

PRAIRIE CREEK PROJECT
VEGETATION AND WILDLIFE
INITIAL ENVIRONMENTAL EVALUATION

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1.1 Study Background

Mineral exploration in the Prairie Creek area of the Mackenzie Mountains has been more or less continuous since the 1960's. Starting in the late 1970's a concerted effort by Cadillac Explorations Ltd. was initiated to establish an operating mine at the site of the current exploration camp, serviced by an access road from there 160 kilometres to the Liard Highway.

In support of this initiative, Cadillac submitted separate initial environmental evaluation reports to the regulatory agencies covering the mine and the proposed winter road (Ker Priestman, 1980a,b). The reports included background information on the wildlife of the study area (mine and access corridor), plus information gathered during wildlife surveys conducted during early July, 1980. The review of these reports resulted in the approval of a winter road, which was completed the following winter (1980-1981).

One of the conditions of the conditions of this approval was that Cadillac Explorations consultants were required to conduct detailed vegetation and wildlife studies of the Prairie Creek area and access corridor in 1981. The studies were initiated in January, 1981 and the completed report, *Prairie Creek Project Vegetation and Wildlife Studies 1981* was submitted that September (Beak, 1981). That report mapped the vegetation of the study area, evaluated the habitat potential for dall's sheep, woodland caribou, and moose, plotted wildlife observations from three systematic surveys (January, March, and June), and discussed potential impacts.

The review by the Government of the Northwest Territories Wildlife Branch identified three topics about which further information was required:

- Dall's sheep lambing areas;
- distribution of thermal cover, particularly in the Grainger River area; and
- mountain (woodland) caribou calving areas.

Further surveys were conducted in 1982, and Beak prepared a Prairie Creek Project Wildlife Studies 1982 Addendum which was forwarded to reviewers in draft form in October, 1982. The report provided distribution maps covering the topics requested, and further consideration of impacts as they affected these species. That completed the wildlife work for Cadillac Explorations Ltd.

Interest in the wildlife of the area continues, and studies such as those conducted by the Canadian Wildlife Service on trumpeter swans, and other studies in the neighbouring Nahanni National park are referenced in the following report.

1.2 Study Area

The study area is a corridor approximately 10 km in width extending approximately 160 km from the Liard Highway, at a location 1.5 km east of the Liard River and approximately 7 km north of the Blackstone River, westward to the Mackenzie Mountains and Prairie Creek (Figure W-1). The corridor crosses and includes portions of three mountains ranges and one high elevation plateau. These include: a) the Nahanni Range between Bluefish Lake on the south and a point approximately 22 km north of the Grainger River Pass; b) the Silent Hills; c) the Ram Plateau; and d) the Mackenzie Mountains. Maximum elevations of these components of the study area exceed 1500 m in the Nahanni Range, 1150 m in the Silent Hills, 1180 m on the Ram Plateau, and 1920 m in the Mackenzie Mountains.

The corridor crosses several important rivers and creeks. Starting in the east these include: a) Liard River, b) Grainger River, c) Fishtrap Creek, d) Tetcela River and tributaries, e) unnamed tributaries of the Ram River south of Sundog Creek, and f) Prairie Creek and certain of its tributaries (Figure W-1).

The study area is virtually identical to that employed for the earlier wildlife studies (e.g. Beak, 1981). There is one exception owing to proposed changes in the road alignment immediately east of the Silent Hills. This alignment change has required an extension southward of the study area to include a greater portion of the Silent Hills and Tetcela River drainage to ensure coverage of a 5 km radius with the road.

1.3 Study Scope and Objectives

The overall scope of this report is to provide coverage of vegetation and wildlife resources of the study area, and an environmental assessment of potential impacts to these resources from mine development by San Andreas Resources Ltd. up to the level of an initial environmental evaluation.

The specific objectives to meet this goal are as follows:

- i) describe and map the basic vegetation zones of the study area, placing emphasis on understory and shrub vegetation;
- ii) describe the wildlife species of importance, specifically woodland caribou, Dall's sheep, moose, grizzly bears, wolves, raptors, and trumpeter swans.

- iii) provide coverage of the seasonal distribution and abundance of the key wildlife species, particularly as they relate to the access corridor.
- iv) identify the habitat utilization patterns of the key ungulates of the study area: Dall's sheep, woodland caribou, and moose;
- v) describe and plot sheep lambing and caribou calving areas in the study area;
- vi) identify significant bird breeding, staging or moulting areas, seasonal use patterns as they relate to project development areas;
- vii) identify raptor breeding sites along the road corridor and in the vicinity of the mine site and airstrip;
- viii) identify key grizzly bear habitat and denning sites in relation to all areas of development, including potential borrow sites; and
- ix) identify and locate any rare or endangered species of plant or wildlife in the development area.

The review of existing studies and field investigations to meet these objectives are the subject of this report.

1.4 Report Structure

The report differentiates inventory and assessment information between two components of the study area: a) Minesite and Prairie Creek, and b) Access Route. The methods section (2.0) is common to both components, as was the approach in collecting information.

The boundary has been placed at South Pass in the Mackenzie Mountains. This represents the approximate eastward limit of exploration associated with the mine's lead-zinc-silver deposit. This boundary has no obvious ecological basis, therefore some of the information is presented, for example maps, for the entire study area. Because of the absence of an ecological boundary in the middle of the Mackenzie Mountains, all of the information on Dall's sheep in this range is initially presented within the minesite component. Only brief reference is made to it in the access route section. However, the access route section is where impacts associated with traffic are discussed in most detail. Where necessary information is repeated where it applies to both sections.

