STARFIELD RESOURCES INC.

2002 WILDLIFE BASELINE STUDIES

FERGUSON LAKE, NUNAVUT

March, 2004

Submitted to:
Starfield Resources Inc.
Vancouver, BC

Prepared by:
EBA Engineering Consultants Ltd.
Yellowknife, NT

STARFIELD RESOURCES INC.

EBA ENGINEERING CONSULTANTS LTD.

eba

STARFIELD RESOURCES INC.
2002 WILDLIFE BASELINE STUDIES
FERGUSON LAKE, NU

Prepared by:

EBA ENGINEERING CONSULTANTS LTD.
Yellowknife, NT / Vancouver, BC

Submitted To:

STARFIELD RESOURCES INC.
Vancouver, BC

0701-01-14863.002

March, 2004

P.O. Box 2244, #201, 4916-49 Street, Yellowknife, Northwest Territories X1A 2P7
Tel: (867)920-2287 - Fax:(867) 873-3324 Internet: yellowknife@eba.ca –Web Site: http//www.eba.ca

EXECUTIVE SUMMARY

During the summer of 2002 Starfield Resources Inc. (SRI) retained EBA Engineering Consultants (EBA) to carry out further baseline wildlife studies in the Ferguson Lake area, Nunavut (NU). The overall objective of the study was to survey specific Valued Ecosystem Components (VECs) of importance to the SRI exploration program in support of ongoing environmental management and future environmental assessment, should the program advance to the development stage. This report follows up an initial baseline wildlife study undertaken in the summer of 2001 (EBA 2002) and presents the results of those studies completed during the summer of 2002.

Between 21 June and 27 June 2002, field studies were carried out to survey caribou and breeding birds present within the SRI study area. Incidental wildlife observations were also documented. This report presents the survey methodology used and the results obtained during these surveys.

The key highlights and results of the 2002 caribou and breeding bird surveys at Ferguson Lake, NU were summarized as follows:

Caribou Survey

Caribou densities for the Study Area were estimated at 1058 (± 158) on 22 June. Fewer caribou were observed this year than in the wildlife studies in the previous years. Fifty two (52) Muskox were also counted. Some birds were also recorded incidentally during the aerial surveys.

Breeding Bird Survey

A total of 513 different bird observations were recorded, comprising 27 different species. Bird species diversity by community type was also examined. Savannah Sparrow, Lapland Longspur, Hoary Redpoll, American Tree Sparrow, and Canada Goose were among the most common species sighted. Incidental mammal sightings were also recorded during the bird survey including 112 Muskoxen.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF TABLES

LIST OF APPENDICES

ACKNOWLEDGMENTS

EBA would like to acknowledge Starfield's Mike Maddigan for his support in encouraging completion of this work. We would also like to acknowledge Great Slave Helicopters for logistics support and SRI Camp personnel for their wonderful hospitality.

The following personnel contributed to the study and the preparation of this report:

Steve Moore (Wildlife Biologist)
Ian Ross (Wildlife Biologist)
Jeff Matheson (Wildlife Biologist)
Tim Abercrombie (Environmental Scientist)
Karen Warrendorf (GIS Mapping)
Richard Hoos (Principal Consultant)

THIS REPORT IS DEDICATED TO THE MEMORY OF IAN ROSS OUR CLOSE FRIEND AND COLLEAGUE. IAN WAS A KEY PARTICIPANT IN THE 2002 SRI WILDLIFE STUDY PROGRAM. IAN WAS KILLED IN A PLANE CRASH ON JUNE 29, 2003 WHILE RADIO TRACKING LIONS IN LAIKIPIA DISTRICT, KENYA. HE DIED DOING WHAT HE LOVED MOST.

1.0 INTRODUCTION

1.1 Introduction

Starfield Resources Inc. (SRI) began an exploration program at the Ferguson Lake property in Nunavut in the spring of 1999. This site is part of an older mineral exploration site originally discovered and explored by International Nickel Company (INCO).

During 2001, in preparation for possible program advancement to the development phase, SRI retained EBA Engineering Consultants Ltd. (EBA) to initiate the collection of baseline wildlife, wildlife habitat and vegetation cover information in the immediate area of the company's Ferguson Lake exploration site (EBA 2002).

The study program conducted in 2001 focused on terrestrial wildlife species and habitats considered to be important to the nearest communities (Rankin Inlet and Baker Lake), regulators and other stakeholders with an interest in the area. The species or species groups selected for study included those that were most likely to interact with current exploration activities or possible future development of a mine at this location.

Of particular interest was the Qamanirjuaq Caribou Herd, with an estimated population in 1994 of approximately 496,000 animals that pass through the region during their annual migration cycle (Beverly and Qamanirjuaq Caribou Management Board 2002).

The wildlife studies focused on wildlife species and terrestrial areas understood to be particularly important to stakeholders and government regulators, which have been previously identified in other Environmental Assessments (EAs) as Valued Ecosystem Components (VECs). These included current industrial developments in other parts of the north, *e.g.* Ekati Diamond Mine™, the Diavik Diamond Mine, the Kennady and Snap Lake projects, Lytton Minerals and activities related to the Tibbitt to Contwoyto winter road. In 2001, the VECs selected for the study included caribou, muskoxen, carnivores, birds of prey (raptors) and wildlife habitats.

1.2 Objectives

The 2002 caribou and breeding bird surveys field program at Ferguson Lake, NU represented the second year of the SRI wildlife studies program. The primary objectives of the 2002 field program included:

- To complete an aerial survey documenting caribou and muskoxen distribution and other incidental wildlife sightings;
- To conduct breeding bird surveys in a number of plots over several days including other incidental wildlife sightings; and,
- To document incidental and miscellaneous species presence.

1.3 Study Area

The SRI study area is located approximately 235 km southwest of Rankin Inlet, NU and covers approximately 40 km by 40 km, totaling 1600 km^2. The wildlife study area was centered around the current camp and exploration area (Plate 1) (Figure 1), to capture the home range of species living within the potential zone of influence, while encompassing a region that was of sufficient size to adequately cover wildlife species with larger home ranges. These boundaries were used to define the study area for the baseline program.

Plate 1 Site photograph of Starfield Resources' Camp at Ferguson Lake, NU (2001).

1.3.1 Climate

No weather station is maintained at the SRI exploration camp. However, Rankin Inlet, the nearest community, is located approximately 235 km to the northeast, of Ferguson Lake and records weather parameters at the airport.

The SRI wildlife study area straddles two ecoregions known as the Maguse River and Kazan River Uplands respectively. The Maguse River Upland is a smaller unit of the Western Taiga Shield Ecozone, while the Kazan River Upland is a smaller unit of the Southern Arctic Ecozone. These smaller units are part of a larger ecological hierarchy as defined by the Canada Committee on Ecological Land Classification. Ecoregions comprise portions of ecozones and are characterized by distinctive regional ecological factors, including climate, physiography, vegetation, soil, water, fauna and land use (Ecological Stratification Working Group 1995).

The climate of the Maguse River Upland ecoregion is marginally more extreme than that of the Kazan River Upland ecoregion and hence, is highlighted here. In general, the Maguse River Upland ecoregion is classified as having a low arctic ecoclimate. Regional weather patterns are influenced by the open waters of Hudson Bay during the late summer and early fall prior to freeze-up. Winters are long and cold, marked by short days and light precipitation followed by short, cool summers. Cold arctic air influences the area for most of the year.

