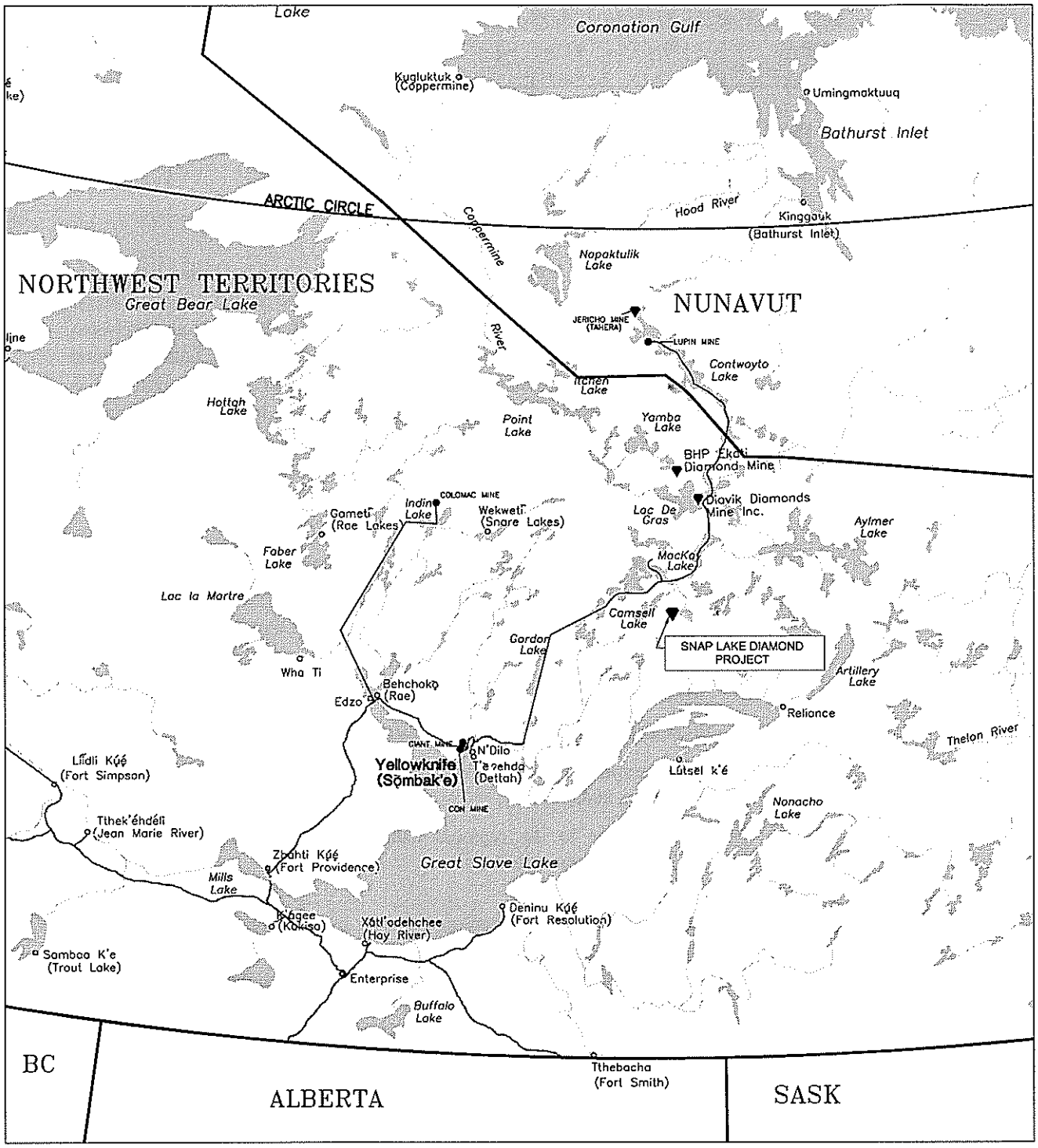

SCALE 1:5,000,000

LEGEND

- ALL-WEATHER HIGHWAYS
- WINTER ROADS
- COMMUNITY
- DIAMOND MINE
- GOLD MINE

REFERENCE

SELECTED MINERAL DEPOSITS OF THE NORTHWEST TERRITORIES, DEPARTMENT OF ENERGY, MINES AND RESOURCES, MINERAL INITIATIVES 1991 TO 1996 REVISED OCTOBER, 1996

PROJECT

DE BEERS

TITLE

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Golder Associates
Saskatoon, Saskatchewan

PROJECT No. 012-6492.5900			FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
CADD	SIB	18/12/01		
CHECK				
REVIEW				

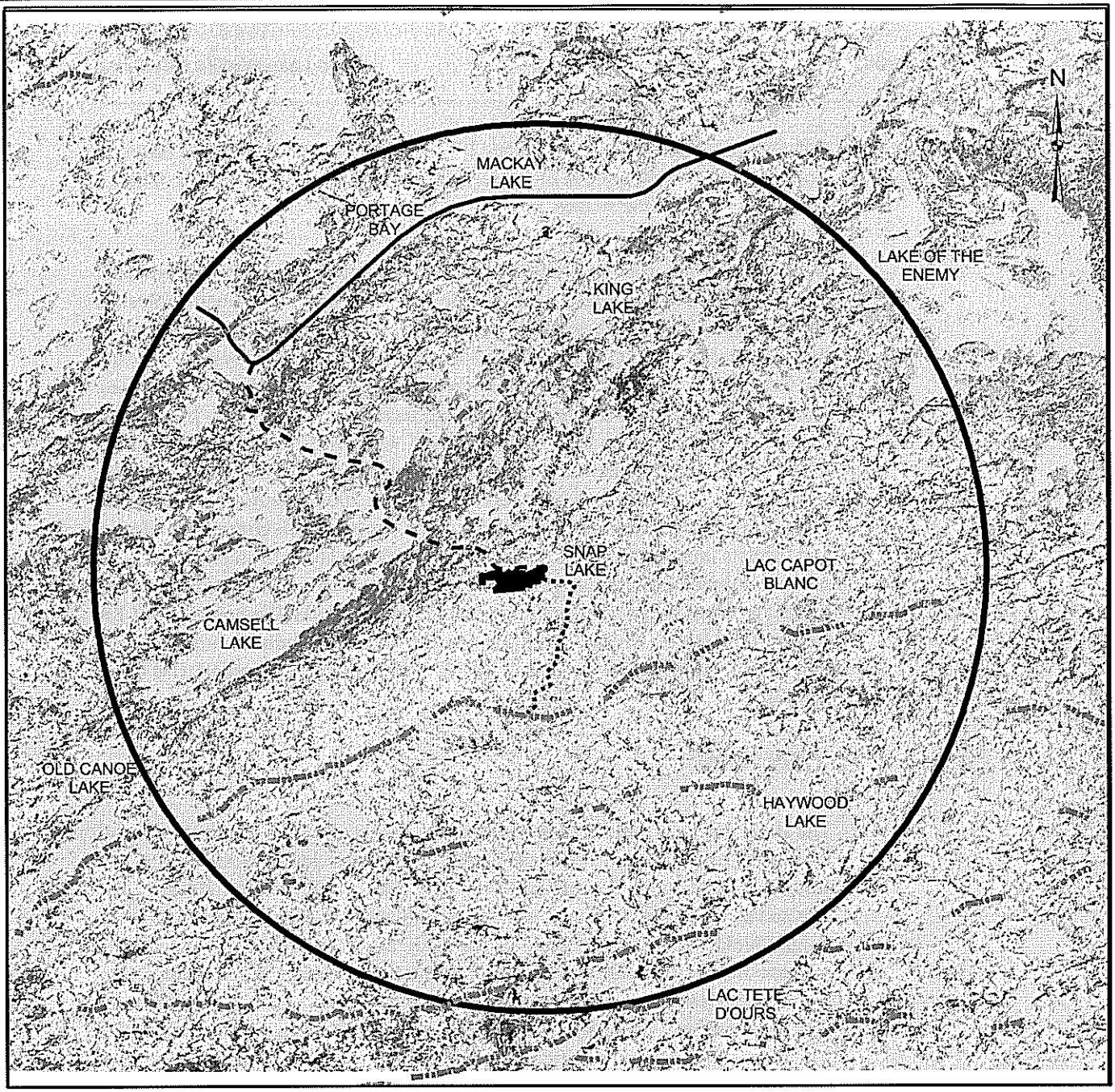
and mitigation procedures (De Beers 2002a). In 2002, an Aboriginal observer from one of the communities of Lutsel K'e, Gameti, N'Dilo, Dettah, or Wha Ti, took part in each of the studies.

Because it is not economically or logistically possible to study the potential impacts of mining activities on all wildlife species, a group of valued ecosystem components (VECs) were selected. Criteria for choosing VECs were based on the ecological, social, cultural, and economic aspects of the ecosystem. During the EA, VECs included caribou, barren-ground grizzly bears, wolves, foxes, wolverines, upland breeding birds (passerines, shorebirds, and ptarmigan), falcons (peregrine falcon and gyrfalcon), and waterfowl (De Beers 2002a). In 2001, monitoring focused on caribou, barren-ground grizzly bears, wolves, wolverines, upland breeding birds, and falcons. In 2002, monitoring was further refined to caribou, barren-ground grizzly bears, wolves, wolverines, and falcons, and habitats important to these species. Information relating to studies conducted on upland breeding birds, foxes, and waterfowl, which are not included in the current monitoring program, are presented in the Snap Lake Diamond Project EA Report (De Beers 2002a). Information on the 2001 upland breeding bird monitoring program can be found in last year's monitoring report (De Beers 2002b).

1.2 STUDY AREA

The study area was defined by a circle with a radius of 31 km from the centre of the Snap Lake Diamond Project (Figure 1.2-1) and is identical to the regional study area used in the Snap Lake Diamond Project EA (De Beers 2002a). The size and shape of the study area were chosen to insure that it remained within the Taiga-Shield Ecozone. The scale of the study area also provides a biologically relevant means of determining the distribution of habitat types available to wildlife species during their seasonal and annual movements. The study area also encompasses Camsell Lake and the southern portion of MacKay Lake, which are an important historical migratory route for the Bathurst caribou herd (Weledeh Yellowknives Dene 1997 and Lutsel K'e Dene First Nation 1999).

The Taiga-Shield Ecozone is characterized by short, cool summers and long, cold winters. The study area primarily consists of heath tundra/boulder habitat interspersed with lakes (Figure 1.2-1). The habitat in the study area is naturally divided along a line drawn approximately through the centre from the northeast to the southwest. Heath tundra/bedrock and heath tundra/boulder associations dominate the southeastern half of the study area while the northwestern half largely consists of heath tundra, heath tundra/boulder, and spruce forest stands. A coniferous forest is located along the east side of Camsell Lake, approximately



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- Heath Tundra
- Heath Bedrock (30 - 80% Bedrock)
- Heath Boulder (30 - 80% Boulder)
- Bedrock Association (>80% Bedrock)
- Boulder Association (>80% Boulder)
- Closed Spruce Forest
- Open Spruce Forest
- Mixed Forest
- Riparian Tall Shrub
- Sedge Wetland
  - Birch Seep
  - Tussock-hummock
- Esker Complex
- Deep Water (>1.5 m)
- Shallow Water (<1.5 m)
- Burn

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

De Beers

TITLE

FIGURE 1.2-1. HABITAT TYPES WITHIN AND ADJACENT TO SNAP LAKE DIAMOND PROJECT STUDY AREA

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2803			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	16 Dec. 2002		

5 to 10 km to the west of Snap Lake (Figure 1.2-1). Vegetation includes sedges and grasses, and heath mat with low shrubs such as dwarf birch, willow, Labrador tea, crowberry, bog cranberry, and bearberry. Small black spruce stands also cover part of the landscape. Animals inhabiting the region during part or all of the year include barren-ground caribou, moose, grizzly bears, black bears, wolves, foxes, wolverines, songbirds, shorebirds, waterfowl, and raptors (*e.g.*, peregrine falcons and gyrfalcons).