2.0 APPROACH AND METHODS

2.1 Vegetation

The only detailed vegetation mapping of the study area was completed in 1981, and was based on a vegetation survey of July, 1981 (Beak, 1981). One of the objectives of this survey was to provide a framework for wildlife habitat assessment. The details of that survey program and its sampling component are provided in the Beak (1981) report. For purposes of this account, their basic methodology is summarized, along with the approach used in September, 1994 to reassess the 1981 mapping.

The original mapping was based on airphoto interpretation plus systematized ground sampling. For each of the lowland vegetation types one sampling transect was established within one large representative stands and run at right angles to the road.

Five sampling

sites were established at random along each transect, and at each site plots of 10 m x 10 m - tree layer, 4 m x 4 m - shrub layer, 1 m x 1 m - herb layer, and 0.1 m x 0.1 m - moss layer were sampled. Plot information was collected and recorded following the methods laid down by Walmsley et al (1980). Data for each site included floristics, site position, surface shape, slope, aspect, and gross soil characteristics.

The 1994 field program completed a reconnaissance of the vegetation of the corridor, looking for macro scale changes. Two burns were discovered, one rather substantial, and from an elevation of approximately 1000 m, their approximate boundaries were plotted. Conspicuous topographic markers, such as lakes, ponds, creeks, and rivers assisted in the mapping of these areas. In addition, in the study area extension in the Silent Hills, provisional mapping was accomplished via reconnaissance overflight, site visit, and photographic coverage of the vegetation.

2.2 Wildlife

Information on wildlife has been obtained through habitat assessment and wildlife surveys conducted by Beak (1981, 1982), and during this study. The habitat assessment conducted by Beak (1981) was based on information from browse surveys and pellet group counts following method described in that report. The browse surveys comprised information on forage abundance and browse utilization to provide a browse index,

which is a measure of browsing intensity. Habitat classification maps were prepared by gathering together all habitat related field data and earlier habitat mapping for that part of the Northwest Territories.

Surveys of wildlife populations were based on aerial surveys using helicopters (Bell 206 Jet ranger with bubble windows, or Aerospatiale Gazelle), and employing three observers: two biologists, positioned on opposite sides of the aircraft, plus the pilot. As indicated by Beak (1981), all observations were registered by number on the 1:50,000 maps used during the survey, and information appropriate to each observation was recorded on cassette tape. This information included number of animals present, habitat types in which they were observed, and straight-line distance from the mine or road facilities (Beak, 1981).

The surveys used a linear strip method at 2 km intervals in non-mountainous terrain, and a contour-line survey method in the study area's mountains (Beak, 1981). The limitations in what information could be inferred from the observations was acknowledged at the time by the reports authors, and bears repeating. There are a number of biases associated with aerial surveys, the most critical being the tendency to undercount (Caughley, 1974). Sightability of animals varies under a variety of conditions (e.g. animal coloration, habitat, air speed, altitude, and observer ability).

In September, 1994 the focus was on wetlands, owing to poor flying conditions at high elevation, and an interest in identifying use by trumpeter swans on wetlands which might be close to the road. Wetlands along the corridor were identified on 1:50,000 scale maps and were numbered for specific site identification. Of the total of 128 wetlands identified by number, a total of 59 were surveyed, primarily for waterfowl but other species were noted.

Different methods were utilized depending on the type of wetland surveyed, and its distance to the nearest wetland. For discrete wetlands separated from other wetlands by more than 500 m and with limited marshy borders, the approach was made at high elevation (> 100 m) and at some distance to delay diving by divers (grebes and loons) and diving ducks. The water surface was scanned for birds, and ripples left by diving birds, during a complete circuit. If waterfowl were observed, a second circuit was made at lower elevation to obtain a better estimate of species composition.

In parts of the Fishtrap and Tetcela river systems the mapped wetlands are part of the river drainage, being more or less connected with the river or adjacent wetlands. A similar strategy was employed, except that a high elevation approach was usually possible only with the first of a series of wetlands. Instead the strategy to circle the lake slowly at relative low elevation to flush and identify to species waterfowl located in the perimeter marshes, and on the second pass at higher elevation (c. 30 m) to identify

waterfowl in the open water.

An attempt was made to identify waterfowl to species, but this was not always possible. In these cases species were identified to species group.

3.0 ENVIRONMENTAL SETTING - MINESITE AND PRAIRIE CREEK

3.1 Vegetation and its Use by Wildlife

Vegetation studies in the Mackenzie Mountains (minesite and Prairie Creek) indicated that it is composed of four basic vegetation units: spruce lichen, subalpine parkland, alpine tundra, and pine parkland (Beak, 1981).

Unit # 1: Spruce/Lichen

This unit is distributed entirely within the Mackenzie Mountains, extending from valley floor to the upper slope extensions of relatively stable colluvial slopes (Figure W-2) Its approximate elevational range is 975 - 1280 m. Its most conspicuous feature is the cream-coloured ground cover provided by a thick layer of lichen, primarily the reindeer lichen (*Cladina stellaris*). Forest cover is variable, depending on aspect and topography, with the greatest densities in draws and on south, southwest, and west facing slopes.

The Beak investigators pointed out that the South Pass component of the spruce/lichen vegetation unit is more sparsely stocked in its tree cover than the Prairie Creek component. This is explained in part by the steep, narrow valley of the former, which influences thermal conditions, plus its greater extent of talus, hence less total plant cover.

The Beak investigators considered this to be the best woodland caribou habitat in the combined study area (mine and access route). They made reference to light browsing of several shrub species (Beak, 1981), but if this is preferred caribou habitat, it will be the lichens which comprise most of the diet. Observations in September, 1994 in this zone immediately adjacent to Prairie Creek at several locations along its length indicated a parallel game trail 5-40m from the river bank depending on local topography. There were frequent caribou tracks, and a few moose tracks. Some disturbance to the lichen ground mat may indicate pawing as well as foraging.