The mean temperatures for summer and winter are 4°C and -24°C, respectively. The average annual precipitation in the region of the wildlife study area is approximately 200 mm.

1.4 Background

1.4.1 Valued Ecosystem Components

The EIA process requires the identification of valued ecosystem components (VECs) (Beanlands and Duinker 1983). However, it is impossible for an impact assessment to address all potential environmental effects of a project. Therefore, it is necessary that the environmental attributes considered to be important in project decisions be identified and addressed during initial baseline work.

In 2001, VECs were selected from species known to occur or of probable occurrence in the wildlife study area, and species that had been previously identified as being important at other northern project sites. Species, or species groups, considered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2000) as being endangered, threatened or vulnerable were automatically considered as potential VECs. VECs that were selected for the initial 2001 baseline studies included:

- caribou
- muskoxen
- carnivores (grizzly bears, wolves and wolverines)
- raptors

This work was completed in 2001. Breeding birds were originally selected as a VEC in 2001. However, the necessary permits for conducting breeding bird surveys were unfortunately not issued until after the breeding bird season was over. As a result, breeding bird surveys were not conducted during 2001. Therefore a principle objective of the 2002 surveys was breeding birds. In 2002 the selected VECs included:

- caribou
- muskoxen
- breeding birds
- other birds

1.5 Report Organization

This report summarizes the caribou distribution and breeding bird field data recorded in the SRI study area during June 2002. The report is divided into five sections including an executive summary, introduction, wildlife VECs, and literature cited.

The wildlife section describes the fieldwork conducted and the study results obtained for ungulates (caribou and muskoxen), and birds. Field methodologies are presented in the respective subsections for each of the VECs.

FERGUSON LAKE
2002
Wildlife Baseline Studies

FIGURE 1: 2002 Ferguson Lake Wildlife Study Area

N
W E
S

0 2.5 5 10 Kilometers

Projection: UTM Zone 14
Date: March, 2004

Datum: NAD27
Project: 01-14863.002

Study Area

Imagery: Landsat 7

- Water
- Rock
- Vegetation

INDEX MAP

STARFIELD RESOURCES INC.

EBA ENGINEERING CONSULTANTS LTD.

eba

590000 600000 610000 620000 630000

6990000 6990000 6990000 6990000 6990000

2.0 WILDLIFE SURVEY

2.1 Caribou

2.1.1 Background

The Qamanirjuaq Caribou herd passes through the region of the SRI study area during their annual migration from their winter range below the treeline in northern Manitoba to their calving grounds located south of Baker Lake (Figure 2). The last survey of the herd was conducted in 1994 estimated the herd size to be around 496,000 animals (Beverly and Qamanirjuaq Caribou Management Board 2002). However, the estimated herd size has varied over the years. During the 1940's and 50's, herd size was estimated to be greater than 100,000 animals. In 1985 the herd size was greater than 200,000, and by 1994 it approached almost 500,000 animals (Wakelyn 1999).

The size of the herd's range is not known with certainty as it overlaps with that of the Beverly herd and differentiation of individuals between the two herds is problematic. However, its boundaries can be approximated as being the western shoreline of Hudson Bay, northward to Wager Bay, southward to Brochet, Manitoba (northern Manitoba) and approximately 350 km inland. The calving grounds are located south of Baker Lake and the wintering range typically extends to below the treeline in northern Manitoba. Caribou distribution and density in the SRI study area varies from year to year.

In general, spring migration northward begins in late March and continues throughout May, however for the adult bulls, spring migration typically occurs about one month after other caribou in the herd have begun to migrate. Fall migration southward typically stretches between late September through to the end of October.

Calving typically occurs between late May and late June, and the specific timing is influenced by the condition of the cows. Most calves are born between 5 and 15 of June. During post-calving (late June throughout July) the caribou gather in large groups to reduce harassment by mosquitoes (Plate 2).

FERGUSON LAKE
2002
Wildlife Baseline Studies

FIGURE 2: Qamanirjuaq Caribou Annual Range in Relation to Study Area

N
W E
S

0 25 50 100 150 200 250 Kilometers

Date: March, 2004 Project: 01-14863.002

LEGEND

- Study Area
- Limit of Continuous Forest
- Range of Beverly and Qamanirjuaq Caribou (based on government surveys, 1940-1995)
- Traditional Calving Grounds (based on government surveys, 1957-1994)
- ? Caribou from this area may have been from another herd

Imagery: Landsat 7

- Water
- Rock
- Vegetation

INDEX MAP

STARFIELD RESOURCES INC.

EBA ENGINEERING CONSULTANTS LTD. eba

Plate 2 Early July (2001), post calving period, caribou are still in large groups.

Once the incidence of insect harassment diminishes in late summer (early August) caribou groups begin to break up. At this time, their movement patterns are not well known. Fall migration is influenced by the weather but typically occurs between mid-September to mid-October. The rut occurs in late October (Beverly and Qamanirjuaq Caribou Management Board 1999).

During normal years caribou typically appear in the SRI study area in low numbers during the annual spring migration (mid-March to late May) and during post-calving (late June and July). The known calving grounds occupy an area between Quartzite Lake, Qamanirjuaq Lake, Ferguson River and Banks Lake, an area to the northeast of the SRI exploration site.

Following post-calving, the herd disperses across the summer rangelands, and spends time grazing in favorable habitat on graminoids and willows (Plate 3). By October the herd begins to migrate southward towards the wintering grounds, eventually working its way south of the treeline. Although most of the herd spends the winter in the boreal forest, some animals remain on the tundra just above the treeline (Beverly and Qamanirjuaq Caribou Management Board 1999).

Plate 3 Small group of caribou moving through a riparian zone (SR) (2001).

2.1.2 Studies Competed in 2001

Caribou baseline studies carried out during 2001 included two aerial surveys. These surveys were designed to determine the abundance, density and distribution of caribou across the SRI study area in relation to the location of current exploration activities at Ferguson Lake.

A total of 6.5 hours were flown on two systematic aerial surveys across the study area on 01 July and 17 August. A total of 8,536 and 24 caribou were counted on transect during the July and August aerial surveys, respectively.

The estimated abundance of caribou within the study area for each survey date was 37,950 (± 21,600) on 01 July and 107 (± 18) on 17 August 2001. The July estimate of 37,950 individuals contains a large standard error of 21,600, and is attributed to counting one particularly large aggregation of 9,800 caribou. This one group of caribou was counted from aerial photographs taken during the survey. Most observations consisted of small groups that were widely dispersed across the study area. The caribou documented across the study area during the July survey represent the post-calving period; while the few caribou documented during the August survey

represent the late summer period when caribou groups disperse following the insect harassment season.

2.1.3 Studies Completed in 2002

A single aerial caribou survey was carried out during summer of 2002. The survey was designed to determine the abundance, density and distribution of caribou across the SRI study area in relation to the location of current exploration activities at Ferguson Lake.

2.1.4 Methods

The methods employed to survey caribou and muskoxen during 2002 were generally consistent with those used in the 2001 baseline studies. The survey area was (40 km x 40 km) 1600 km^2. The distance between each transect was 5 km. Nine (9) systematic transects were flown once on June 22. The effective survey width for each transect was 1 km (comprising 500 m on either side of the helicopter). Nine transects multiplied by 1 km multiplied by 40 km (9 x 1 km x 40 km) is 360 km^2 of total area surveyed. Three hundred and sixty (360) km^2 out of a total of 1,600 km^2 represents 22.5% coverage of the study area.