2 CARIBOU

2.1 OBJECTIVES

Information from 1999 to 2002 was used to address the following objectives:

- to determine the number and distribution of caribou within the study area during the peak northern and post-calving migration periods;
- to determine the behaviour of caribou groups within the study area; and,
- to determine the composition of caribou groups (*i.e.*, nursery and non-nursery) within the study area during the post-calving migration.

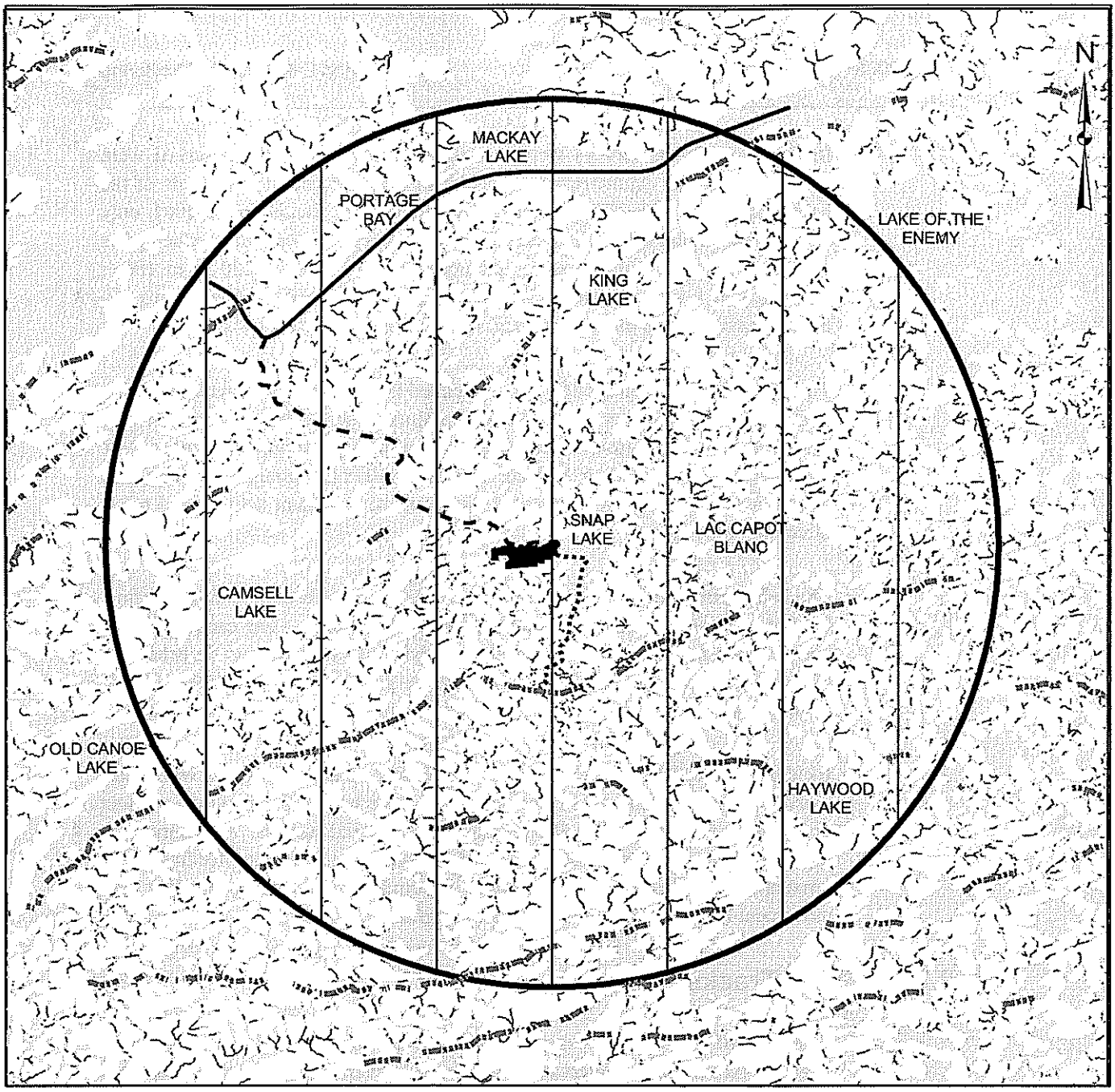
2.2 METHODS

2.2.1 Aerial Surveys

Since 1999, systematic aerial surveys have been conducted within the study area during the peak northern and post-calving migration periods (Table 2.2-1). The northern migration included all observations prior to and including 30 June, and the post-calving migration, all observations after 30 June. Movements of satellite collared caribou (provided by Judy Dragon, Resources, Wildlife and Economic Development [RWED]) were used to identify peak caribou movements in the region, in addition to observations by pilots, camp personnel at Snap Lake, and staff at the MacKay Lake Lodge. Seven transect lines, spaced 8 km apart, were flown in a north-south direction following a predetermined flight path using global positioning system (GPS) coordinates (Figure 2.2-1). In 2000, within a radius of 11 km of the mine site, transects were doubled (spaced 4 km apart) to provide additional coverage of caribou movements near the mine site.

Table 2.2-1 Aerial Survey Dates during the Northern and Post-calving Migrations, 1999 to 2002

Year	Northern Migration	Post-calving Migration
1999	20 March, 2 April	21, 22, 23 July
2000	11, 14 April 4, 7, 10 May	21 July 17 August
2001	11, 21 May	8, 11, 16 August 24 October
2002	4, 25 April 6, 9, 14, 21 May	23 July 2, 10 August 30 September



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- Aerial Transects

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

De Beers

TITLE

FIGURE 2.2-1. AERIAL SURVEY TRANSECTS FOR CARIBOU, 1999 - 2002

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2803			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	15 Dec. 2002		

In 1999 and 2000, surveys were unbounded (*i.e.*, all animals observed were recorded), with an estimated survey width of 2 km (1 km on either side of the helicopter), providing 25% coverage of the study area. Beginning in 2001, only caribou within 600 m of either side of the helicopter were counted, reducing the coverage to 15%. Surveys were conducted by helicopter at 120 m to 180 m above ground level (agl), and 145 to 160 km per hour. Caribou observations off-transect (past the end of transect lines) were not used in the analysis.

The location of caribou groups, and associated habitat type, were recorded using a GPS unit. Composition of the group during post-calving migration was classified as nursery (groups with calves) or non-nursery (groups without calves). Caribou behaviour (feeding, bedded, standing, walking, trotting, or running) and direction of movement was recorded based on the dominant activity and travel direction of the group.

The behaviour of each caribou group was classified as feeding/resting (feeding, bedded, standing) or moving (walking, trotting, running). For each migration period, a log-likelihood test was used to analyze the effect of year on behaviour (*i.e.*, feeding/resting or moving activity). After pooling data from 1999 to 2002, differences in behaviour among habitats was analyzed using a log-likelihood test.

Incidental observations, including bears and bear dens, wolves and wolf dens, wolverines, raptors and raptor nest sites, and large herds of caribou off-transect or out of the study area were also recorded during aerial surveys. Also during the 2002 northern migration surveys, the location of high-density feeding areas (craters) were recorded as additional information on caribou feeding and movement behaviour during the northern migration.

2.2.2 Snow Tracks

Estimates of caribou snow-track densities were obtained during spring aerial surveys. At two minute intervals (approximately every 4 km), observers reported the number of trails observed during the previous two minutes as none (no tracks observed), low (occasional single tracks), moderate (frequent single tracks and tracks from groups), or high (continuous single tracks and tracks from groups). In 2002, five snow track surveys were conducted. The maximum track density value recorded for all five surveys was used for the presentation of results. This information was used to help determine the pattern of movement of caribou through the study area during the northern migration.

2.3 RESULTS

2.3.1 Caribou Numbers and Distribution

Aerial surveys in 1999 through 2002 recorded a total of 668 caribou groups. Most of the groups (92%) were composed of 50 animals or less. For example, 41% (N = 274) of the groups observed consisted of one or two individuals. Only seven (1%) of the groups contained 500 or more individuals.

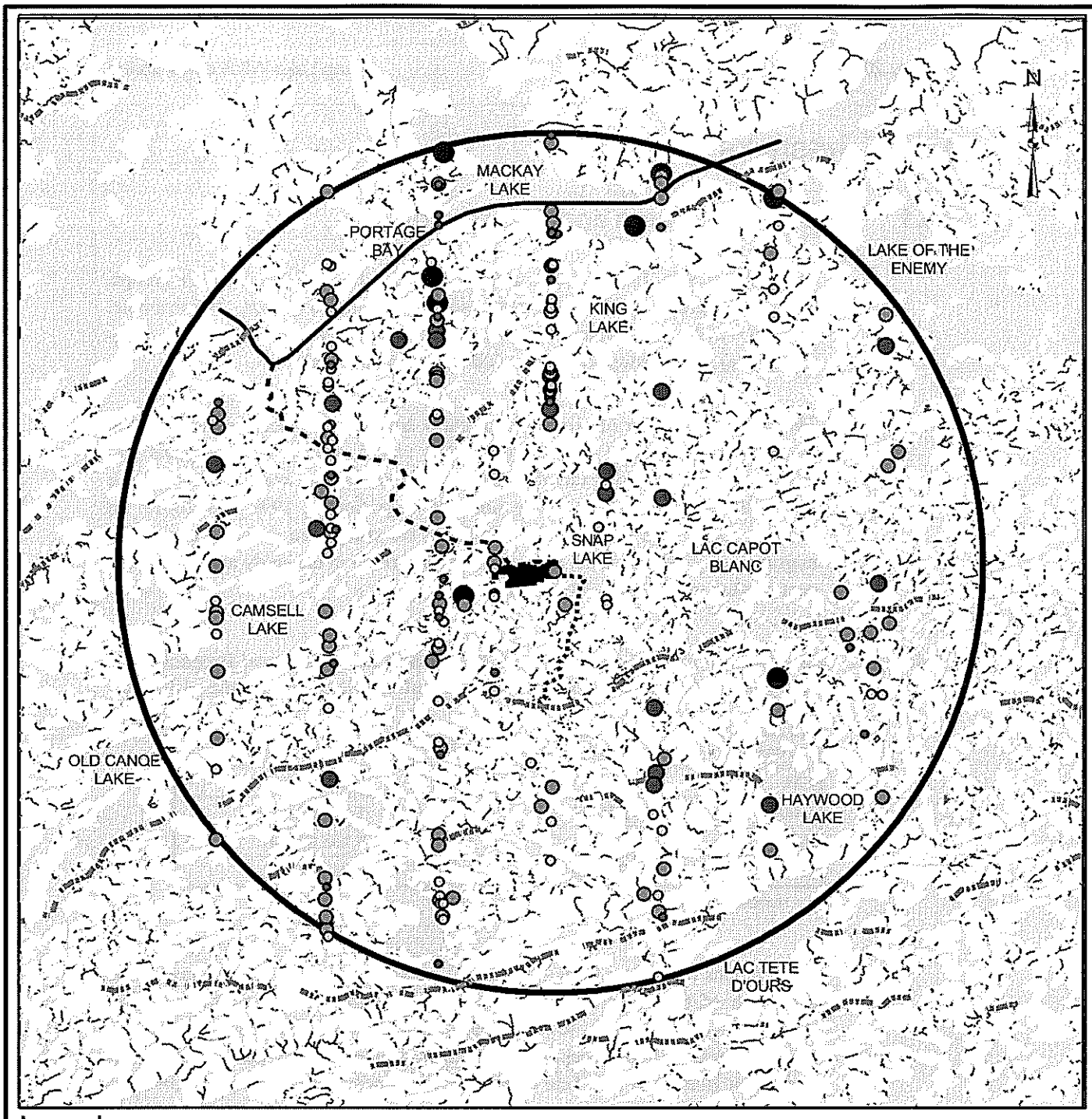
The estimated number of caribou in the study area (*i.e.*, number observed divided by proportion of study area surveyed) has varied widely between years and migration periods. For example, less than 1,500 caribou were estimated to be within the study area during the northern migration in 1999 and 2001. In contrast, there were over 15,000 animals in the study area during the northern migration of 2000 and 2002, and over 25,000 caribou in the study area during the post-calving migration in 1999 (Table 2.3-1).