Unit # 2: Subalpine Shrub

In the Mackenzie Mountains this vegetation unit is a mid-elevation zone lying between the spruce lichen and alpine tundra units. Vegetation was sampled from two sites, one in the Prairie Creek drainage and the other in the South Pass drainages (Beak, 1981). Both sites were characterized by a thin organic layer, a variable shrub cover (10-100%) dominated by dwarf birch (*Betula nana*), Labrador tea (*Ledum groenlandicum*), and willow (*Salix glauca*). Herb cover was limited (5-30%), but the ground cover was 60-100% and dominated by reindeer lichen at one site, and *Cetraria* and *Alectoria* lichens at the other site (South Pass).

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Figure W-2

Evaluation of browse in July indicated only limited use (Beak, 1981). Pellet groups at sampling sites indicated use was primarily by Dall's sheep, with some evidence of use by woodland caribou.

Unit # 3: Alpine Tundra

This vegetation unit comprises a substantial area, and provides much of the characteristic features of the Mackenzie Mountains. It comprises all the area above tree line, and thus was found to be highly variable in plant cover and type (Beak, 1981). Characteristic vegetation, based on greatest coverage, was the lichen, *Cetraria nivalis*, the mountain-avens, *Dryas integrifolia*, the heather, *Cassiope tetragona*, and the creeping willow, *S. nivalis*.

This is an important unit, primarily because it represents the key winter range and lambing areas for Dall's sheep, and calving areas for woodland caribou (Beak, 1981, 1982). Animal use during the Beak habitat studies was confirmed by evidence of cratering, browsing on *Vaccinium uliginosum*, *Betula nana*, and *Carex albo-nigra*. Pellet groups of both Dall's sheep and woodland caribou were relatively common.

Unit # 4: Pine Parkland

A small component of the pine parkland vegetation unit occurs within the Mackenzie Mountain portion of the study area (Beak, 1981). It is in a low elevation valley immediately north of the Second Canyon between 425m and 750m. No vegetation sampling was conducted in this area. Elsewhere along the corridor, pine parkland was characterized by low tree layer cover (8-15%) consisting of jack pine (*Pinus banksiana*), black spruce, white spruce (*Picea glauca*), and the willow (*S. arbusculoides*). The shrub layer (coverage 5-45%) was dominated by dwarf birch and Scouler's willow (*S. scouleriana*); in the herb layer (coverage 15-65%) the prominent species were bunchberry (*Cornus canadensis*), lingonberry (*Vaccinium vitis-idaea*), and twinflower (*Linnaea borealis*); and at ground level there was 100% cover primarily by red-stemmed feathermoss (*Pleurozium schreberi*) and *Cladonia* lichen.

Browse utilization and pellet group counts in this vegetation unit ranked third and first compared to all units in the combined study area. Based on pellets, moose was estimated by Beak (1981) to be the predominant ungulate species in this vegetation unit.

3.2 Wildlife

3.2.1 Dall's Sheep

Dall's sheep are a conspicuous feature of both the Mackenzie Mountains and the Nahanni Range. Knowledge of their occurrence and habitat preferences is based primarily on surveys conducted in 1980 and 1981, information from other investigations conducted in the area by Parks Canada and the NWT wildlife Branch (e.g. Simmons, 1981), and incidental observations by the Rescan study team in September, 1994. The months of observation were January, March, April, June and July. Systematic surveys of the Mackenzie Mountain study area component were flown in all of those months except April. From these observation the following pattern emerges.

Winter: In January, 14 of 17 sheep observed were east of Prairie Creek along the eastern fringe of the Mackenzie Mountains in windswept areas devoid of snow (Beak, 1981). Only three rams were found to the west of Prairie Creek in areas of considerable snow depth (Figure W-3). In March surveys conducted seven weeks later the number of Dall's sheep recorded in the Mackenzie Mountains had risen to 45, all of them located east of Prairie Creek. The difference was they were located over a broader band of the eastern plateaus of the Mackenzie Mountains.

In terms of habitat classification, two contiguous areas in the Mackenzie Mountains ranked high for winter range (Figure W-3). The more westerly one (class 1) combined moderate forage, wind swept plateaus, and abundant escape terrain. Immediately to the west is a class 2 area, similar to the previous area, except that forage is sparse, and escape terrain is limited. To the west, several areas were rated as moderate winter range, but few or no sheep were observed in these areas.

Lambing: No systematic surveys were conducted in April and May, thus the early June survey (1981) has the most relevance to lambing since it so closely followed that event.

A total of 45 Dall's sheep were observed, 13 of them in the mountains west of Prairie Creek, and others on mountains immediately adjacent to Prairie Creek, mountain ranges on which they were absent during surveys ten weeks earlier (Figure W-3). The data support the hypothesis that the animals move from superior winter range east of Prairie Creek to superior lambing areas in the mountains immediately adjacent to Prairie Creek. These mountains are topographically more precipitous, with more escape terrain and likely more secluded protected locations for lambing. Among the sheep observed were 4 rams, 26 ewes, and 15 lambs (Beak, 1981).

One lamb and ewe were observed on a steep slope, at relatively low elevation,

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Figure W-3.

approximately 0.3km west of the airstrip. Of the twelve sites where ewes and lambs were observed, nine were within three kilometres of the mine, or access road in the Mackenzie Mountains. The significance of this is discussed below, and was reviewed earlier (Beak, 1982). The main point is that these sheep were distributed at locations considerable above the valley floor and generally out of site of it.