A single systematic aerial survey was flown during June 22, 2002. An A-Star helicopter was used. Four continuous hours of helicopter time were required to complete the aerial survey. Three personnel flew on each survey. In addition to the pilot, a navigator in the front seat used a map to plot and follow a predetermined flight path (Figure 3), and record all observations of wildlife by observation number. A recorder in the right rear seat took notes corresponding to each observation number. The surveys were conducted from 120-180 metres above ground level (agl), at a speed of 145-160 kilometres per hour. Line transects were followed with the aid of the 1:250,000 scale map and GPS units.

Local weather conditions resulting in poor visibility during the survey resulted in a temporary deviation from these protocols. Observations included an estimate of herd size, direction of movement (one of 8 cardinal directions), activity, and if possible habitat type, habitat modifier, and group composition.

All observations of wildlife were recorded. For caribou, all individuals seen within the effective survey strip were recorded as "In" while those beyond the transect

boundary were recorded as "Out." Density estimates were calculated using Jolly's Method 2 (Jolly 1969).

The following information was recorded for each observation:

- transect number
- GPS waypoint, using a hand held Magellan 12XL Global Position System (GPS), with a remote antenna for increased accuracy
- species
- number of caribou "in" and "out"
- dominant composition of caribou group
- dominant activity
- overall directional movement of caribou, if moving
- habitat type
- habitat modifier
- additional observations of any wildlife and den locations

Incidental observations of Canada Geese, Rough-legged Hawks, Sandhill Cranes, Snow Geese, Tundra Swans are highlighted in Section 2.3. All observations collected during aerial caribou surveys are listed in Appendix A. All terrestrial species documented during the 2001 field program are listed in Appendix B.

2.1.5 Results

A total of 238 caribou were counted on transect during the June 22, 2002 aerial survey. The estimated abundance of caribou within the study area for the survey is thus (238/360 km x 1600 km) 1058 (± 158).

The estimate of 1,058 individuals includes a 95% confidence limit of 158. This is attributed significant variations in aggregations of caribou found within the series of transects. Most observations consisted of small groups that were widely dispersed across the study area. The caribou documented across the study area during the survey period were considered to be representative of the post-calving period.

2.2 Muskoxen

2.2.1 *Background*

Muskoxen are commonly seen throughout the region of the study area. The majority of the muskoxen in the world are found in Nunavut and the Northwest Territories (Graves and Hall 1988). These animals occur on most arctic islands, along the coast and in some areas as far south as the treeline. Historic numbers and distribution were greatly reduced across the barrenlands during the last century through a probable combination of over-hunting and unfavourable weather conditions (Graf and Shank 1989). Over the last few decades the population in the central mainland of Nunavut and the Northwest Territories has been steadily growing (Graves and Hall 1988), and more recently, muskoxen have been expanding their distribution further south.

2.2.2 *Studies Completed in 2001*

Muskoxen were surveyed concurrently with the aerial caribou surveys in 2001. A total of 4.0 hours were flown on systematic surveys across the SRI study area on 01 July and 17 August. Thirty-nine (39) and 5 muskoxen were counted on transects during the July and August aerial surveys, respectively. The estimated abundance of muskoxen within the study area for each survey date was 173 (± 65) on 01 July and 22 (± 6) on 17 August (Plate 4).

2.2.3 *Studies Completed in 2002*

Muskoxen were surveyed concurrently with the aerial caribou surveys in 2002 and consequently employed the same survey methodology employed (See Section 2.1.4).

2.2.4 *Results*

The 2002 muskoxen survey was conducted concurrently with the caribou survey. A total of 4.0 hours were flown on a systematic survey across the SRI study area on June 22. Fifty-two (52) muskoxen were counted on the nine transects during the June aerial survey. Because muskoxen distribution is highly dependent on the habitat and vegetation present, many transects recorded no muskoxen sightings. Thus the variance was very high and abundance could not be reasonably calculated. However a

large number (112) of muskoxen were incidentally observed during the breeding bird surveys.

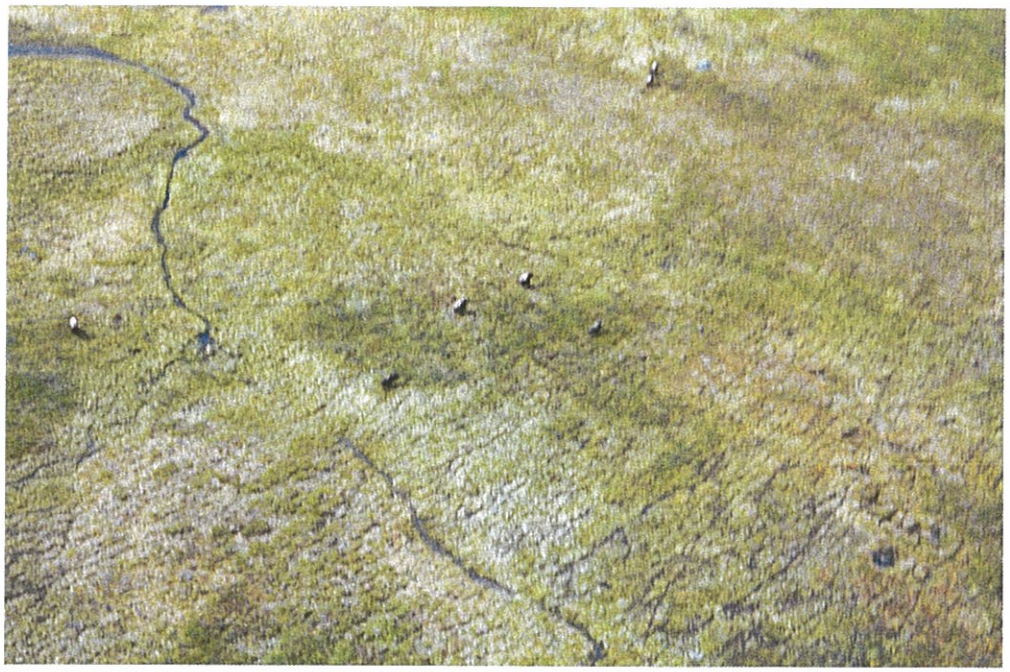
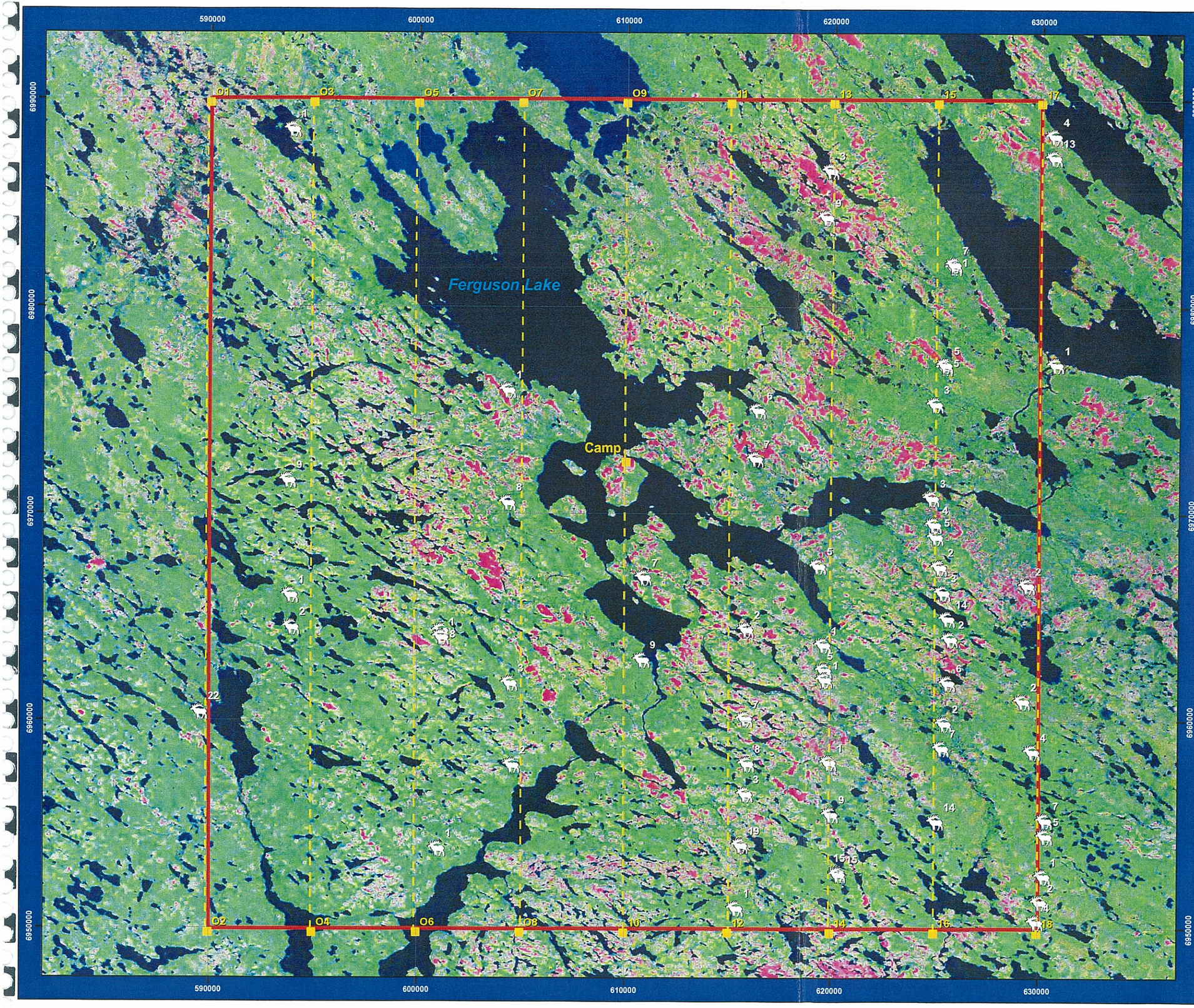