Table 2.3-1 Estimated Number of Caribou in the Snap Lake Diamond Project Study Area during the Northern and Post-calving Migrations, 1999 to 2002

Year	Northern Migration	Post-calving Migration
1999	4 (N = 2)	27,804 (N = 3)
2000	15,416 (N = 5)	1,192 (N = 2)
2001	1,053 (N = 2)	5,153 (N = 4)
2002	14,747 (N = 6)	8,060 (N = 4)

N = Number of Surveys.

Observations of caribou from 1999 to 2002 suggest that most groups travel west and north of the Snap Lake Diamond Project during the northern migration (Figure 2.3-1). Relatively few caribou were observed in the eastern portion of the study area, with the exception of the areas around MacKay Lake and between Lac Capot Blanc and Lac Tete d'Ours. The majority of the groups observed in the southeastern portion of the study area were recorded during the 2002 northern migration. A large number of caribou observations were recorded between Camsell Lake and MacKay Lake. Similarly, higher caribou snow track densities were more common along transects in the western portion of the study area (Figure 2.3-2, 2.3-3, and 2.3-4), particularly in 2000 and 2002 when large numbers of caribou were present in the study area (Table 2.3-1).



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint

- 1 - 2
- 3 - 10
- 11 - 50
- 51 - 100
- 101 - 500

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

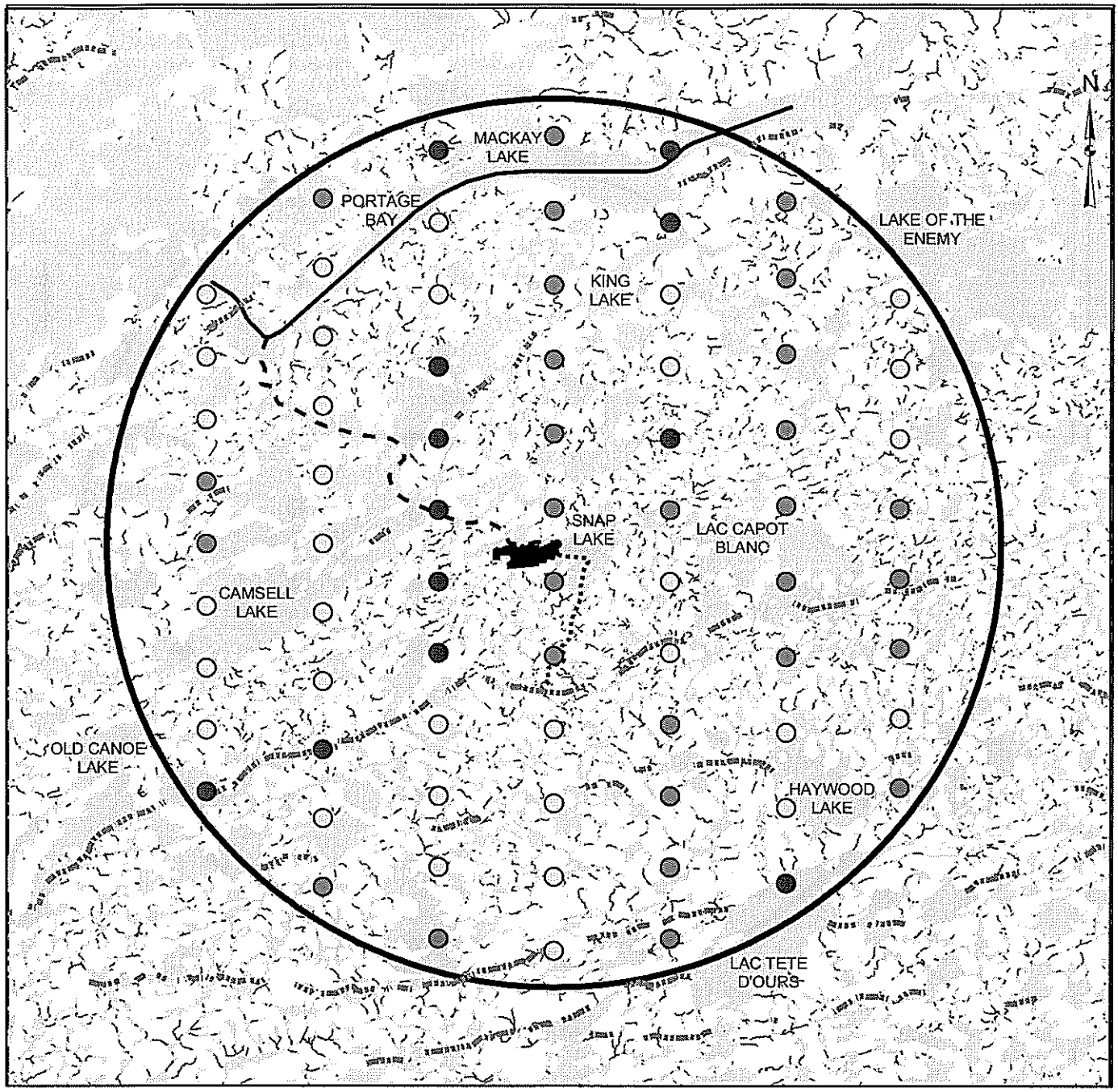
De Beers

TITLE

FIGURE 2.3-1. CARIBOU NUMBERS ALONG TRANSECTS DURING THE NORTHERN MIGRATIONS, 1999 TO 2002

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2903			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	22 Jan. 2002		
CHECK	ACS	22 Jan. 2002		
REVIEW	JV	22 Jan. 2002		



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- High
- Moderate
- Low

REFERENCE

Digital map data from National Topographic Data Base
(NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

10 0 10

Scale 1:400,000 Kilometres

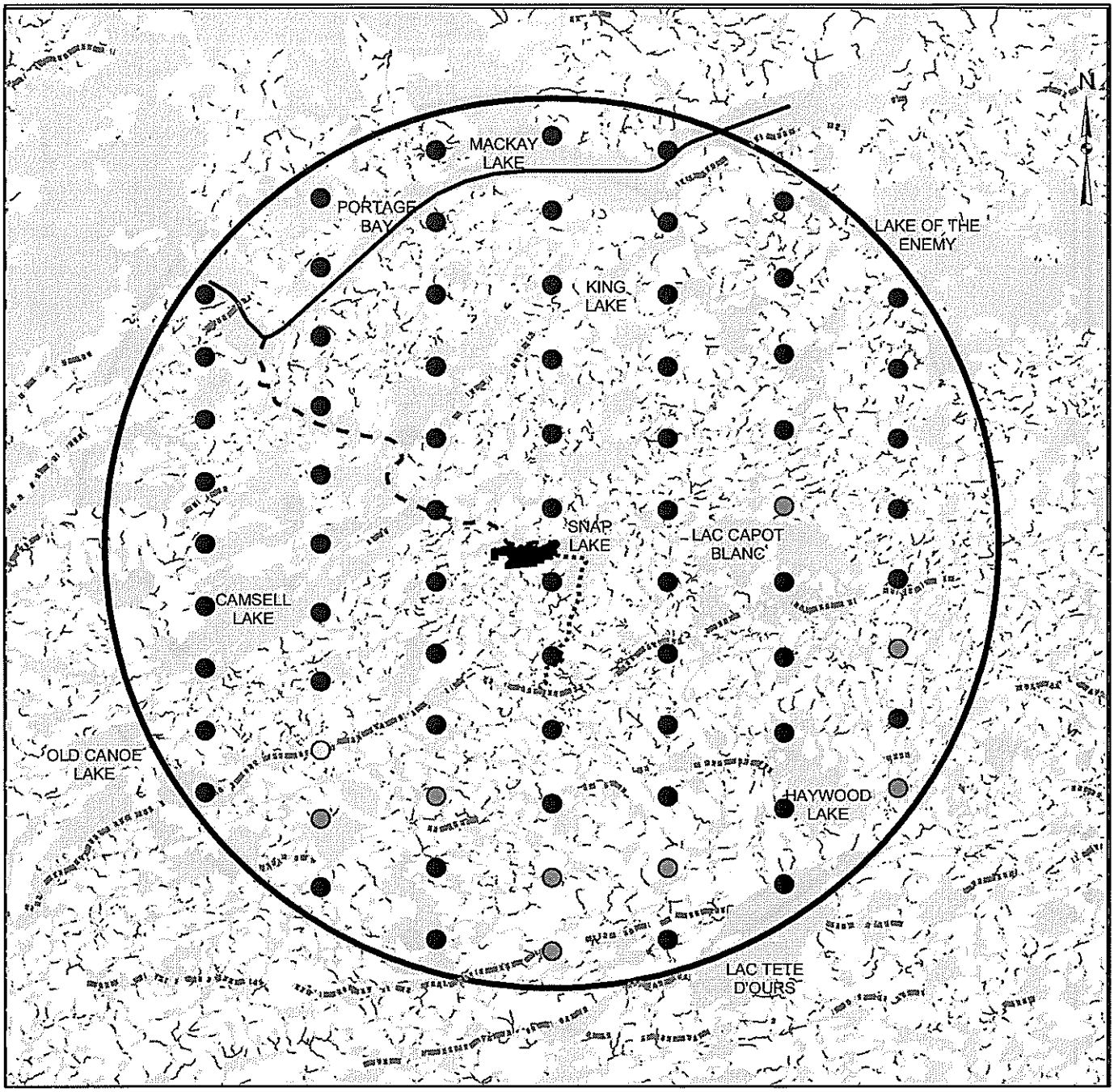
PROJECT

De Beers

TITLE **FIGURE 2.3-2. CARIBOU SNOW TRACK DENSITY (NUMBER/4KM) ALONG TRANSECTS DURING THE NORTHERN MIGRATION, 2000**

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2803			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	16 Dec. 2002		