Summer: Sheep distribution in summer is based on July, 1980 surveys by Beak (Ker Priestman, 1980b). These showed traditional social concentration patterns for that period. Rams had a separate distribution, primarily on the west side of Prairie Creek and south of the mine. In one location, approximately 8 km south of the mine, 18 rams were found in one group. During those surveys, several nursery bands were found: one of these directly west of the mine, and another east and upslope of Caribou Flats.

Fall: Information from the fall period is much more limited, and is not supported by data from systematic surveys. Even so, incidental sightings of wildlife by mine staff at the San Andreas Resources and recorded by camp management indicates a sharp reduction in sightings of sheep near the mine and along the access route as far as km 18 after August (Table 1).

Table 1. Sightings of Dall's Sheep by camp personnel in 1994 near the San Andreas Resources explorations camp, by camp personnel.

Month	Number of Sightings	Total Animals Observed
June	3	56
July	7	131
August	4	30
September	1	1
October	1	2

In addition to the tabulated information, it is important to point out that of the total of 220 animals observed, 155 were observed in three groups of lambs and ewes (50, 50, 55) on the airstrip, just around the corner from the mine. They were observed June 4, July 6 and July 10. The last substantial concentration (14) was August 28, probably lambs and ewes, but it was not recorded. While these data indicate a late summer dispersal away from areas immediately around the mine it is not obvious what the distribution of Dall's sheep may be in September and October.

3.2.2 Woodland Caribou.

Recorded observations of woodland caribou in the study area are concentrated primarily in the summer. The following account is based primarily on sightings recorded by personnel from Beak consultants which flew surveys in 1980 and 1981.

Winter: Two systematic surveys of the Mackenzie Mountains were conducted in winter, in January and March, 1981 (Beak, 1981). During this period there was only one observation of woodland caribou, a group of five approximately eight kilometres southwest of the exploration camp (Figure W-4). There were other sightings. Unfortunately, the Beak report does not mention whether caribou tracks were sighted in the Mackenzie Mountains.

As indicated by the literature review of winter habitat requirements, woodland caribou winter range consists primarily of mature, open black spruce forests with a ground mat of reindeer lichen (Beak, 1981). This habitat, which characterizes major features of the spruce lichen habitat zone, occurs in the Mackenzie Mountain in the valley floor where snow depth will at times limit mobility and access to forage (Figure W-4).

Calving: The early June survey conducted in 1981 is assumed to have recently followed the calving period, and thus may reflect, partially at least, the calving distribution of this species in this portion of the Mackenzie Mountains.

In early June, 1981 a total of 74 woodland caribou were observed in the Mackenzie Mountains. The composition included 5 males, 39 females, 19 calves; 11 were unclassified (Beak, 1981). Of this total, only 12 were located west of Prairie Creek. Of the 62 remaining, 25 were located in the hills surrounding Caribou Flats, and 37 north and east of the exploration camp, including 28 which were located east of the divide and thus on the access route portion of the study area.

From these post calving observations, a map of probable calving areas was plotted (Figure W-5). Of the groups observed, there was one group of 6 cows and 6 calves, and another of 3 cows and 3 calves. This infers a trend towards forming post-calving or nursery bands. In his study of woodland caribou in the Spatzizi Plateau of British Columbia, Bergerud listed four reasons for post-calving aggregations:

- a) cows and calves congregate in areas with abundant forage near to calving grounds;
- b) they congregate in open areas for good visibility;

- c) these areas are traditional post-calving areas; and

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Figure W-4.

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Figure W-5.

- d) post-calving aggregations are an anti-predator strategy.

Summer: Observations of woodland caribou during July (1980) in the Mackenzie Mountains were limited. This indicates the post calving congregations observed on the eastern plateaus of this range in June disperse before mid July. One likely hypothesis is that the caribou move down to lower elevation as the forage in the xeric conditions of high elevations deteriorates. In this scenario, some caribou females and their young might move into the spruce lichen environments at lower elevation within this component of the study area, whereas others would move into the black spruce parkland immediately east of the Mackenzie Mountains.

Autumn: There were no systematic surveys of the study area during fall months. Incidental observations of caribou by San Andreas Resources personnel, are much less than that of dall's sheep, and the few sightings of caribou or their tracks in the autumn only confirm that caribou remain in the mountains at this time of year.

3.2.3 Moose

The majority of moose sightings have been made in the lowland habitats in the eastern half of the study area. There was one sighting during the January (1981) survey (Figure W-6), north of Folded Mountain (Beak, 1981).

The Mackenzie Mountains were classified as fair moose habitat in the valley bottoms, and poor elsewhere.

3.2.4 Grizzly and Black Bears

The June, 1981 survey was directed at searching not only for calving and lambing areas, but also for evidence of grizzly bear denning activity. The timing of the survey (June 9,10) was considered ideal for located recently used dens.

Diggings were observed west of Folded Mountain, and one adult was spotted not far away. The diggings were closely examined, but no den was found (Beak, 1981). Another grizzly bear was observed along Tundra Ridge east of Caribou Flats (Figure W-6). During the previous summer, a sow and two cubs were observed at tree line southwest of the camp area.

On September 15, 1994 a ground survey between the camp and Folded Mountain revealed grizzly bear tracks extending from the airstrip north for approximately two kilometres. On September 13, grizzly bear tracks were observed on a Prairie Creek sandbar approximately 10 km north of Folded Mountain.

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Figure W-6.

Black Bears also occur in the study area, though infrequently seen. One was reported near the camp (Ker Priestman, 1980a), but there have been no other recorded sightings in this part of the study area. The preliminary conclusion is black bears are not common in the Mackenzie Mountains. Black bears are less common in areas supporting moderate to high densities of grizzly bears, and this may apply in the Mackenzie Mountains.