Plate 4 A small group of muskoxen feeding in a sedge meadow (CE).

FERGUSON LAKE
2002
Wildlife Baseline Studies

FIGURE 3: Aerial Survey Transects and Caribou Observations



N
W E
S

0 2.5 5 10 Kilometers

Projection: UTM Zone 14
Date: March, 2004

Datum: NAD27
Project: 01-14863.002

LEGEND

- Study Area
- Caribou Observations
- Caribou Survey Transects - June 22, 2002

Imagery: Landsat 7

- Water
- Rock
- Vegetation

INDEX MAP

STARFIELD RESOURCES INC.

EBA ENGINEERING CONSULTANTS LTD.

eba

2.3 Birds

2.3.1 Background

Nunavut and the Northwest Territories are home to few year-round resident birds but host immense numbers of migratory species during the brief snow-free period. The importance of the arctic regions for nesting and brood-rearing is evident in the 16 migratory bird sanctuaries that have been established across Nunavut and the Northwest Territories, covering 11 million hectares of arctic coastal habitat (Graves and Hall 1988).

Most of these sanctuaries are for the protection of waterfowl. One-fifth of the North American population of all ducks, geese and swans nest in the Northwest Territories and Nunavut (Graves and Hall 1988).

Although many migratory species use arctic habitats for only a few months of the year, these areas are important because birds depend on them for breeding and nesting. SRI's project area is small compared to the length and breadth of the bird migratory pathways. Birds in the SRI study area and the region are considered to be VECs because of their relatively high species diversity in each habitat type and their general sensitivity to development. Some species, in particular waterfowl and ptarmigan, are also very important to the Aboriginal and other residents of the surrounding region for food. The presence of bird species has been used as an ecological indicator to monitor environmental health.

Monitoring of birds can be a valuable tool for determining the state of the environment, or changes in the environment (Baillie 1991). Birds are often used in monitoring programs since they are usually high in the food chain and, consequently, are particularly susceptible to environmental changes. Species feeding on fish, such as loons and colonial waterbirds, and birds of prey are at the top of their food chains. A shift in prey abundance as a result of human disturbance can affect bird populations at the local level.

2.3.2 Bird Surveys Conducted in 2001

A total of 32 different species of birds were documented to be present in the wildlife study area during the 2001 field program (Appendix B). Sandhill Cranes were observed during the aerial caribou surveys, conducted in July and August. Waterfowl were documented on an opportunistic basis.

2.3.2.1 Aerial Survey

During aerial surveys in 2001, the main bird species documented, in order of dominance, included 329 Canada Geese, 167 Greater White-Fronted Geese, 48 Sandhill Cranes, 29 Herring Gulls, 11 Tundra Swans, 1 Long-tailed Jaeger, 1 Rough-legged Hawk, 1 Golden Eagle, and 1 Willow Ptarmigan (Plate 5) (Appendix A).

Sandhill Cranes were commonly distributed throughout the wildlife study area, and were highly visible during aerial caribou surveys. Sandhill Crane territories were documented during the two caribou surveys completed on 01 July and 17 August. A total of 48 cranes were recorded, consisting of single and paired observations. Paired observations were interpreted as being a territorial pair and, hence, a suspected breeding pair. Paired birds were much more visible during August than in July. During the August survey, 18 of 20 observations consisted of pairs, while in early July only 6 of 16 observations consisted of pairs (Plate 6).

Presumably the lower pair counts in early July were a result of one of the parents in a given pair being more difficult to detect because of sitting and incubating activities. In contrast, in August the young birds would have fledged, resulting in both parents standing and being more visible. The data supports this statement, as there was almost exactly twice the number of individuals counted in August compared to early July during the incubation period.

The results documented in August are presumed to be more reflective of the true number of territories than those recorded in July and, consequently, are the data set used to estimate the number of territories in the SRI study area. Consequently, there were 18 pairs (territories) of Sandhill Cranes documented across the study area.

2.3.2.2 Raptor Survey

A raptor survey was also conducted in July 2001. During the survey twenty-six sites were located and investigated in the study area. Eight raptor territories were established and at least seven of these involved occupied nests.

Peregrine Falcons occupied five territories in the study area and one just outside the study area boundaries. Two of the six sites were confirmed as occupied with eggs (OE); while the remaining four sites were occupied nests with reproduction likely (OP). Confirmation of successful fledging requires multiple visits and ground searching. To minimize stress to birds, ground searches were avoided. The results suggest that at least six pairs of Peregrine Falcons were successful in reproducing eggs and/or offspring during 2001, based on the observed presence of eggs and territorial behavior

Rough-legged Hawk territories were observed at two sites. One of these included a nest with two young that appeared close to fledging. The second site contained a pair exhibiting territorial behaviour, but no nest was found.

Plate 5 Ptarmigan on nest (2002).