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- Moderate
- Low
- None

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

10 0 10

Scale 1:400,000 Kilometres

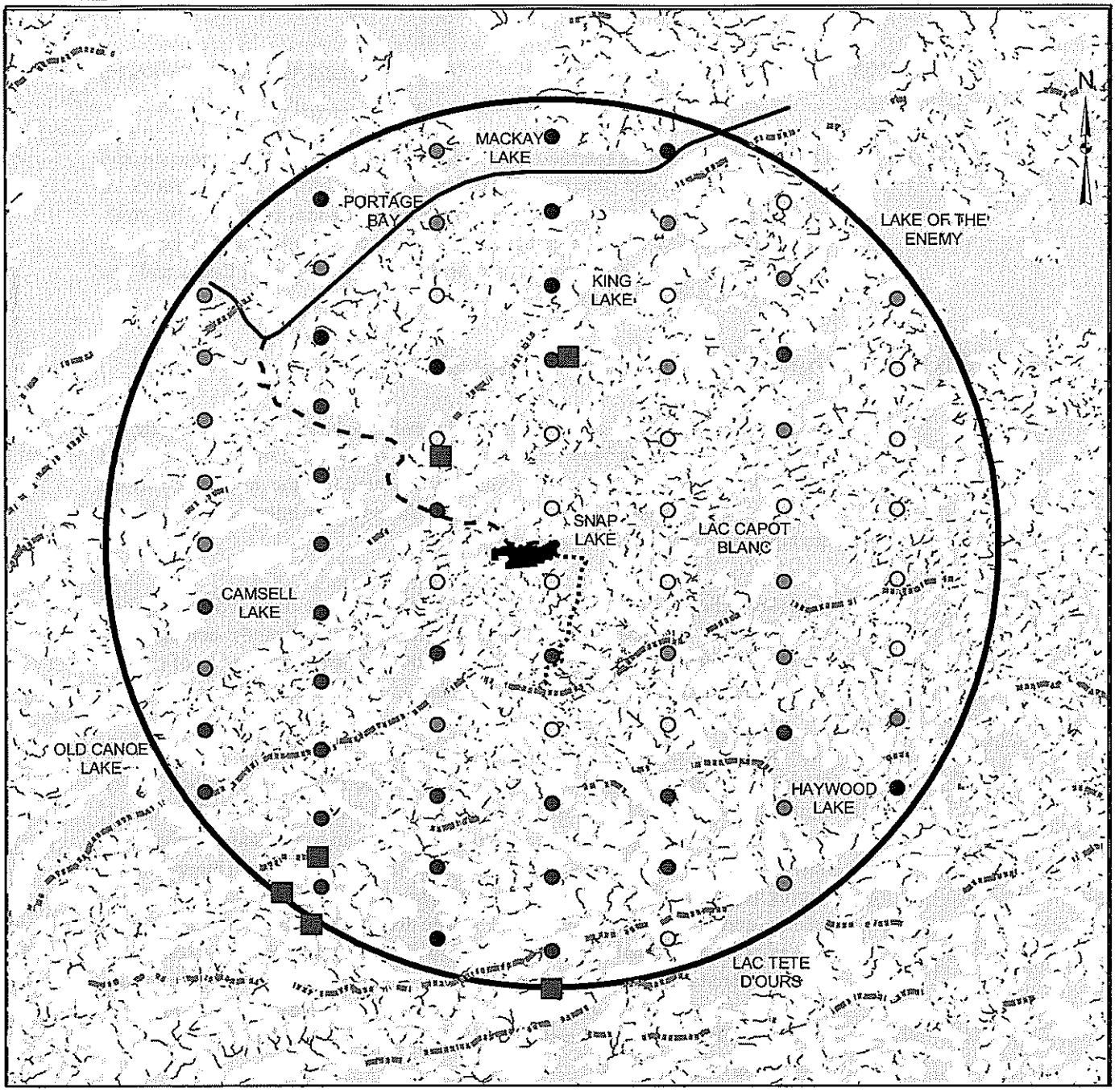
PROJECT

De Beers

TITLE **FIGURE 2.3-3. CARIBOU SNOW TRACK DENSITY (NUMBER/4 KM) ALONG TRANSECTS DURING THE NORTHERN MIGRATION, 2001**

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2903			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	16 Dec. 2002		



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- High
- Moderate
- Low
- None
- High Density Feeding Craters

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

De Beers

TITLE **FIGURE 2.3-4. CARIBOU SNOW TRACK DENSITY (NUMBER/4 KM) ALONG TRANSECTS DURING THE NORTHERN MIGRATION, 2002**

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2903			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	16 Dec. 2002		

During the post-calving migration, the areas to the southwest of the mine site and between Camsell and MacKay Lakes show much higher concentrations of caribou groups and larger groups than much of the eastern portion of the study area (Figure 2.3-5). Four large herds of 500 to 1,500 animals were seen in the study area in July 1999, three on or near MacKay and Camsell Lakes and one directly south of the mine site (Figure 2.3-5).

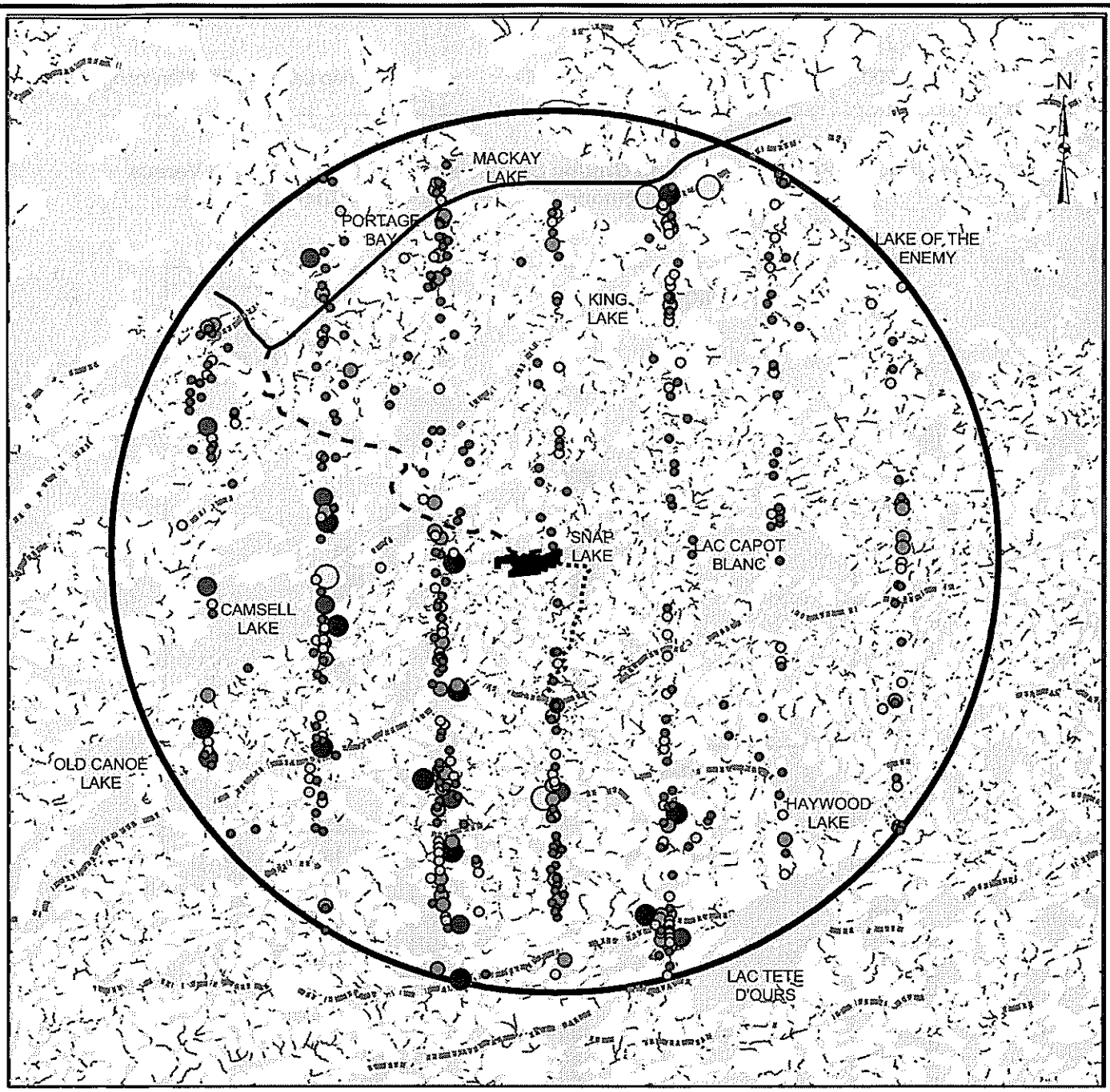
2.3.2 Behaviour and Group Composition

In 2002, the fraction of caribou groups observed feeding and resting during the northern migration was 58%, which is intermediate between the values recorded for 2000 and 2001 (Figure 2.3-6). Analysis indicated that the number of caribou groups observed feeding and resting during the northern migration was similar among years ($\chi^2 = 0.42$, $df = 2$, $P = 0.81$).

Analysis indicated that the proportion of caribou groups observed feeding and resting during the post-calving migration changed significantly among years ($\chi^2 = 63.57$, $df = 3$, $P < 0.01$). In 1999 and 2002, a greater proportion of caribou groups were observed feeding and resting than in 2000 and 2001 (Figure 2.3-6).

The behaviour of caribou was also associated with different habitat types. During the northern migration when the lakes were still frozen, caribou moved significantly more on frozen lakes than in heath tundra habitat ($\chi^2 = 12.95$, $df = 1$, $P < 0.01$). For example, 28% of the groups observed in heath tundra habitat were moving, while 52% of the groups on frozen lakes were moving (Figure 2.3-7). During the post-calving migration, significantly more caribou groups displayed feeding and resting behaviour in the spruce forest and sedge wetland habitats than in heath tundra habitat, frozen lakes (in October), or in the other (esker and bedrock) habitat types ($\chi^2 = 64.10$, $df = 3$, $P < 0.01$). Over 65% of the groups observed in spruce forest and sedge wetland were feeding and resting, while only 43% of caribou groups in heath tundra and 21% on frozen lakes, were feeding and resting (Figure 2.3-7).

Since 1999, 343 caribou groups were classified as either nursery or non-nursery during the post-calving migration. The proportion of nursery groups observed during the post-calving migration has varied significantly across years ($\chi^2 = 109.70$, $df = 3$, $P < 0.01$). For example, in 2002, 20% of the groups classified contained calves, while the proportion of nursery groups ranged from 3% to 66% during 1999 through 2001 (Table 2.3-2).



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint

- 1 - 2
- 3 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 500 - 1500

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base
(NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

De Beers

TITLE

FIGURE 2.3-5. CARIBOU NUMBERS ALONG TRANSECTS DURING THE POST-CALVING MIGRATIONS, 1999 TO 2002

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2903			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	22 Jan. 2002		
CHECK	ACS	22 Jan. 2002		
REVIEW	JV	22 Jan. 2002		

Figure 2.3-6 Percent of Caribou Groups Displaying Feeding and Resting Versus Moving Behaviour among Years during the Northern and Post-calving Migrations