3.2.5 Wolf

Sightings of wolf are infrequent, but they are assumed to be a persistent element of the area's wildlife. In 1980, camp personnel identified Caribou Flats and the camp area as sites where wolves had been observed. No sightings were made during the 1981 areal surveys.

In 1994, one wolf was observed by camp personnel east of Folded Mountain on the access route; the precise position is not clear from the notes. On September 12, a solitary wolf was observed crossing the access route approximately one kilometre east of Folded Mountain. From this information, it is not possible to infer any information on the population of wolves or their pressure on prey populations (caribou, sheep) in this area.

3.2.6 Furbearers

Furbearer habitat in the Mackenzie Mountains is primarily restricted to terrestrial furbearers. Very little recorded information is available, except that general studies for the Northwest Territories identify marten, lynx, weasel, and wolverine as the most important furbearers. Wolverine occur in the lowest densities of those species identified, but one was observed in July, 1980 in alpine tundra habitat, southwest of the exploration camp (Ker Priestman, 1980b)

3.2.7 Aquatic Birds

The Mackenzie Mountain component of the study area is a precipitous environment in which the only aquatic environment is Prairie Creek, its tributaries, plus the tailings pond immediately north of the exploration camp.

In spite of these unlikely conditions, sightings were made during fish habitat surveys along Prairie Creek. A flock of seven American wigeon were observed on the creek approximately four kilometres northwest of Folded Mountain (Figure W-6). Approximately five kilometres south of camp one green-winged teal was observed.

Observations made in July, 1980 indicate Prairie Creek is a breeding area for spotted

sandpipers (Ker Priestman, 1980b). No other breeding aquatic birds were observed.

3.2.8 Raptors

During July, 1980 surveys of the minesite and Prairie Creek raptor surveys were conducted along suitable looking cliffs. The target of the surveys were nests of golden eagles and peregrine falcons.

In April of that year, there were observations of golden eagle above Caribou Flats (Ker Priestman, 1980a), and in July an active eyrie in cliffs between there and the road corridor (Figure W-6).

During the January, 1981 survey there was one confirmed sighting of a gyrfalcon at high elevation, less than five kilometres NNE of the camp. On that survey, ptarmigan were frequently flushed from the alpine areas; these are a likely prey for gyrfalcons.

3.2.9 Rare and Endangered Species

According to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 1992) there are several designated species which could occur in the study area in the endangered, threatened, or vulnerable categories. The *anatum* subspecies of peregrine falcon, listed by COSEWIC as endangered, could breed in the Mackenzie Mountains, though Beak surveys of all likely cliffs did not locate any of their nests, nor any individual birds.

There are no likely species in the study area in the threatened category, but several species are listed as vulnerable. This list includes woodland caribou, grizzly bear, wolverine, great grey owl, and trumpeter swan. The first two have already been discussed. Trumpeter swans are an increasingly common breeding species, particularly in the Tetcela and Fishtrap Creek drainages, and are discussed under the access route (Section 5.0).

One wolverine was observed on alpine tundra habitat in July, 1980 (Ker Priestman, 1980b), and at that time, mine personnel identified wolverine among species seen infrequently during the previous twelve years (1968-1980) of exploration activity (Ker Priestman, 1980a).

Great grey owls have not been recorded in the area of the minesite and Prairie Creek, although the area is within their range.

4.0 ENVIRONMENTAL EVALUATION - MINESITE AND PRAIRIE CREEK

5.0 ENVIRONMENTAL SETTING - ACCESS ROUTE

5.1 Vegetation and its Use by Wildlife

Vegetation along the access route is composed of twelve vegetation units: aspen-Liard floodplain, floodplain/tillplain, Grainger tillplain, burn, black spruce muskeg, pine parkland, subalpine shrub, alpine tundra, mixed coniferous deciduous, black spruce parkland, riparian alluvial, and spruce lichen. The information is based on 1981 and 1982 vegetation studies by Beak (1981, 1982) and by observations and mapping completed in September, 1994.

Unit # 1: Spruce/Lichen

Along the access route east of the Prairie Creek/Ram River system divide, spruce lichen is distributed in limited areas in the valley floors of four of the Ram River tributaries.

The description in Section 3.1 applies equally to these examples of the spruce lichen vegetation zone, except to reemphasize the reduced tree cover in this drainage. Basically, its distinctive feature is the cream-colour of its ground cover, composed almost entirely of the reindeer lichen, (*Cladina stellaris*).

This has been reported to be the best woodland caribou habitat in the combined study area (Beak, 1981). A ground survey along the winter road in this area found almost continuous caribou tracks.

Unit # 5: Black Spruce Parkland

This unit extends from the eastern base of the Mackenzie Mountain ramparts eastward to the eastern edge of the Ram Plateau. In terms of the access route, it starts at kilometre 32 and extends more or less continuously to kilometre 64 (Figure W-2). The elevational range is 793-915 m (Beak, 1981).

Tree cover varies from 5% - 30% comprised mostly of black spruce, with patches of white spruce on well drained south aspect slopes. Trees support a rich corticous lichen cover of *Alectoria* and *Parmelia* species. The shrub layer (20-45% coverage) is primarily composed of dwarf birch and willow (*S. glauca*). Coverage in the herb layer is also moderate (10-45%); major species are kinnikinnik (*Arctostaphylos uva-ursi*), along with labrador tea and blueberry (*Vaccinium* sp.). Ground cover is 100%, and is composed primarily of reindeer lichen and red-stemmed feathermoss (Beak, 1981).

Habitat studies in July (1981) indicated only limited recent browsing of dwarf birch and willow (Beak, 1981). Three moose pellet groups were recorded along the one transect surveyed. This unit should represent an important habitat for woodland caribou at certain times of year.