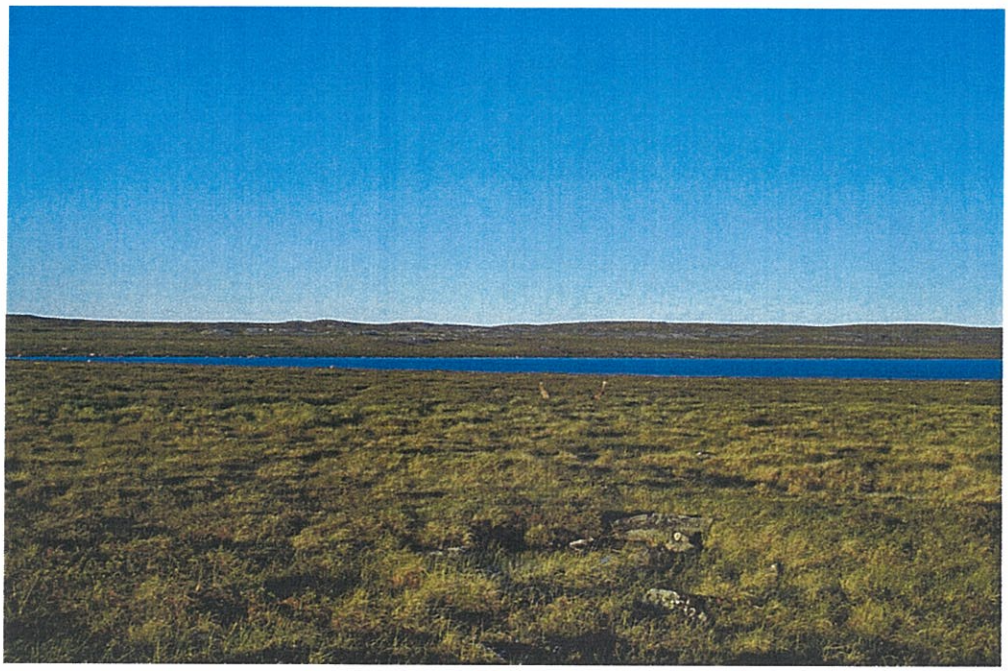


Plate 6 This pair of Sandhill Cranes from the 2001 survey (center of photograph), fledged one young on the same island that the SRI camp is situated.

2.3.2.3 Breeding Bird Survey

Breeding bird surveys were intended to be undertaken during July 2001 but because the permitting process had not been completed in time, these surveys could not be conducted. However, in lieu of these breeding bird surveys, birds present in the area were documented during the vegetation/habitat assessment component of the program.

In the summer of 2001 preliminary biogeoclimatic ecosystem classification was conducted of the SRI study area. Representative habitats within the study area were assessed and classified. The primary objectives was to sample representative sites for each community type, document the flora and fauna, classify the habitat, and provide an annotated list of the flora species. Vegetation studies help to document the current baseline conditions and determine potential project impacts on different habitats. The results obtained assisted in providing the basis for designing future wildlife habitat studies.

A total of 60 site assessments were conducted representing 12 different ecosystem units: *Betula – Ledum, Saxifraga – Silene, Betula – Empetrum, Betula – Rubus chamaemorus, Betula – Calamagrostis, Eriophorum vaginatum – Andromeda, Carex chordorhiza – E. russeolum, Salix – Rubus arcticus, Carex aquatilis – E. angustifolium, Arctophila – Ranunculus*, lichen – boulder field, and exposed bedrock. Five hundred and forty three (543) plant observations were documented comprising of 161 plant species. These ecosystem units and plant species are typical of the barrenlands.

2.3.3 Bird Surveys Conducted in 2002

2.3.3.1 Aerial Survey

During the June 2002 caribou and muskoxen aerial survey (for methods see Section 2.1.3) incidental bird observations were documented and include: 24 Canada Geese, 15 Sandhill Cranes, 5 Tundra Swans, 2 Rough-legged Hawks, 3 Snow Geese (Appendix A).

In the aerial surveys, many transects recorded no bird sitings. Because of this, the variance was very high and abundance could not be reasonably calculated.

Sandhill Cranes are common on the tundra. These birds are large and highly conspicuous when standing on the low-open tundra. There were considerably fewer cranes in the 2002 survey than in the 2001 survey because of the wet weather during the field study. During rainy weather the cranes crouch down and are more difficult to see.

2.3.3.2 Breeding Bird Survey

Breeding birds are commonly used in monitoring programs as they represent an abundant and diverse group of species that are relatively easy to monitor, particularly because the males exhibit conspicuous territorial behaviour. Long-term monitoring is used to observe and measure impacts (Baillie 1991; Bibby *et al.* 1993) on birds, if they occur.

The spring migration of birds begins in early May and peaks around mid- to late May. The breeding season for small perching birds (passerines) typically starts during the first week of June and continues until approximately the third week of June. Fall

migration begins in mid-August and continues through to mid-September. Perching birds (Passeriformes) are the most common breeders within the study area and include the Lapland Longspur, Lesser Golden Plover, Horned Lark and Harris Sparrow. The least common species breeding in the study area include the Blackpoll Warbler, Common Snipe, White-crowned Sparrow and Long-tailed Jaeger. Based on species richness, the three most important breeding habitats in the mine area are riparian tall shrub, birch hummock, and heath mat tundra.

Breeding bird surveys were conducted during the breeding season, when most species of songbirds are on territory and singing (Ralph and Scott 1981; Verner 1985; Bibby *et al.* 1993). Singing rate is thought to be highest just before official sunrise and then declines slowly for the next four hours. Ralph *et a*l. (1993) and Banci and Moore (1997) believe the best time for surveys is within these four hours because the singing rate is most stable. During the breeding season, these time periods represent the time of day when birds are most visual and vocal (Robbins 1981; Skirvin 1981; Dawson 1981). This timeframe was also tested and confirmed in 1996 (Banci and Moore 1997). Consequently, all breeding bird surveys were conducted when birds are most conspicuous during the day.