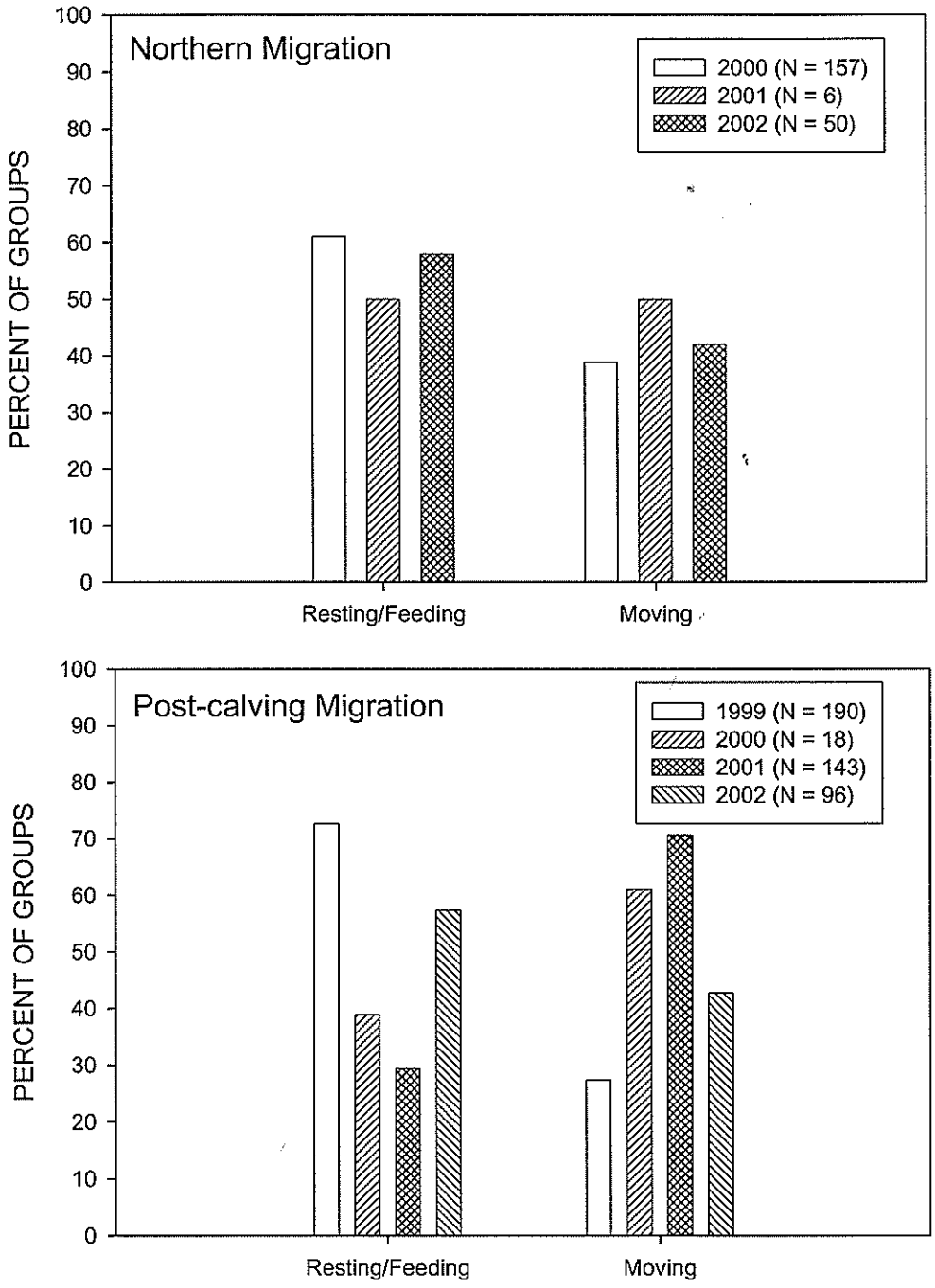
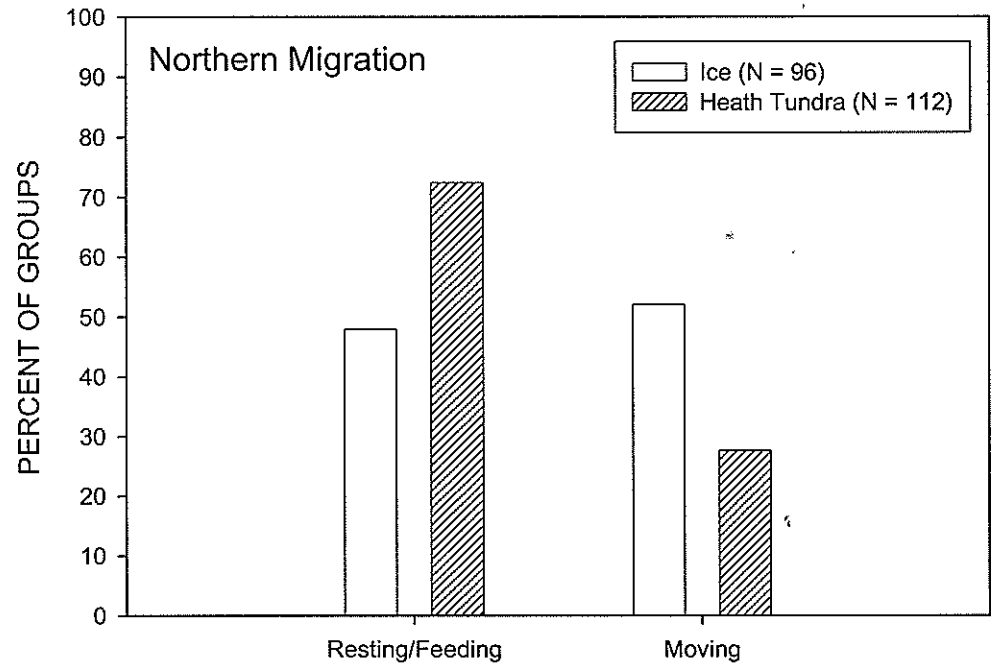


Figure 2.3-7 Percent of Caribou Groups Displaying Feeding and Resting Versus Moving Behaviour among Habitats during the Northern and Post-calving Migrations



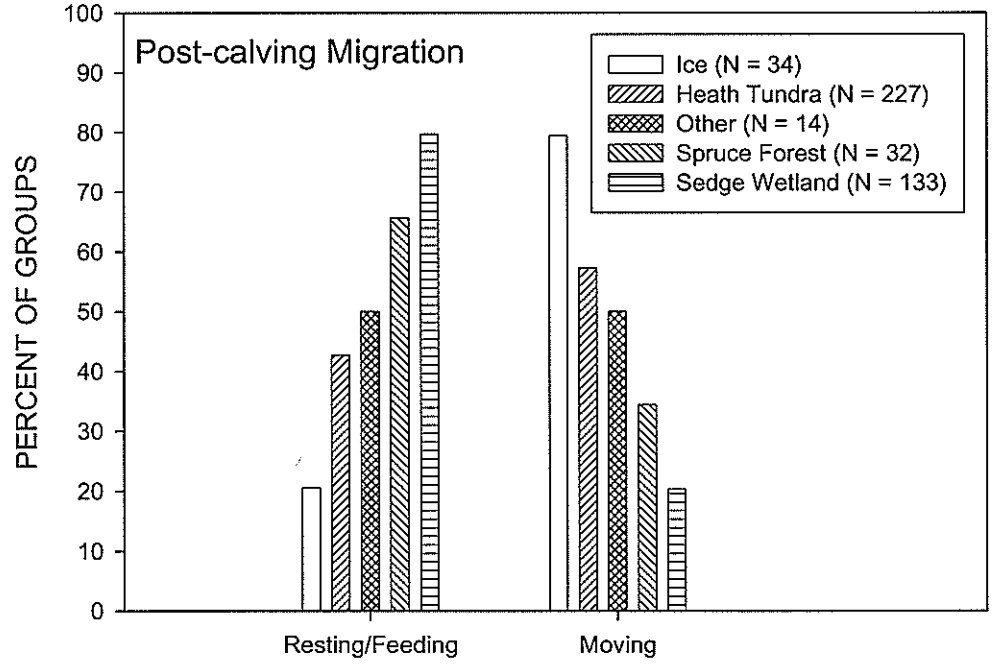


Table 2.3-2 Proportion of Nursery Groups Observed Within the Snap Lake Diamond Project Study Area during the Post-calving Migration, 1999 to 2002

Year	Number of Groups Classified	% Nursery
1999	186	66.1
2000	12	8.3
2001	71	2.8
2002	74	20.3

2.4 DISCUSSION

During baseline studies for the EA (1999 and 2000), aerial surveys for caribou located most animals west and north of the Snap Lake Diamond Project. This pattern was particularly evident during the northern migration. Results from 2001 and 2002 support the information on caribou numbers and distribution reported in the EA (De Beers 2002a). For example, during the northern migration, the majority of caribou groups and high-density snow tracks were recorded in the western portion of study area. Similarly, during the post-calving migration, the distribution of caribou groups showed a higher density of larger caribou groups to the southwest and the north of the mine site. However, the data also exemplify the annual variation in caribou numbers and distribution between migration periods and years (BHP Billiton 2002; De Beers 2002a; Gunn *et al.* 2002). For example, during the northern migration of 2002, many more caribou groups were observed in the southeastern portion of the study area than in previous years. Therefore, while caribou have tended to use the western portion of the study area more, this pattern is subject to annual variation. They can be expected to use the eastern portion of the study area in some years.

The proportion of nursery groups observed in the study area during the post-calving migration has also shown a large amount of annual variation. In 1999 there were more nursery than non-nursery groups observed in the study area, while in 2000 – 2002, the opposite was true. The source of this variation is unclear, but it is likely related to year-to-year changes in calf survival and/or the migratory path of nursery groups associated with the Bathurst herd. For example, the extremely low proportion of nursery groups within the Snap Lake study area during 2001 was similar to the results obtained in the Ekati Diamond Mine™ study area. During 2001, the proportion of nursery groups observed (4%) in the Ekati Diamond Mine™ area was significantly lower than the average (28%) obtained from 1998 through 2000 (BHP Billiton 2002). Autumn aerial surveys by RWED indicated that calf survival was lower in 2001 than in recent years.

3 GRIZZLY BEARS

3.1 OBJECTIVES

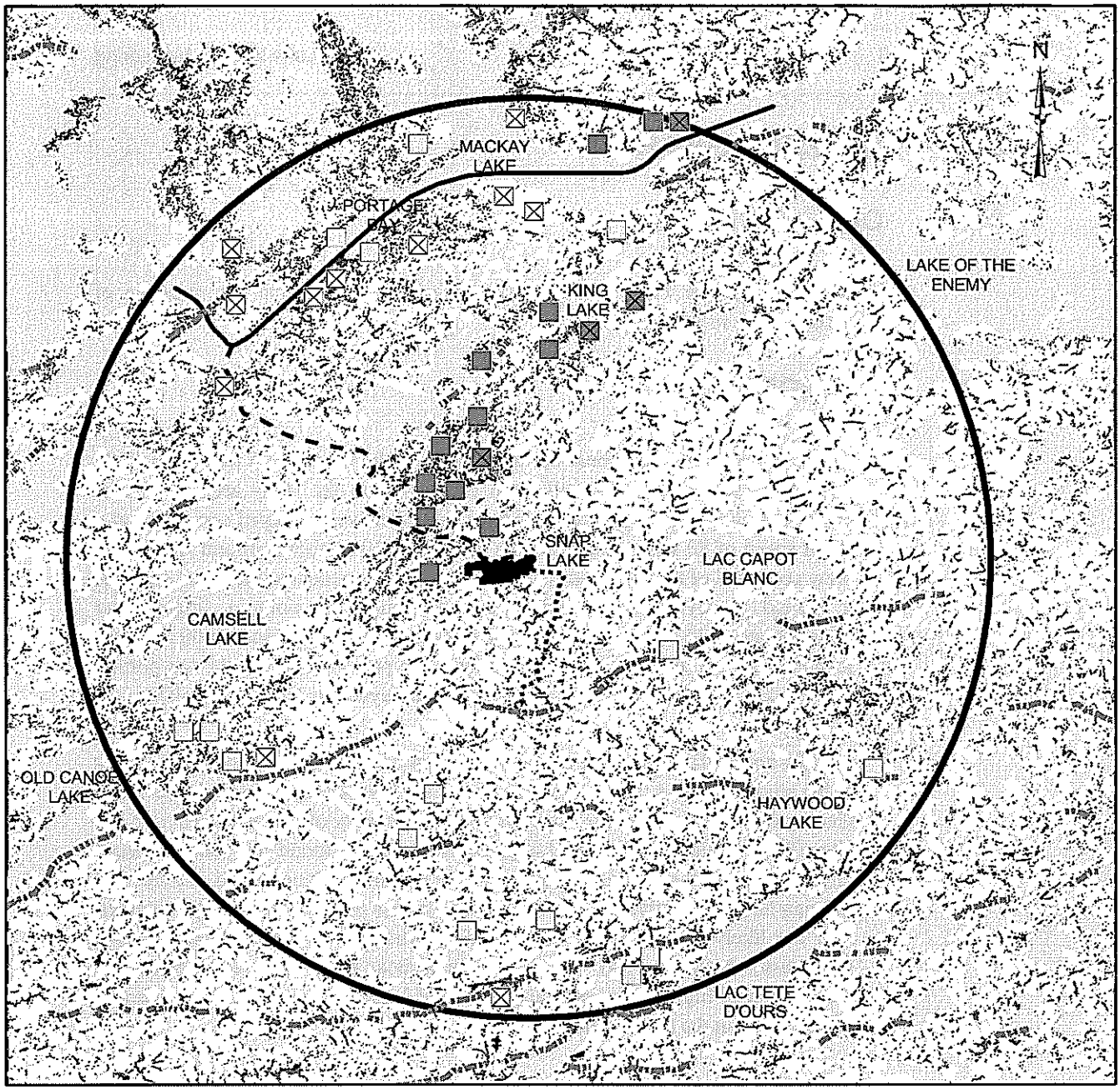
Information from 1999 to 2002 was collected to determine the presence of grizzly bears in the study area.