Unit # 6: Riparian Alluvial

Riparian alluvial is essentially sparsely vegetated alluvial streams and rivers of the Ram River system. The braided streams in this unit are relatively wide in places, and on some of the instream islands which survive for several years there may be colonization by willow, *Dryas integrifolia*, and various grasses and sedges. The unit was not sampled in earlier studies by Beak (1981), but is likely to represent an occasional wildlife corridor, and for moose a class 2 winter range.

Unit # 4: Pine Parkland

The pine parkland vegetation unit occurs in both study area components, and was described in Section 3.1. Along the access route it occurs on i) the lower slopes of the Nahanni Range, between 549 and 763 m, and ii) the Ram Plateau from kilometre 53 to 63, within a limited elevational range (915-975 m). Studies of tree cover indicated forest communities within this unit: one dominated by the jack pine on 10% slope and southwest aspect, the other by black spruce in poorly drained depressions. Like many of the lowland units, the ground cover is 100%, composed in the jack pine type primarily of red-stemmed feathermoss and reindeer lichen (Beak, 1981).

Habitat studies indicated limited browsing, and 9 moose pellet groups were found.

Unit # 7: Mixed Coniferous/Deciduous

The mixed coniferous deciduous covers the low elevational parts of the Tetcela and Fishtrap Creek drainages from kilometre 64 to 110 where the access approaches Grainger pass. This a post-fire successional forest, estimated to have resulted from a burn occurring approximately between 1940 and 1950. Two subtypes were identified: i) the

Tetcela Valley, and ii) the Silent Hills (Beak, 1981).

The western slopes of the Silent Hills are well drained, and the tree cover was calculated at 78%. Of this, 80% was deciduous - primarily aspen (*Populus tremuloides*) and birch (*Betula papyrifera*), and the remainder (20%) white spruce (Beak, 1981).

The Tetcela Valley transect was variable and included elements of black spruce parkland mixed with a dense coniferous deciduous forest. The vegetational succession appears to be returning to black spruce parkland. In 1981, the forest cover at the tree level varied from 60-100%, and comprised birch, alder (*Alnus crispa*), and Scouler's willow. with lesser amounts of black spruce and jack pine. Coverage at the lower strata (shrub, herb, and moss) were considerable less than tree cover (Beak, 1981). The forest includes a significant portion of black spruce snags.

Habitat studies indicated in terms of browse availability and utilization the major species in this unit were alder, and Scouler's willow. Nine moose pellet groups were recorded.

Unit # 8: Black Spruce Muskeg

This vegetation unit is distributed in lowland, waterlogged drainages which grade into open wetlands. It occurs in three areas: i) Fishtrap Creek, west of the Silent Hills within an elevational range of 244-305 m, ii) an eastern tributary of the Tetcela/Ram River system in the valley between the Silent Hills and the Nahanni Range at an elevation of approximately 490 m, and iii) a lowland area west of the Grainger River near its mouth (Figure W-2).

The representative site for sampling was located in the Tetcela component, and its basic element were a shrub layer (coverage 35-60%) of black spruce and blueberry willow (*Salix myrtilifolia*), labrador tea and dwarf birch (Beak, 1981). Coverage in the herb layer was 25-50% comprising red bearberry (*Arctostaphalus rubra*), grass and labrador tea. *Dicranum* moss and lichens provided a thick ground cover.

Habitat studies indicated some browsing on dwarf birch and willow. A total of 3 moose pellet groups were found. The wetlands within this habitat represent productive waterfowl habitat, particularly for trumpeter swans (Section 5.2.6).

Unit # 9: Burn

Since the vegetation studies of 1981 and 1982, there have been two burns along the access corridor. The earliest is situated within black spruce parkland near kilometre 66, and appears to be 5 - 10 years old (Figure W-2). No examination of regenerating vegetation

was made. The second burn took place in July and August, 1994 and covers an enormous area immediately east of the Nahanni Range.

Unit # 2: Subalpine Shrub

Along the access corridor this vegetation unit occurs on i) the eastern slopes of the Mackenzie Mountains, and ii) the Nahanni Range. In the former, the elevational range extends from 1325 m downslope to 1070 m, whereas in the Nahanni Range the elevational extend is considerably lower, from approximately 1220 m down to 700 m.

The vegetation description for this unit, provided in Section 3.1 based on Beak (1981) is presumed to apply to these areas, although there was no systematic sampling of the Nahanni Range component.

Unit # 1: Alpine Tundra

Alpine tundra along the access corridor occurs as i) a large area on the eastern slope of the Mackenzie Mountains, and ii) a much smaller component in the Nahanni Range. This account repeats some of the description provided for the unit in Section 3.1. Major cover species include the *Cetraria nivalis*, *Dryas integrifolia*, *Cassiope tetragona*, and *Salix nivalis*.

This unit is important for it represents key year round range and lambing areas for Dall's sheep, and calving areas for woodland caribou (Beak, 1981, 1982). Pellet groups of both Dall's sheep and woodland caribou were relatively common during July, 1981 sampling.

Unit # 10: Grainger Tillplain

The Grainger tillplain unit is a rolling, drumlinized tillplain with little elevational range (approximately 460 m to 670 m), and an absence of forest cover (Beak, 1981). The basic subtypes include depressions and drier meadows. The former are wet sedge meadows dominated by *Carex rostrata*. The drier meadows are composed of a shrub layer (80% coverage) of dwarf birch, cinguefoil (*Potentilla fruticosa*), labrador tea and *Myrica gale*, a herb cover of sedges, red bearberry, and horsetails (*Equisetum* sp.), and a ground cover of *Dicranum* moss. In other areas, there is a taller shrub community of alder, dwarf birch, and willow (*Salix planifolia*), or coniferous thickets of black spruce. Further details are provided in the Beak (1981) report. However, over 40% of this habitat occurring along the access corridor has been recently burned.