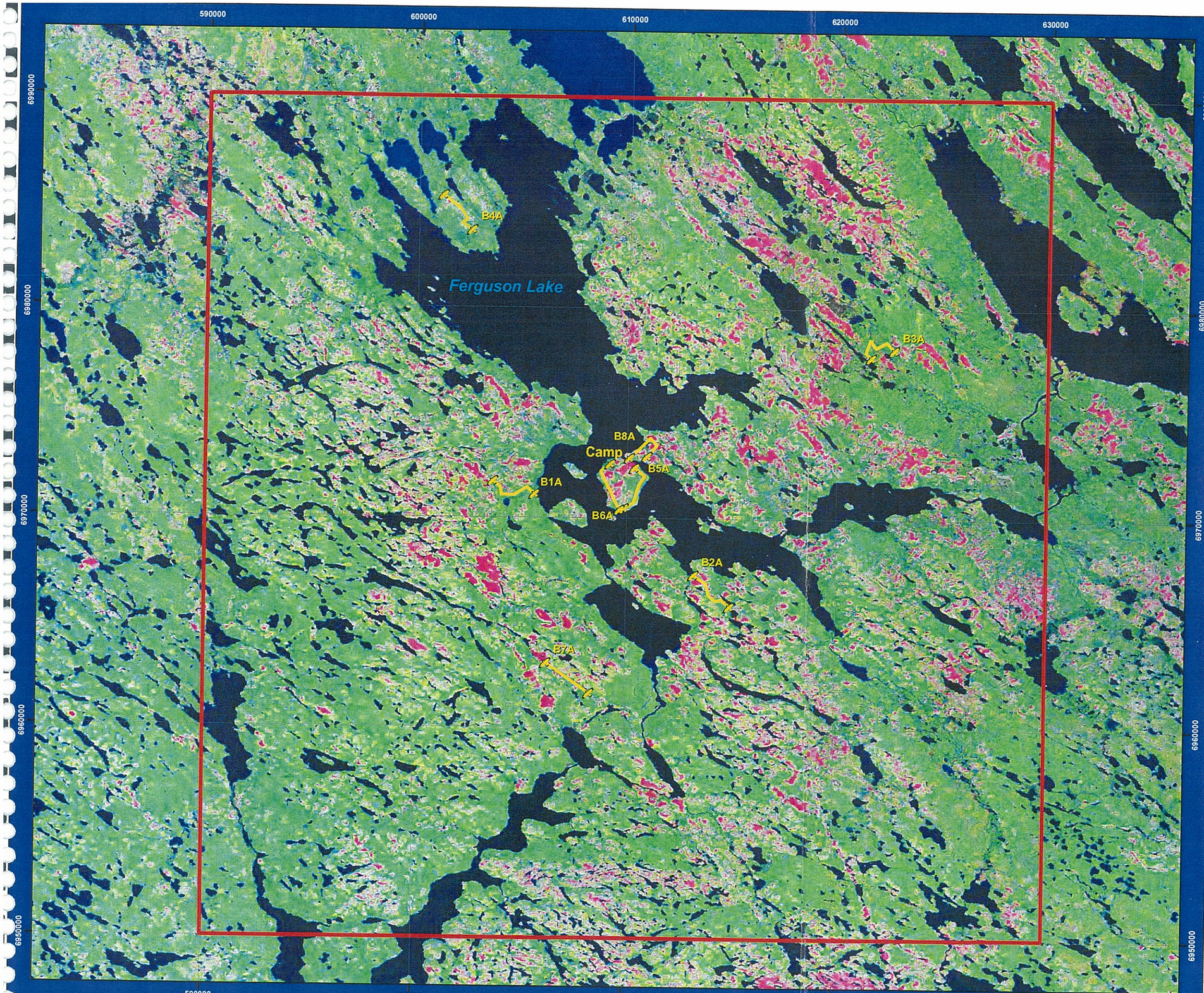
Methodology

Two breeding bird surveys were planned for each day: the first survey was to occur from 5:00 am to 7:30 am, and the second survey from 7:30 am to 10:00 am. During the breeding season, this timeframe brackets the period during the day when birds are most visual and vocal (Robbins, 1981; Skirvin 1981; Dawson 1981). This timeframe was also tested and confirmed in 1996 (Banci and Moore 1997). Consequently, all breeding bird surveys are conducted when birds are most conspicuous during the day.

Breeding bird surveys were conducted using a standard transect method, following a single transect from point A to point B. Transects surveyed ranged from 2.5 to 2.6 km long. Locations of Breeding bird plots are shown in Figure 4. At the local scale, large tracts of homogenous habitat are not common in this region and, consequently, survey routes were adjusted to remain within one type of plant community.

FERGUSON LAKE
2002
Wildlife Baseline Studies

FIGURE 4: Breeding Bird Plots



N
W E
S

0 2.5 5 10 Kilometers

Projection: UTM Zone 14
Date: March, 2004

Datum: NAD27
Project: 01-14863.002

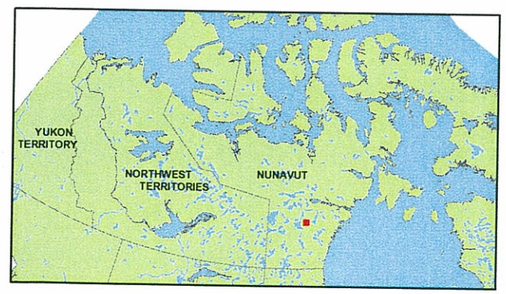
LEGEND

- Study Area
- Bird Survey Transects

Imagery: Landsat 7

- Water
- Rock
- Vegetation

INDEX MAP



STARFIELD RESOURCES INC.

EBA ENGINEERING CONSULTANTS LTD.

eba

Typically, three observers are used for surveying 100 m wide transects, however, in this case, due to logistical constraints only two observers were used. Transects were traversed by two observers walking abreast, covering a strip width of 100 m. The spacing between the observers was 50 m, thus each observer surveyed a 25 m wide strip on either side. To ensure consistency in spacing of observers, a fiberglass tape measure was laid out to re-position the observers. After some initial practice the observers became sensitive to the correct spacing. Depending on the accessibility of the terrain, surveys of 0.25 km^2 plots usually took 3 to 4 hours.

Prior to commencing a survey, the observers recorded the date, location, weather conditions, crewmembers, and start time. Once surveys were initiated, the observers proceeded along their respective transects at a uniform speed to ensure each transect received equal sampling effort. Once the survey was completed, surveyors reviewed and completed data sheets. Additional observations were discussed and documented on data sheets and in field notebooks.

Bird species were identified visually and/or by territorial calls. Six types of data were recorded for each bird observation: observation number, time, number of individual birds, species (sex where possible), ecosystem unit observed in, and behavioural activity (flushed, territorial display, *etc.*). Territories were recorded when typical territorial behaviour was observed such as territorial calls, displays, disputes, leading behaviour (distraction), a pair, nest site, anxious parents, incubation, nest building, fledged young, mating, adults carrying food to a nest, or the begging calls of nestlings.

Birds were only counted as being "in" the survey during the actual survey period, from start to finish. During the survey, all birds observed within 25m on either side of an observer were recorded as being "in," and all other birds were recorded as being "out" or "flyovers." In some cases birds could be recorded as incidental if they were not adjacent to the plot, *i.e.* a flock of geese flying in the distance.

Results

Breeding bird surveys were conducted from June 23 to 27, 2002. A total of 513 birds were documented on 8 survey plots, representing 27 different species. Results from the transect counts are presented in Table 1 and Figure 5. Table 1 presents the number of minimum counts by vegetation community type. Figure 5 graphically illustrates species diversity by community type. Appendix B identifies the species and

numbers of individual birds observed, in addition to other incidental mammal sightings during the breeding bird surveys.

Table 1 Minimum Number of Counts of Individual Birds by Vegetation Community Type

Transect	Vegetation Community Type	Minimum Counts[1]	Number of Territories[2]
1	BR/EA	67	29
2	RB/BL	15	4[3]
3	EA/CE/BR	54	23
4	BL	37	24
5	BR	53	31
6	RB	14	6[3]
7	SR/BR	49	16
8	BR/RB/EA/BL	51	30

[1] Minimum counts include only those detections as being "In" and does not include flyovers or those birds recorded as being "Out."
[2] Territories are recorded when birds exhibit territorial behaviour such as territorial calls, displays, disputes, leading behaviour (distraction), a pair, nest site, anxious parents, incubation, nest building, fledged young, mating, adults carrying food to a nest, or the begging calls of nestlings.
[3] These low detections are a result of poor survey conditions as a result of weather.