3.2 METHODS

Aerial surveys for grizzly bear den sites were conducted from 28 to 30 May 1999 and 25 to 26 May 2000 on all main eskers within the study area (De Beers 2002a). Using a helicopter, each side of the esker was surveyed separately at a flight speed of 80 km per hour and an altitude of 30 m above ground level. The crew consisted of the pilot and two technicians. Subsequent to the aerial surveys, a ground survey for bear dens was also conducted along a single esker approximately 10 km south of Snap Lake during 1999 and 2000. Three technicians walked along this esker system; one person surveyed the top portion of the esker, while the other two people each surveyed one side of the esker.

In 2001 and 2002, the survey method for measuring the presence of grizzly bears in the study area was changed to account for the low density of bears in the Slave Geological Province, and the associated low probability of discovering active den sites (BHP Billiton 2002). McLoughlin *et al.* (1999) found that barren-ground grizzly bears spend a large proportion of the non-hibernating period in esker and riparian habitats. Although sedge wetlands are less preferred during the summer, they are likely important during the spring, when tender and nutritious sedges and grasses have emerged. The presence of bear sign within and adjacent to these seasonal high quality habitats (preferred habitats) was used as an index of bear activity in the study area.

The presence of grizzly bears in the study area was monitored through ground surveys of randomly selected plots (containing at least 30% preferred habitat) within the study area (Figure 3.2-1). Each plot encompassed a 250 m x 250 m area, but searching was not restricted to the area of the plot and included an approximate 1 km buffer from the initial starting point. Surveys of each plot were standardized to 1 hour and conducted by two people experienced in identifying bear sign. An additional person served as a "look-out" and remained vigilant towards potential bear encounters at all times. If the centre point of a plot fell within open water, then searching began from the nearest shoreline. For safety reasons, thick shrubs that may have concealed a bear were not searched.



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- Sedge Wetland Habitat
- Riparian Habitat
- Sedge Wetland Plots
- Riparian Plots
- Bear Sign Present

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

De Beers

TITLE

FIGURE 3.2-1. LOCATIONS OF SEDGE WETLAND AND RIPARIAN SAMPLE PLOTS FOR GRIZZLY BEARS, 2002

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2303			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	15 Dec. 2002		

Bear sign included separate observations of beds, digs, tracks, scat, hair, and prey remains. Any grizzly bear hair collected was delivered to RWED. Except for hair, bear sign that was made in the previous years was excluded from the analysis. Tracks and hair were identified separately for grizzly bears and black bears. Scat, digs, prey remains, beds, and some poorly preserved tracks were assumed to be grizzly bear sign, although it is possible that some of these types of sign may have been made by black bears.

Plots in sedge wetland habitat (N=26) were surveyed between 26 June and 4 July 2001, and 3 July and 7 July 2002. Plots in riparian habitats (N=16) were surveyed between 7 August and 10 August 2001, and 8 August and 11 August 2002.

3.3 RESULTS

Since surveys began in 1999, no active bear dens (*i.e.*, dens used during the most recent winter) have been located within the study area. However, recent tracks, feces, and sign of grizzly bear excavations for ground squirrels have been observed every year.

In 2002, 28 separate observations of grizzly bear sign were recorded among 42 plots in sedge wetland and riparian habitat (Table 3.3-1). Tracks were most common, comprising 68% of sign, followed by scat and digs. No prey remains, beds, or hair were observed.

Table 3.3-1 Number of Separate Observations for Each Type of Grizzly Bear Sign Found in Wetland and Riparian Plots, 2001 and 2002

Type of Sign	Wetland (N=26 plots)		Riparian (N=16 plots)	
	2001	2002	2001	2002
Tracks	24	18	23	1
Scat	2	4	2	1
Digs	1	0	1	4
Prey remains	0	0	2	0
Bed	0	0	0	0
Hair	0	0	0	0
Total	27	22	28	6

The total number of individual grizzly bear sign found in 2002 was considerably lower than 2001. While the numbers of sign in the wetland habitat are

comparable between years, there was much less sign observed in the riparian habitat in 2002.

In the wetland habitat, the percentage of plots where sign was observed was similar between years (Table 3.3-2). In the riparian habitat, there were significantly fewer plots with grizzly bear sign in 2002 than in 2001.

Table 3.3-2 Number of Wetland and Riparian Plots Containing Grizzly Bear Sign, 2001 and 2002

	Wetland		Riparian	
	2001	2002	2001	2002
Number of plots with sign	14	11	13	4
% Plots with sign	54	42	81	25
95% confidence limit	33 – 73%	23 - 63%	54 - 96%	7 - 52%
Number of plots surveyed	26	26	16	16

Note: 95% confidence limit based on binomial distribution.

Incidental observations by all personnel at the Snap Lake Diamond Project reported one grizzly bear in August 2000, and four observations of grizzly bears during May 2001. From April to August 2002, four grizzly bears were reported within the study area. There were no incidental observations of grizzly bears within 7 km of the mine site in 2002.

Although not a VEC species, black bears were observed incidentally within the study area on several occasions. In 2002, six incidental observations of black bears were recorded within the study area.

3.4 DISCUSSION

In 2002, there were fewer individual occurrences of sign observed (N = 28) than in 2001 (N = 55). There were also fewer plots with sign present in 2002 (N = 15) than in 2001 (N = 27). The difference between years is largely a result of the almost complete lack of tracks observed in the 2002 riparian habitat survey. However, the results indicate that grizzly bears are using habitats within the study area.

The low number of tracks may be explained by the unusually wet weather in summer 2002. Different types of sign have different levels of persistence in the environment. In relation to scat and digs, the persistence of tracks in the environment is particularly dependent on recent weather (*i.e.*, in extremely wet or dry conditions tracks either do not form or do not last). In 2002, the Mackenzie

District (roughly encompassing the NWT) had a wetter than average spring, followed by the sixth wettest summer on record since 1948. Summer precipitation for the region was 38% higher in 2002 than the long-term average (Environment Canada 2002). Precipitation data collected at the Snap Lake Weather Station showed the total rainfall for July 2002 (106.8 mm) was more than twice that recorded in July 2001 (48.4 mm), and almost a third of the mean annual precipitation for the study area (De Beers 2002a). Although the abundance of other types of sign was comparable between years, the low frequency of tracks recorded during the riparian habitat survey may be related to the unusual summer weather in 2002.

4 WOLVERINES

4.1 OBJECTIVES

Information was collected from 1999 to 2002 to determine the presence of wolverines in the study area.

4.2 METHODS

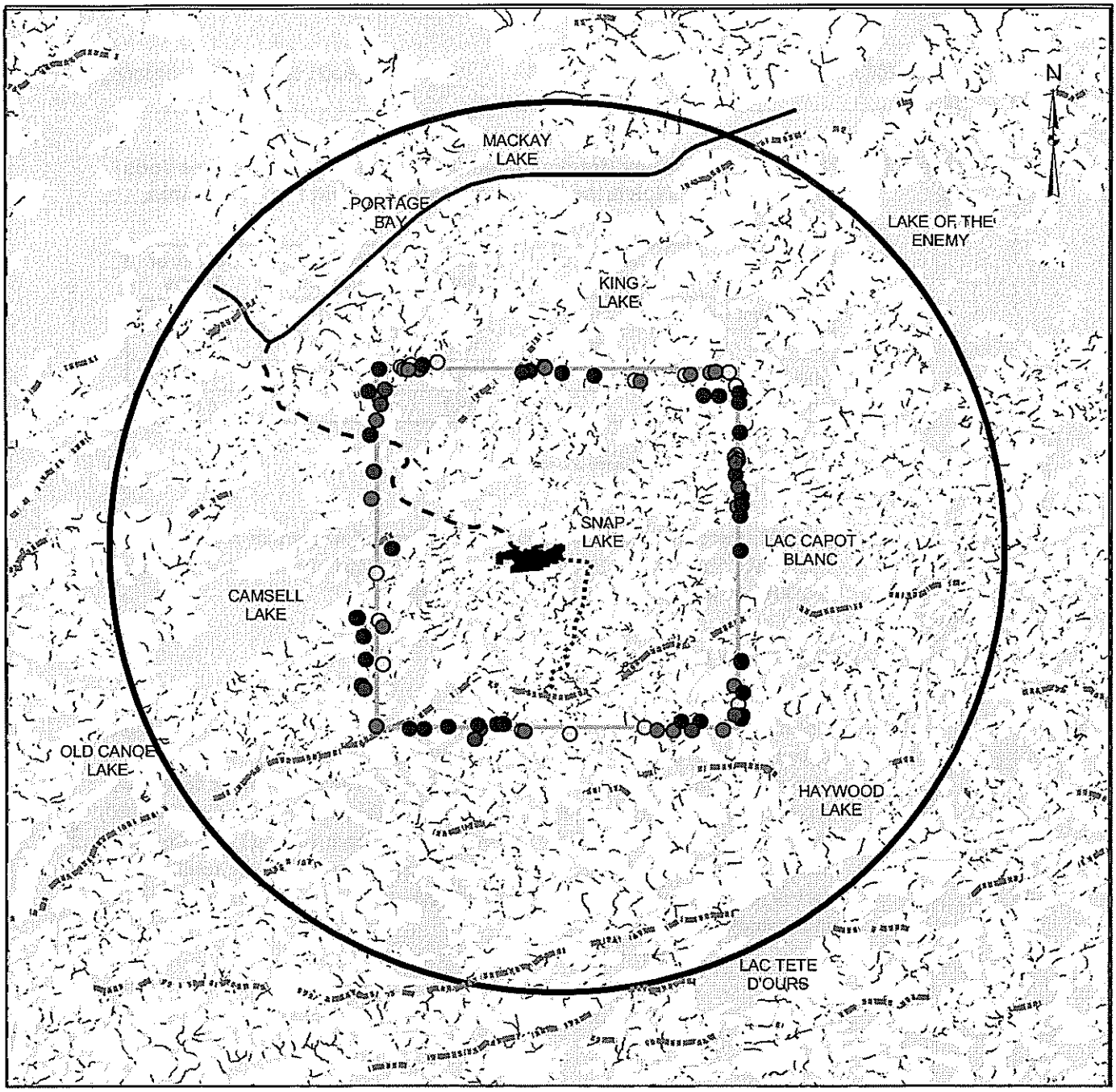
During late-winter of 1999 to 2002, field staff, including one aboriginal observer, travelled a pre-determined route of approximately 100 km by snowmobile around the mine footprint (Figure 4.3-1). The survey route was driven slowly to minimize the potential for missing tracks. Two observers drove parallel to each other, separated by a distance of approximately 25 m. Terrain dictated the exact travel route and spacing between observers. When possible, surveys were conducted within 1 to 10 days of a fresh snowfall. If weather conditions were unsuitable for tracking, the survey was postponed.

During the survey, observations were made on the number of wolverine tracks encountered as well as the GPS location for each track. The number of 12 hr periods since the most recent snow fall, current weather conditions, and the total distance travelled (from the snowmobile odometer) were also recorded. Track counts were standardized among surveys by accounting for the time since the most recent snow fall. Track density was calculated as the number of wolverine tracks / km of distance travelled / mean number of 12 hr periods since the most recent snow fall.