Habitat studies showed considerable availability of browse, with utilization greatest on the willow (*S. planifolia*). Four caribou and 3 moose pellet groups were found.

Unit # 11: Floodplain/Tillplain

This is a heterogeneous unit comprising the following subunits: Grainger tillplain, lowland marsh, shrub, and mixed forest in three cover categories - <30%, 30-50%, and >50% (Beak, 1982). Major tree species in this mosaic include trembling aspen, white spruce, black spruce, paper birch, jack pine and alder. The most dense of the mixed forest communities, comprising more than 50% coverage, is distributed along parts of the Grainger River, and hypothetically provides because of forest structure a degree of thermal cover important to ungulates in winter (Beak, 1982).

Unit # 12: Aspen Liard Floodplain

This vegetation unit borders the Liard River from kilometre 151 to 164.5, excluding the Liard crossing itself. The climax tree species is white spruce, but frequent fires have led to a dis-climax of aspen (Beak, 1981). Within the aspen subunit, the canopy was estimated to reach a height of 20 m, with other understory trees between 12 m and 16 m. The shrub layer was predominately alder and prickly rose (*Rosa acicularis*). There was limited ground cover (5%) owing to a thick layer of deciduous litter.

Habitat studies showed moderate browsing of highbush-cranberry (*Viburnum edule*), and light browsing of trembling aspen.

5.2 Wildlife

5.2.1 Dall's Sheep

According to surveys conducted by Beak Consultants, Dall's sheep occur at high elevation in both the Nahanni Range and the Mackenzie Mountains, and nowhere in between. Based on sightings and tracks they frequently cross valleys within the mountains, but they are restricted to mountain ranges. In Section 3.2.1, the report covered Dall's sheep in the Mackenzie Mountains including their use, particularly in winter, of the windblown eastern plateau of this range. This section refers briefly to that part of the access route but concentrates on the Nahanni Range.

The Nahanni Range represents some of the study area's best sheep range, and was ranked as Class 1, using the rating scale developed by the Canada Land Inventory (Beak, 1981). Exposed as it is to prevailing winds, snow accumulation is limited making forage available year round. Escape terrain is abundant. Forage was considered to be "somewhat limited", but sampling of vegetation and habitat use of this area was limited to one site.

Winter: Only one winter survey covered the Nahanni Range. In March, 1981 a total of 32 Dall's sheep were observed in that part of the Nahanni Range within the study area (Figure W-7) (Beak, 1981). These observations provide support for the area's high capability rating for sheep.

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Figure W-7.

Lambing: Surveys in 1980 and 1981 provided observations on possible lambing areas. All the areas identified are west of the Ram River/Prairie Creek divide. No potential calving areas were found on the eastern plateaus of the Mackenzie Mountains. June surveys of the Nahanni Range were not attempted.

Summer: In July, 1980 wildlife surveys covered the Nahanni Range, and confirmed the presence of significant numbers of ewes and lambs. It was too late to make any inferences on lambing areas, but the upper elevation slopes clearly represent important nursery areas.

In general, the density of sheep habitat use may be highest in the Nahanni Range. The greatest concentration of Dall's sheep pellets was found.

5.2.2 Woodland Caribou

Observations of woodland caribou east of the Mackenzie Mountains are limited to a sighting of 13 approximately two kilometres north of the Grainger River (Figure W-7) in March (1981), and a solitary individual just east of Grainger Pass in July (Beak, 1981). Unfortunately, tracks were not recorded, thereby missing useful evidence of recent occurrence.

Based on these limited sightings and a review of caribou habitat requirements, the Beak team evaluated the access corridor but did not provide a classification rating.

Winter: Two areas were classified as winter range. The first starts at the eastern base of the Mackenzie Mountains and extends eastwards through black spruce parkland, pine parkland, and the western fringe of the mixed coniferous deciduous habitat (Figure W-7). This area is classified as potential winter range, hypothetically linked to the alpine plateaus immediately and just outside the study area. The Beak (1981) classification was based on the abundant corticolous lichens of the black spruce parkland habitat. There is also a significant ground cover of reindeer moss.

The other winter range is immediately east of the Nahanni Range (Figure W-7) in habitat classified as Grainger tillplain and floodplain tillplain habitats. It was identified by Watson et al (1973, referenced by Beak, 1981) as part of the winter range of the Martin Hills caribou herd. Although habitat studies confirmed browsing and caribou pellet groups in these habitats the season of use could not be determined.

Calving: The western part of the access route is below important caribou calving grounds. These are located on the broad eastern plateaus of the Mackenzie Mountains (Figure W-5), and were discussed in Section 3.2.2. No surveys were conducted in the

Nahanni Range during or immediately after the calving period.

Summer: Beak investigators assessed the alpine tundra and subalpine shrub of the Nahanni Range to represent summer range for woodland caribou. This assessment was based on its abundant forage, particularly lichens, shrubs, forbs and sedges, and the relief from insect harassment (Beak, 1981).

The low elevation habitat of the lower Grainger River/Liard River, the Fishtrap and Tetcela drainages were judged to have little capacity as summer or winter range.

5.2.3 Moose

Moose and their sign were found along most of the length of the access route (Beak, 1981). Only in the sparsely vegetated eastern slope of the Mackenzie Mountains was there little evidence of this species.

Winter: Class 1 winter range was estimated to occur in two areas (Beak, 1981). One was located adjacent on the north shore of the Liard River and extending partway up the Grainger River. Its main components was its combination of forage and thermal cover (Beak, 1981). The other was the valley bottoms of the Tetcela River and Fishtrap Creek. The mixed coniferous deciduous vegetation unit in this area ranked highest in moose production capacity of the six lowland habitat transects sampled.