Although 27 different bird species were recorded as occurring in the area, not all were be breeding on site. Many species are transient, merely passing through the area on their way to breeding grounds further north or wintering grounds in the south. The status of a given bird species is often classified as being a migrant, breeder, transient, resident, accidental or hypothetical. A migrant is a bird that occurs regularly on a seasonal basis, usually as it passes through during spring or fall migration. A breeder is a species that is believed to be breeding in the area and is usually present during the spring, summer and fall. A transient is a species that occurs irregularly at any time of the year. A resident is a bird species that occurs throughout a given season and, hence, there are summer residents, winter residents

and residents that occur all year round. Incidental observations are species that occur infrequently and are usually defined by a limited number of observations. A hypothetical species is a bird that is believed to be occurring in the area but remains unconfirmed.

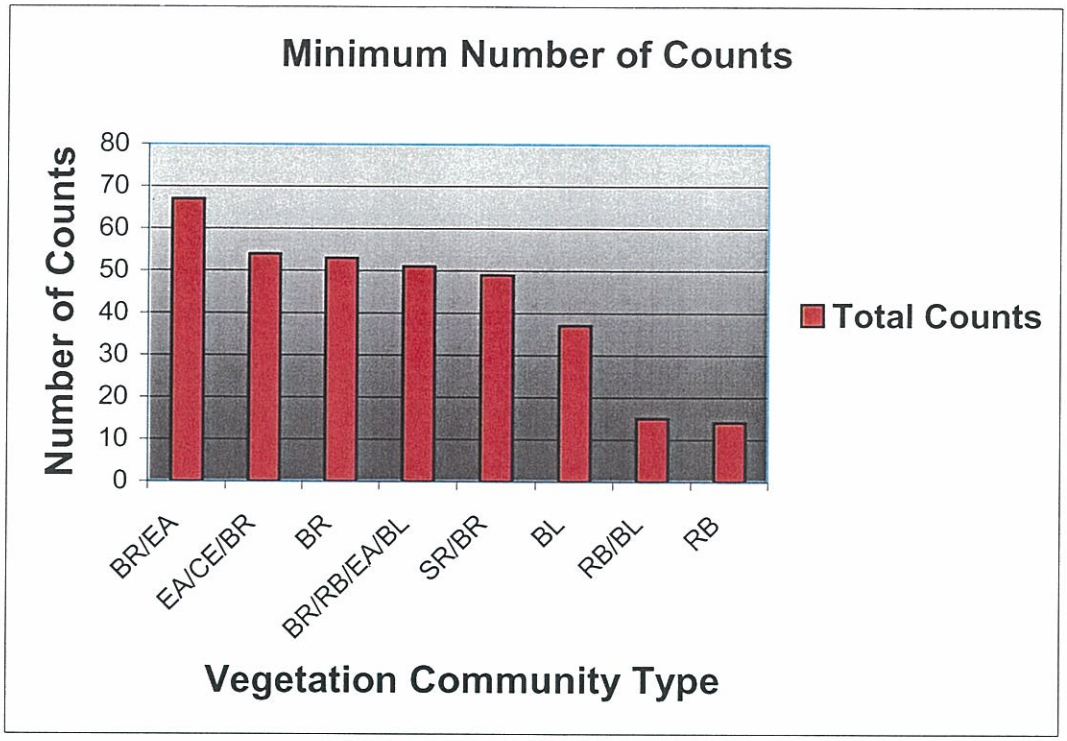


Figure 5 Minimum Bird Counts per Vegetation Community Type.

A total of 513 different bird observations were recorded, comprising of 27 different species (Appendix B). These observations included actual sightings, bird calls or sign. The original species list for the SRI area contained fewer species than those recorded in the field because so little is known about bird distributions in that part of the Northwest Territories and, consequently, range maps generally do not cover that area.

Among the more common species observed, in order of frequency of occurrence included Savanna Sparrow and Lapland Longspur, accounting for 46% of all observations.

4.0 CLOSURE

The 2002 Ferguson Lake caribou and breeding bird surveys were conducted by EBA Engineering Consultants on behalf of Starfield Resources Inc. We trust this report fulfils Starfield's requirements at this time. If you have any questions, please contact the undersigned.

Respectfully submitted,

EBA ENGINEERING CONSULTANTS LTD.

Prepared by:

S. Moore, B.E.S., B.A.
Wildlife Biologist

J. Matheson, M.Sc., R.P.Bio.
Wildlife Biologist

T. Abercrombie, B.Sc., M.Sc.
Environmental Scientist

Reviewed by:

R.A. Hoos, M.Sc., R.P.Bio.
Principal Consultant

COLLEGE OF APPLIED BIOLOGY
Richard A. Hoos
R.P. Bio #1033
CAB

5.0 REFERENCES

Agriculture and Agri-Foods. 1996. Ecoregions, Soil Landscapes, Base Data. Soil Landscapes of Canada, Ver. 2.2 and Soil Organic Carbon. Digital Database of Canada, National Soils Database, 1:1 Map and associated text pages.

Baillie, S.R. 1991. Monitoring terrestrial breeding bird populations. *in Monitoring for Conservation and Ecology*. Goldsmith, F.B. (Ed.). Chapman and Hall. New York, New York. 275 pp.

Banci, V. and S. Moore. 1997. *1996 Wildlife Studies*. Prepared by Rescan Environmental Services for BHP Diamonds Inc, Yellowknife, NT.

Beanlands, G.E. and P.N. Duinker. 1983. An ecological framework for environmental impact assessment in Canada. Institute for Resource and Environmental Studies, Dalhousie Univ., Halifax. 132 pp.

Beverly and Qamanirjuaq Caribou Management Board. 2002. Beverly and Qamanirjuaq Caribou, 1996 – 2002, Management Plan. 12 pp.

Beverly and Qamanirjuaq Caribou Management Board. 1999. Protecting Beverly and Qamanirjuaq Caribou and Caribou Range. Part I: Background Information. 19 pp.

Bibby, C.J., N.D. Burgess and D.A. Hill. 1993, *Bird Census Techniques*. Academic Press. Toronto. 257 pp.

COSEWIC. 2000. Canadian Species at Risk, May 2000. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

COSEWIC 1999. COSEWIC updates list. *News release, May 7*. Ottawa.

Craighead, F.C. Jr. and D.P. Mindell. 1981. Nesting raptors in western Wyoming, 1947 and 1975. *J. Wildl. Manage*. 45:865-872.

Dawson, D.G. 1981. Counting Birds for a Relative Measure (Index) of Density. *Studies in Avian Biology*. No. 6:12-16.

EBA Engineering Consultants Ltd. (EBA). 2002. 2001 Wildlife Baseline Studies, Ferguson Lake, Nunavut. Prepared for Starfield Resources Inc., Vancouver, BC for EBA Engineering Consultants Ltd., Yellowknife, Yukon.

Ecological Stratification Working Group. 1995. *A national ecological framework for Canada.* Agriculture and Agra-Food Canada, Research Branch, Centre for Land and Biological Resources Research, Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch, Ottawa-Hull. 125 pp.

Graf, R. and C. Shank. 1989. Abundance and Distribution of Muskoxen Near Artillery Lake, NWT. March 1989. Department of Renewable Resources, Government of the Northwest Territories. File Report No. 80. 19 pp.

Graves and Hall. 1988. *Arctic Animals*. Department of Renewable Resources, Government of the Northwest Territories, Yellowknife.

Jolly, G.M. 1969. Sampling Methods for Aerial Census of Wildlife Populations. *E. Afr. Agric. For. J.* 34:46-49.

Kennedy, P.L. 1980. Raptor baseline studies in energy development. *Wildl. Soc. Bull.* 8:129-135.

Kuyt, E. 1980. Distribution and breeding biology of raptors in the Thelon River area, Northwest Territories, 1957-1969. *Can. Field-Naturalist* 94:121-130.