Since 1999, there have been four surveys completed in the study area. Dates for these surveys were 30 March to 1 April 1999, 12 to 15 April 2000, 13 to 15 April 2001 and 23 to 24 April 2002.

4.3 RESULTS

Nine wolverine tracks were observed along the survey route at nine locations in 2002 (Figure 4.3-1). These tracks were observed over a distance of 118.7 km, resulting in an estimated track density of 0.019 tracks / km / number of 12 hr periods since snow (Table 4.3-1). In 2002, snow tracking conditions were relatively poor as winds were high.



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Wolverine Survey Route
- Proposed Project Footprint

- 1999
- 2000
- 2001
- 2002

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT: DE BEERS

TITLE: FIGURE 4.3-1. LOCATION OF WOLVERINE TRACKS ALONG SURVEY ROUTE, 1999 - 2002

Golder Associates
Yellowknife, Northwest Territories

			PROJECT No. 022-2903	SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002			
GIS	ACS	20 Nov. 2002			
CHECK	ACS	20 Nov. 2002			
REVIEW	JV	16 Dec. 2002			

Table 4.3-1 Number and Density (tracks / linear km / number of 12 hour periods since snow) of Wolverine Tracks Observed within the Study Area, 1999 - 2002

Survey	Number of Tracks	Distance (km)	12 hr Periods Since Snow	Density of Tracks
March/April 1999	19	100[1]	10	0.019
April 2000	26	100[1]	28[2]	0.009
April 2001	51	114.7	5	0.089
April 2002	9	118.7	4	0.019

[1] Approximate distance.

[2] Over 14 days had passed since previous snowfall.

In 2002, there were four incidental observations of wolverines recorded in the Snap Lake Study Area. Seven incidental observations of wolverines were made in 2001, six were made in 2000, and ten in 1999.

4.4 DISCUSSION

The density of wolverine tracks in spring 2002 was within the range of estimates obtained since the survey began in 1999, and indicate that wolverines are currently moving within or through the study area. The highest track density was recorded in the spring of 2001 and the lowest density was recorded in 2000. Because there was only a single survey conducted each year and because highly variable tracking conditions can have a strong influence over the results of the survey, conclusions regarding the year-to-year variation in wolverine abundance in the study area are limited.

5 WOLVES

5.1 OBJECTIVES

Information was collected from 1999 to 2001 to determine the occupancy and distribution of wolf dens in the study area.

5.2 METHODS

Spring aerial surveys for wolf den sites were conducted (28 to 30 May 1999 and 25 to 26 May 2000) on all main eskers within the study area (De Beers 2002a). Using a helicopter, each side of the esker was surveyed separately by two observers at a flight speed of 80 km per hour and an altitude of 30-m above ground level. To minimize disturbance, time spent flying around the den site was limited. In 2000, all active dens were re-surveyed on 26 July to record occupancy and pup production.

In 2001, spring surveys of wolf dens located in 1999 and 2000 were conducted (1-2 June) to determine occupancy. The aerial searches of esker systems were not conducted. Telemetry equipment was mounted on the helicopter during the spring survey to check for the presence of collared wolves within the study area. Dens were classified as active if wolves or fresh sign (tracks or scat) were observed at the den. All active dens were visited twice throughout the summer to determine if they were still active, and to document pup production (6 July) and pup survivorship (8 August). Pup counts were made from the ground with a spotting scope to obtain accurate counts and to minimize disturbance.

In 2002, wolf den surveys were conducted through a cooperative research program between De Beers, RWED, and The University of Alberta (Kevin LeDrew De Beers, pers. comm.). Dens located from 1999 through 2001 were visited once on 3 June to determine occupancy and revisited if deemed active. GPS and VHF collars were deployed on wolves at active den sites on 22 June. GPS collars were programmed to collect a location every 30 minutes for about 90 days to determine the extent of the wolves' movements (Dean Cluff, RWED, pers. comm.).

Active dens were watched by two observers for approximately five days in early summer from observation points at 400 m and 800 m away. Two days were spent at each den site to determine group composition (*i.e.*, male, female, nursing, and non-nursing) and three days were spent completing an experimental disturbance study (Paul Frame University of Alberta pers. comm.).

5.3 RESULTS

Since 1999, seven wolf dens have been located in the study area. In 1999, two active dens were located within the study area. A survey in the spring of 2000 located three new den sites, and one additional den site was found in 2001. In 2002, a seventh den site was located and added to the monitoring program (Figure 5.3-1 and Table 5.3-1).

Table 5.3-1 Activity of Wolf Dens Located within the Snap Lake Study Area

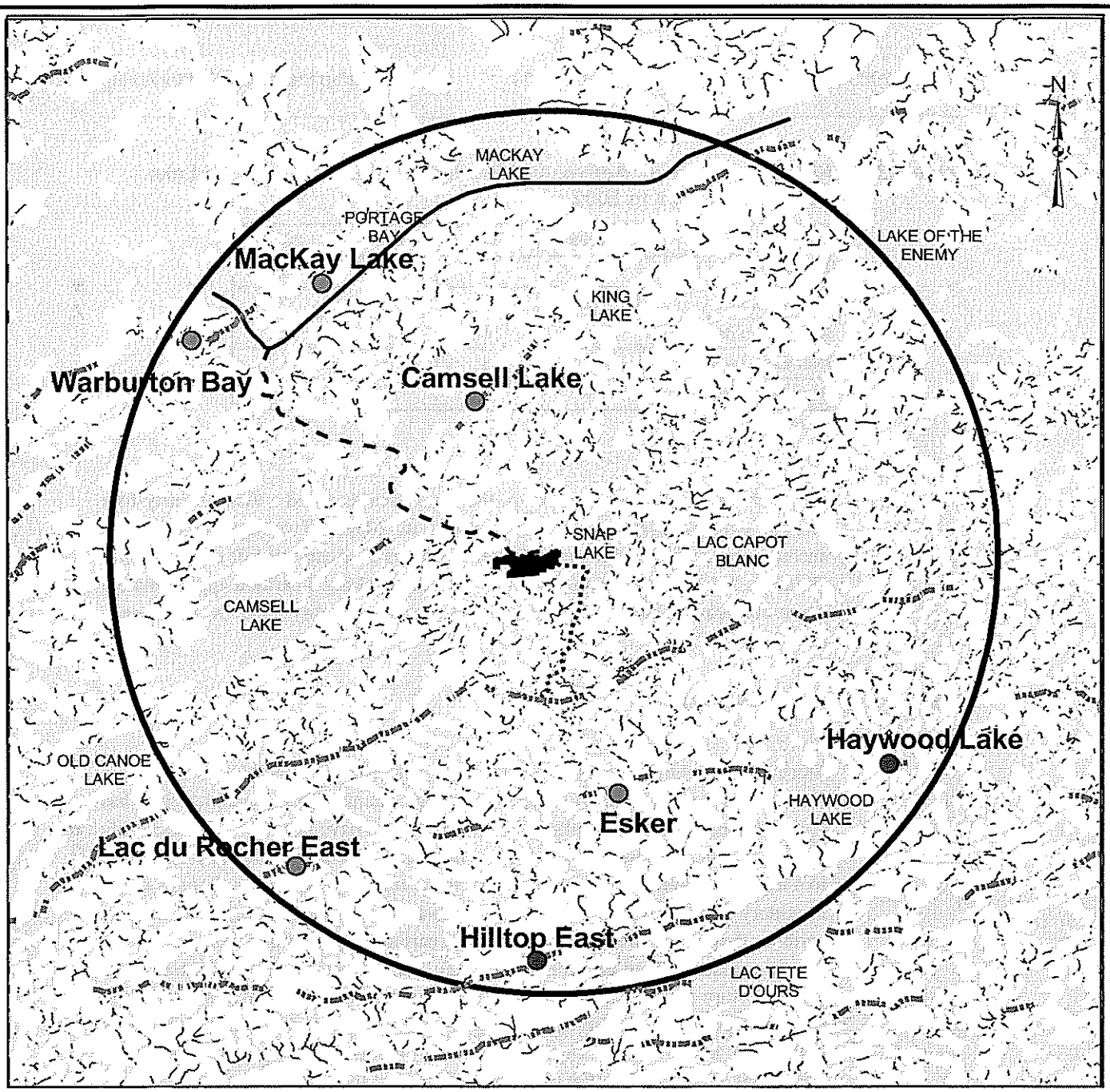
Den Site	1999	2000	2001	2002
Warburton Bay	Yes	Yes	Yes	No
Camsell Lake	Yes	Yes	Yes	No
Lac Du Rocher East	-	Yes	No	No
MacKay Lake	-	Yes	Yes	No
Esker Wolf	-	Yes	Yes	No
Haywood Lake	-	-	Yes	Yes
Hilltop East	-	-	-	Yes[1]

[1] Not active during spring survey.
- Not located.

In 2002, there were two active wolf dens within the study area (Table 5.3-1). On 3 June, a survey of all known den sites within the study area showed that only the Haywood Lake site was active. On the same day, an active wolf den was identified 5 km outside of the study area. However, in early August the adults and pups had moved into the study area and occupied a new den site, Hilltop East (Paul Frame University of Alberta pers. comm.).

In 2002, three radio collars were deployed on wolves in the Snap Lake study area. On 22 June, at the Haywood Lake den site, a male wolf was fitted with a GPS radio collar (which later released prematurely) and a female was fitted with a VHF collar. No pups were produced at this den site. A female was fitted with a GPS radio collar south of the study area and was later found at the Hilltop East den site (Paul Frame University of Alberta pers. comm.).

Observers located three pups at the Hilltop East den site in August 2002 (Table 5.3-2). This represents the first productive den found in the study area since monitoring began in 1999, although this is likely due to the increased survey effort in 2002. During June and July, 2002, adult wolves were observed leaving the den for 12 to 18 hour periods (Paul Frame University of Alberta pers. comm.). In 2002, observers remained at den sites for extended periods of time which increased the likelihood of observing adults or pups.



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- Active Wolf Dens
- Inactive Wolf Dens

10 0 10

Scale 1:400,000 Kilometres

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

PROJECT

DE BEERS

TITLE

FIGURE 5.3-1. LOCATION OF WOLF DEN SITES, 2002

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2803			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	16 Dec. 2002		

Table 5.3-2 Number of Known, Active, and Productive Dens in the Snap Lake Study Area, 1999 to 2002

	1999	2000	2001	2002
Known dens	2	5	6	7
Active dens	2	5	5	2
Productive dens	-	0	0	1
Number of adults	1	8	7	5
Number of pups	-	0	0	3

- Not assessed.

Incidental observations of wolves in the study area recorded a total of thirty-four wolves over twelve separate observations in 2002. Two notable examples include observations of a pack of twelve wolves at a caribou kill on Lac Capot Blanc on 5 April, and a group of three wolves attacking a caribou approximately 10 m northeast of the runway on 16 February (Darren Raymond De Beers pers. comm.).

5.4 DISCUSSION

Since 1999, seven active wolf den sites have been identified within the study area for the Snap Lake Diamond Project. Although the number of occupied dens has varied among years, the results indicate that wolves have denned within the study area each year. Annual variation in the number of occupied dens may be related to a number of natural environmental factors, such as year-to-year changes in the migratory route of caribou. Because wolves on the tundra prey primarily on caribou, they likely prefer den sites where caribou are most available during the denning season (Heard and Williams 1992). As well, wolves in the central NWT tend to return to an area within 25 km of the previous year's den site (Walton *et al.* 2001). Due to fidelity to this large denning area, the number of active dens within the study area is expected to vary among years because packs with traditional denning areas that overlap the border of the study area may move into or out of the study area in different years. For example, one pack of wolves (with a radio-collared female) was initially identified as denning 5-km outside the study area, but was later recorded as having established a den within the study area. Wolf mortality during the winter, when hunting and trapping is more common (Walton *et al.* 2001), may also result in annual variation in the number active dens within a geographic area.