Several other areas were judged to represent moderate winter range (Beak, 1981). These include i) Grainger tillplain, primarily because of high forage production, ii) mixed coniferous deciduous habitat of the Silent Hills and well drained areas adjacent, based on high productivity and evidence of high browse utilization rates, iii) pine parkland on the Ram Plateau, combined with small depressions of black spruce parkland, and iv) components of the riparian alluvial habitat of the Ram River system (Beak, 1981).

Summer: Summer habitat was not assessed with the same emphasis as winter habitat, as summer habitat requirements are frequently a less critical issue.

No surveys were especially directed at moose in the summer, but surveys of wetlands frequently produce sightings of moose, confirming their use of vegetation in and around wetlands. For this reason, summer habitats were those which combined substantial forage capability in association with wetlands.

Several areas were judged to represent good moose habitat. These included i) the valley bottoms of the Tetcela and Fishtrap drainages, ii) Grainger tillplain, iii) Silent Hills and its mixed coniferous deciduous habitat, and iv) pine parkland habitat of the Ram Plateau.

5.2.4 Grizzly and Black Bears

Both species are believed to occur along the access corridor. Recorded observations are limited to the sighting of a black bear in September, 1994.

Grizzly bears usually den from mid-October to early May, and potential denning areas may occur on the eastern slope of the Mackenzie Mountains and the Nahanni Range. Early June surveys failed to find recently used dens in the former area, but the Nahanni range was not surveyed at that time. They occupy very large home ranges, varying from 86 to 287 km² (Pearson, 1975), thus the scarcity of sightings is not unusual.

According to information assembled by Polar Gas (1984), the eastern slopes of the Mackenzie Mountains comprise many Class 1 (high use area) and Class 2 areas for grizzly bears. The Nahanni Range is has been classified as a Class 2 area.

Black bears are more likely than grizzly bears to occur in low elevation habitats. They are considered common along the forested habitats of the Mackenzie Valley. An area of special abundance, based on large annual harvests, is the area around Fort Simpson (Polar Gas, 1984). It is suspected that this area of abundance extends to the Liard and Grainger portions of the study area.

5.2.5 Wolf

Along the access route wolves were observed on one occasion. Five were observed beside pond # 114 on September 13, 1994 (Figure W-7). The pack was comprised of three black phase and two grey phase animals. A brief search was made from the air, but no carcasses were observed in the area.

Their abundance along the access corridor is unknown, but they are suspected of being important predators of woodland caribou and moose.

5.2.6 Furbearers

In 1980, a review of trapping along the road corridor was completed by Beak Consultants (in Ker Priestman, 1980a). At that time, three traplines were being operated on lands crossed by the corridor. They were described as follows:

1. East of the Nahanni Range, from Bluefish Lake (1st gap) in the south, northward to the 3rd gap thus including Grainger Pass.

2 & 3. Directly adjacent to Trapline # 1, but extending west of the Nahanni Range as far as the Tetcela River, and including the Silent Hills.

The major species harvested at that time include beaver, marten, mink, lynx, weasel, and wolverine.

In a review of Mackenzie Valley wildlife, Polar Gas (1984) identified marten as being the important upland furbearer in the Norman Wells to Fort Simpson area, and lynx as being relatively abundant between Norman Wells and the NWT/Alberta border. Among the aquatic furbearers, beaver dams were common on wetlands surveyed in 1980 and 1994, but the survey information is not sufficiently quantified. Very little information is available on muskrat, and few have been recorded during surveys. Polar Gas (1984) pointed out that south of the Camsell Bend, muskrat habitat is relatively poor.

5.2.7 Aquatic Birds

Surveys of wetlands were undertaken primarily to identify ponds and lakes which might be important to trumpeter swans and other waterfowl during the fall staging period. A total of 55 ponds were surveyed, with emphasis on those located in the Fishtrap Creek and Tetcela River drainages (Figure W-8).

Examination of these closely abutting drainages indicated some potential for confusion. Following the 1:50,000 map from east to west starting at the Liard River, there are 30 wetlands (numbered A-1 to A-30) between there and Grainger Pass. Few wetlands in this area were surveyed. Continuing through Grainger Pass, one enters an unnamed drainage which flows north, divides into two, with both arms flowing into the Tetcela River. The term, Tetcela drainage, is used to describe the wetlands (numbered B-1 to B-16) in this drainage. However, there are other parts of the Tetcela drainage, and these are west, beyond the drainage of Fishtrap Creek. Continuing westward through the gap in the Silent Hills, one enters the Fishtrap Creek drainage. Fishtrap Creek flows south and is associated with numerous wetlands (numbered C-1 to C-25), more or less connected to the main river or each other. Continuing westward one reenters the Tetcela drainage (wetlands D-1 to D-4), followed by the Ram River drainage (wetlands D-5 to D-13).

During the surveys, a total of 629 waterfowl were counted on the 55 wetlands surveyed. These included 7 swans, 233 dabbling ducks, 304 diving ducks, and 85 shorebirds. The swans were located on three wetlands (B-8, B-14, and C-5), and included one pair with one young of the year on wetland B-8 (Figure W-8). The most productive wetlands have been tabulated (Table 2). As indicated by the wetland numbering the most productive wetlands are widely distributed, indicating considerable waterfowl use by waterfowl in

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all three drainages surveyed: Tetcela, Fishtrap, and Ram.

5.2.9 Rare and Endangered Species

Rare and endangered species were covered under the Minesite and Prairie Creek section of this report (Section 3.2.9). That account applies also to the access route.

Three species considered in this account were recently examined by COSEWIC (1992) and not designated in any risk category. These three species are bald eagle, golden eagle, and gyrfalcon.