Newton, I. 1979. *Population ecology of raptors*. Buteo Books, Vermilion, South Dakota.

Platt, J.B. 1976. Gyrfalcon nest site selection and winter activity in the western Canadian arctic. *Can. Field-Naturalist* 90:338-345.

Poole, K.G. and R.G. Bromley. 1988*a*. Natural history of the gyrfalcon in the central Canadian Arctic. *Arctic* 41:31-38.

Poole, K.G. and R.G. Bromley. 1988*b*. Interrelationships within a raptor guild in the central Canadian Arctic. *Can. J. Zoology* 66:2275-2282.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. U.S.D.A. For. Serv., Albany, CA. General Technical Report PSW-GTR-144.

Ralph, C.J. and J.M. Scott (eds.). 1981. Estimating the Number of Terrestrial Birds: Studies in Avian Biology no. 6. Copper Ornithological Society, Lawrence, Kansas.

Robbins, C. 1981. Effect of time of day on bird activity. *Studies in Avian Biology*. No. 6:275-286.

Shank, C. C. 1997. *1996 central Arctic raptor surveys.* Unpubl. Report. Dept. of Resources, Wildlife and Economic Development. 4pp.

Shank, C.C., R.G. Bromley, and K.G. Poole. 1993. Increase in breeding population of tundra peregrine falcons in the central Canadian Arctic. *Wilson Bull.* 105:188-190.

Shank, C. C., and K. G. Poole. 1994. Status of gyrfalcon *Falco rusticolus* populations in the Northwest Territories, Canada. Pp 421-436 in B.-U. Meyburg and R. D. Chancellor (eds.), *Raptor Conservation Today*. WWGBP/the Pica Press.

Skirvin, A.A. 1981. Effect of time of day and time of season on the number of observation and density estimates of breeding birds. *Studies in Avian Biology*. No. 6:271-274.

Verner, J. 1985. Assessment of counting techniques, pp. 247-301. In: R.F. Johnston (ed.). Current Ornithology Vol. 2. Plenum Press, New York.

Wakelyn, Leslie. 1999. The Qamanirjuaq Caribou Herd – An Arctic Enigma. http://www.arctic-caribou.com/qcs.pdf.

APPENDIX A

SPECIES OBSERVED DURING AERIAL SURVEYS, FERGUSON LAKE, NU, 2002 and 2001

All wildlife observation list in order of frequency during aerial survey at Ferguson Lake, NU, June 22, 2002.

Species	TOTAL
Caribou	238
Muskoxen	52
Canada Goose	24
Sandhill Crane	15
Tundra Swan	5
Snow Goose	3
Rough-legged Hawk	2

All wildlife observation list in order of frequency during both aerial caribou surveys at Ferguson Lake, NU, in 2001.

Species	July	August	Totals
Caribou	8,536	24	8,560
Canada Goose	252	77	329
Greater white-fronted Goose	0	167	167
Muskox	79	5	84
Sandhill Crane	10	38	48
Herring Gull	2	27	29
Tundra Swan	7	4	11
Wolf	5	0	5
Long-tailed Jaeger	0	1	1
Rough-legged Hawk	0	1	1
Golden Eagle	1	0	1
Willow Ptarmigan	1	0	1

APPENDIX B

AVIAN AND MAMMAL SPECIES OBSERVED DURING BREEDING BIRD SURVEYS, FERGUSON LAKE, NU, 2002.

Mammalian Species	No. of Individuals	Avifauna Species	No. of Individuals
Arctic Fox	1	American Pipit	6
Artic Hare	8	American Tree Sparrow	47
Muskoxen	1	Blackpoll Warbler	3
Caribou	19	Canada Goose	31
Arctic Ground Squirrel	1	Common Raven	2
		Common Snipe	2
		Gray-Cheeked Thrush	7
		Greater White-Fronted Goose	5
		Harris' Sparrow	1
		Herring Gull	16
		Horned Lark	17
		Hoary Redpoll	53
		Lapland Longspur	117
		Least Sandpiper	2
		Long-Tailed Jaeger	3
		Northern Pintail	4
		Long-tailed Duck	8
		Red-breasted Merganser	2
		Rough legged Hawk	3
		Sandhill Crane	17
		Savannah Sparrow	126
		Semipalmated Sandpiper	4
		Stilt Sandpiper	1
		Surf Scooter	1
		Tundra Swan	9
		Unknown Passerine	6
		Unknown Raptor	0
		White-Crowned Sparrow	8
		Willow Ptarmigan	12
Total Species	***5***	***Total Species***	***27***
Total Individuals	***30***	***Total Individuals***	***513***

APPENDIX C

WILDLIFE SPECIES OBSERVED IN THE SRI STUDY AREA, FERGUSON LAKE, NU, 2002.

Miscellaneous wildlife observation list in order of frequency during surveys and at near camp area at Ferguson Lake, NU, 2002.

Species	Total
Muskoxen	112
Long-tailed Jaeger	4
Caribou	4
Sandhill Crane	2
Great white-fronted Goose	2
Rough-legged Hawk	1
Canada Goose	1

APPENDIX D

HABITAT CLASSIFICATION OF THE SRI STUDY AREA, FERGUSON LAKE, NU

Ecosystem	Formal Name	Common Name	Map Code
1	*Betula – Ledum*	Mesic Tundra	BL
2	*Saxifraga – Silene*	Esker Top	SS
3	*Betula – Empetrum*	Esker sides, tundra crests	BE
4	*Betula – Rubus chamaemorus*	Birch Hummock	BR
5	*Betula – Calamagrostis*	Birch Seep	BC
6	*Eriophorum vaginatum – Andromeda*	Cottongrass Tussock	EA
7	*Carex chordorhiza – E. russeolum*	Sedge Meadow	CE
8	*Salix – Rubus arcticus*	Willow Riparian	SR
9	*Carex aquatilis – E. angustifolium*	Sedge Fen	CA
10	*Arctophila – Ranunculus*	Emergent Marsh	AR
11	Lichen	Lichen – Boulder Field	BF
12	Exposed Bedrock		RB
Modifiers:			
B	30% or more of the surface cover is boulders		
R	30% or more of the surface cover is bedrock		
S	Slope is 15% or greater		
E	Unit occurs on an esker		
G	Unit has more than 30% cover of shrubs greater than 50 cm in height		

APPENDIX E

DESCRIPTION OF ECOSYSTEM (LANDSCAPE) UNITS WITHIN THE FERGUSON LAKE STUDY AREA

Ecosystem Unit	Description
Heath Tundra	Includes bouldery tundra (BLb), rocky tundra (BLr) and non-esker *Betula-Empetrum* (BE) habitats. All typically have a mat of dwarf birch and prostrate shrub vegetation.
Esker complex	All ecosystem units occurring on esker landforms; SSe on esker tops, BEe on side-slopes, and BLe and occasionally BRe at the base of eskers.
Birch hummock	All polygons typed as BR.
Birch seep	All polygons typed as BC.
Willow riparian	All polygons typed as SR.
Wetland complex	A complex of cotton-grass tussock (EA), sedge meadow (CE), and occasionally sedge fens (CA) and emergents (AR).
Tussock tundra	All polygons typed as EA.
Bedrock and boulder fields	Includes exposed bedrock (RB), which is relatively rare, and boulder fields (BF), which are more common. Both support little vegetation other than lichens and have generally low capability for wildlife.