When prey resources are low (early to mid July), wolves may travel an average of 41 km from their den site to search for prey (Walton *et al.* 2001), and may leave the den for periods of 12 to 18 hours. This behaviour may produce an underestimate of the number of occupied and productive dens during mid to late

summer. For example, if a radio collar had not been used to track the Hilltop East female, then observers would not have known that the den site was active in August. Similarly, the absence of occupied dens during the summer of 2000 and 2001 may have with the result of the absence of adults while out on extended hunting trips. RWED plans to continue monitoring wolves in the Snap Lake region, with help from radio collars, to gather more information on their behaviour and distribution.

6 FALCONS

6.1 OBJECTIVES

Information from 1999 to 2002 was used to determine the distribution, occupancy, and productivity of falcons in the study area.

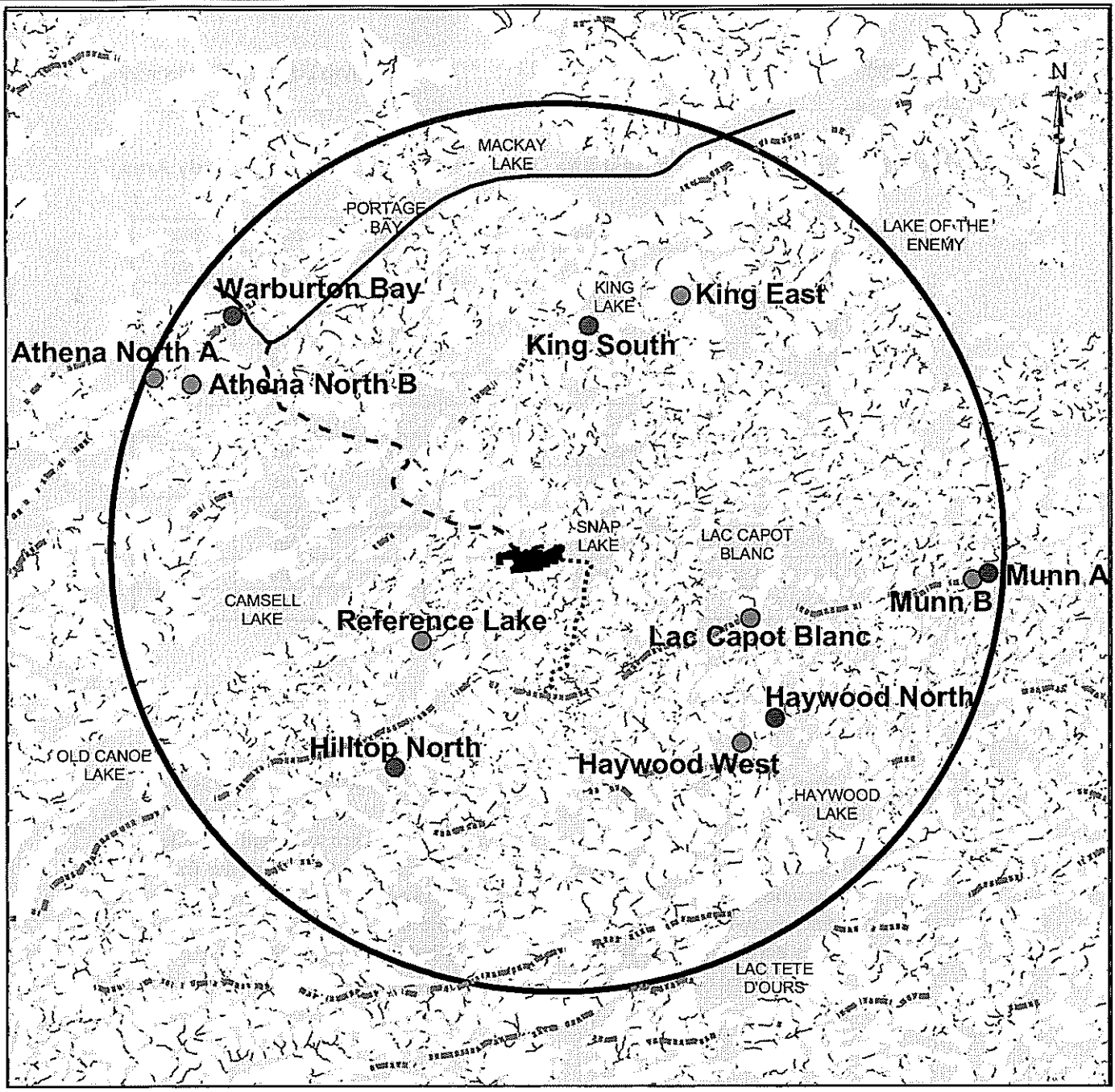
6.2 METHODS

Prior to initial baseline studies, topographic maps were used to identify suitable nest site locations for falcons in the Snap Lake study area. These sites were searched for falcon activity during esker surveys for carnivore dens between 28 and 30 May in 1999 and 2000. In addition, on 26 July 2000, an intensive survey for falcon nests was conducted within an 11-km radius of the proposed mine footprint. Transect lines, spaced 2 km apart and running in a north-south direction, were flown within the 11-km radius, but no nest sites were identified during this survey. All previously identified nest sites were also surveyed to determine occupancy and chick production on 26 July 2000. Falcon nest sites located during other wildlife surveys (*i.e.*, surveys for upland breeding birds and waterfowl) were also recorded. In 2001 and 2002, all nest sites that were located in 1999 and 2000 were visited in early June to determine occupancy and again in July to determine nest success and productivity.

Nest sites were classified as occupied if a pair of birds were observed at a nest site, eggs were seen in a nest, or a single bird was exhibiting incubation behaviour. If a nest was not immediately obvious and only a single bird was perched on a cliff, then observers landed near the site and verified the presence of a nest on the ground. If a nest could not be located quickly it was assumed that a breeding attempt was occurring when the adult exhibited defensive behaviour. Nests were classified as productive if young were observed in the nest during the July survey.

6.3 RESULTS

Since 1999, 12 falcon nest sites have been located in the study area, ranging from 7 km (Reference Lake) to 29 km (Munn A) from the advanced exploration camp (Figure 6.3-1). Surveys conducted in 1999 identified four peregrine and six gyrfalcon nest sites (of which King East has subsequently been occupied by a peregrine). Two additional peregrine nest sites were located in 2000 (Table 6.3-1). In 2002, three gyrfalcon nests and all seven peregrine nests were occupied during the 4 June survey (Table 6.3-1). King south has been occupied by ravens during the past two spring occupancy surveys.



Legend

- Study Area
- Winter Access Road
- Esker Access Road
- Tibbitt - Contwoyto Winter Road
- Eskers
- Proposed Project Footprint
- Peregrine Falcon Nest Sites
- Gyrfalcon Nest Sites
- Inactive Historic Nest Sites

REFERENCE

Digital map data from National Topographic Data Base (NTDB 1:250,000 scale) Datum NAD 83
Projection: UTM Zone 12

10 0 10
Scale 1:400,000 Kilometres

PROJECT: DE BEERS

TITLE: FIGURE 6.3-1. LOCATION OF GYRFALCON AND PEREGRINE FALCON NEST SITES, 2002

Golder Associates
Yellowknife, Northwest Territories

PROJECT No. 022-2903			SCALE AS SHOWN	REV. 0
DESIGN	ACS	20 Nov. 2002		
GIS	ACS	20 Nov. 2002		
CHECK	ACS	20 Nov. 2002		
REVIEW	JV	16 Dec. 2002		

Table 6.3-1 History of Falcon Nest Site Occupancy in the Snap Lake Study Area, 1999 to 2002

Nest Site	Species	1999	2000	2001	2002
Hilltop North	Gyrfalcon	Yes	No	No	No
Haywood North	Gyrfalcon	Yes[1]	No	Yes	Yes
King South	Gyrfalcon	Yes	Yes	No[3]	No[3]
Munn A	Gyrfalcon	Yes	-	Yes	Yes
Warburton Bay	Gyrfalcon	Yes	No	Yes	Yes
King East	Peregrine	Yes[2]	Yes	Yes	Yes
Haywood West	Peregrine	Yes	Yes	No	Yes
Reference Lake	Peregrine	Yes	No	Yes	Yes
Athena North A	Peregrine	Yes	Yes	Yes	Yes
Athena North B	Peregrine	Yes	-	No	Yes
Lac Capot Blanc	Peregrine	-	Yes	Yes	Yes
Munn B	Peregrine	-	Yes	Yes	Yes

- Not identified that year.

[1] Located incidentally on 21 July.

[2] Occupied by gyrfalcons.

[3] Occupied by ravens.

To determine the difference in occupancy and productivity (defined as the mean number of young per occupied nest site and per productive nest site) between peregrines and gyrfalcons, results for each species were separated in Table 6.3-2. Once a territory has been occupied, nest success (measured as the fraction of occupied nests which were productive) has varied from 40 – 80% for peregrine falcons and 0 to 100% for gyrfalcons (Table 6.3-2). Productivity at these nest sites during all three years was similar for both species, estimated at 1.1 young per occupied nest for peregrines and 1.0 young per occupied nest for gyrfalcons.

Table 6.3-2 Occupancy and Productivity of Peregrine Falcons and Gyrfalcons, 2000 to 2002

	2000		2001		2002	
	P	G	P	G	P	G
Number of known sites	6	4	7	4	7	4
Occupied in spring	5	1	5	3	7	3
Productive	4	1	2	0	3	2
Total young produced	10	1	3	0	6	6
% Productive occupied sites	80%	100%	40%	0%	43%	67%
Productivity (young per occupied site)	2.0	1.0	0.6	0.0	0.9	2.0
Productivity (young per productive site)	2.5	1.0	1.5	-	2.0	3.0

P = peregrine, G = gyrfalcon.

7.3 DISCUSSION

Historical nest site occupancy rate for falcons, especially peregrine falcons, has been high in the Snap Lake study area. For example, from 2000 through 2002, 75% of the known peregrine and gyrfalcon nests have been occupied in the spring. Nest success, measured as the fraction of occupied nests that were productive, was 52% (N=17 nests) for peregrines and 43% (N=7 nests) for gyrfalcons from 2000 through 2002 in the Snap Lake study area. Productivity measures for the two falcon species were similar in the Snap Lake study area and were approximately 1.0 young per occupied nest from 2000 through 2002. These results are only slightly lower than those presented by Johnstone (1998) for peregrines near Rankin Inlet that showed a 56% nest success rate and a mean productivity of 1.4 chicks per occupied nest for high quality territories. Poole and Bromley (1988) measured a nest success rate of 67% and productivity of 1.5 chicks per occupied nest (N=75 nests) for gyrfalcons near Bathurst Inlet from 1982 to 1986.

Weather and food availability has a strong influence on productivity of falcons (Johnstone 1998 and Poole and Bromley 1988). Other factors may include differences in habitat suitability and associated prey abundance, nest density, and survey effort. Within the time period of the studies at Snap Lake, precipitation is likely a key factor in determining nest success during the early stages of the nesting season (Poole and Bromley 1988; Bradley *et al.* 1997). Severe weather can affect timing of laying as well as clutch size, and egg and chick survival. Freezing rain at the end of May and into June at Snap Lake may have contributed to the lowest nest success and productivity, which occurred in 2001. For example, only three fledglings were observed in 2001, whereas in 2000 and 2002

eleven and twelve fledglings were observed, respectively. Similar declines in nest success and productivity were also recorded in the Ekati Diamond Mine™, Diavik Diamond Mine, and Daring Lake study areas (BHP Billiton 2002). Thus, it is expected that nest success and productivity in the Snap Lake study area will exhibit a high degree of variation from year-to-year.

7 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

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AS/JV/CP/RS/DP/bh

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