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prepared for
Parks Canada

By
Canadian Wildlife Service,
Edmonton,
1976

Description of the
Wildlife Component for
Impact Assessment at Three
Potential Campsite Locations
in Nahanni National Park, N.W.T.

By
L.N. Carbyn and D. Patriquin

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Room 1110
10025 Jasper Avenue
EDMONTON, Alberta
T5J 1S6
March 31, 1976

Mr. R. P. Malis
Director, Prairie and Northern Region
Parks Canada
Main Floor, 114 Garry Street
WINNIPEG, Manitoba
R3C 1G1

Dear Mr. Malis:

I am pleased to transmit herewith the report "Description of the Wildlife Component for Impact Assessment at three potential Campsite locations in Nahanni National Park, N.W.T." by L.N. Carbyn and D. Patriquin.

This work covers the results obtained during two summers' field work and is the final report as per guidelines drawn up in 1974. The project was funded by Parks Canada.

Black and Grizzly bears are widely distributed in the Park, and as in other areas, these species can create management problems. Rabbitkettle Lake area is a particularly good area for Grizzly bears. We would like to draw your attention to the need of effective public education and subsequent garbage disposal programs, in order to deal with a potentially hazardous problem.

We are pleased to have been able to participate in this segment of the program and welcome discussion on any of the results presented.

Yours sincerely

W.J.D. Stephen
Regional Director

DESCRIPTION OF THE WILDLIFE COMPONENT
FOR IMPACT ASSESSMENT AT THREE
POTENTIAL CAMPSITE LOCATIONS IN
NAHANNI NATIONAL PARK, NWT

Prepared for Parks Canada

by

L.N. Carbyn and D. Patriquin

Canadian Wildlife Service

Edmonton, Alberta

1976

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DIRECTOR
CANADIAN WILDLIFE SERVICE
EDMONTON, ALBERTA

OR THE

DIRECTOR
PARKS CANADA
PRAIRIE REGION
WINNIPEG, MANITOBA

ACKNOWLEDGEMENTS

We would like to thank Jack Nolan, David Pitt-Brooke and Jim Tutt for their assistance during the field seasons.

Art Cochrane and Ray Frey were helpful in getting us started within the study areas, and providing us with the necessary liaison while the work was in progress. Art Cochrane's skill as a "river rat" was particularly appreciated - may the wardens never lose their backcountry travelling abilities!

We are grateful for the discussions and companionships of Fred Marsh and George Scotter. Greg Wickware was most helpful in outlining the parks' requirements to us. Fred Marsh reviewed the report while still in its early draft stage. Art Houle, Parks planner acted as a catalyst to obtain human use information for the Socio-Economic Research Division of Parks Canada.

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TERMS OF REFERENCE AS SUBMITTED TO CANADIAN WILDLIFE SERVICE

BY PARKS CANADA - PRAIRIE REGION

(1974)

GENERAL: The resource inventory schedule for Nahanni begins in fiscal year 1975-76. Because initial inventory efforts will be concerned with mapping, describing and analysing the land-forms, surficial deposits and vegetation, other resource inventory studies will be delayed until 1977-78. In view of the increasing public use of the Park it was felt important to initiate a study to obtain early data on those wildlife species upon which man would have an impact, or come into conflict with.

PURPOSE: The present study will be conducted over a two (2) year period and is designed to provide data on the various wildlife resources in sufficient detail to allow an interpretation of the impact man would have on these species, as well as identifying those species man would come into conflict with (i.e. potentially dangerous species). The information will be used to ensure the proper location of primitive camping sites, trails, and other facilities in those areas where initial impact or conflict is expected.

STUDY AREA: The study areas are located within the present boundaries of Nahanni National Park and include the following:

- Kraus' Hotsprings
- Virginia Falls
- Junction of Flat-Nahanni Rivers
- Rabbitkettle Hotsprings

STUDY
OBJECTIVES:

- Documentation of grizzly bear distribution from spot observations and summarization of past records;
- Identification and preliminary mapping of potential or known grizzly habitat;
- By locating mineral licks and establishing an observation program at these licks, document the activities of various faunal species in the study areas;
- Document the location of wolf denning areas, travel routes, rendezvous sites, etc.;
- Document small mammal diversity, i.e. species present in the areas or areas of concentration; (discussion will be limited to those species upon which man would have an impact).
- Other observations of local wildlife which seem pertinent to the area.

STUDY
SCHEDULE:

The program will be conducted over a two year period. The following schedule is tentative and may be changed after consultation with Parks Canada.

YEAR 1 - (1974-1975)

- Areas to be examined include:
 - Virginia Falls
 - Kraus' Hotsprings

YEAR 2 - (1975-1976)

- Areas to be examined include:
 - Rabbitkettle Hotsprings
 - Junction Flat-Nahanni Rivers

REPORT:

- A progress report (brief) to be submitted not later than November 30, 1974.
- A progress report (brief) to be submitted not later than March 31, 1975.
- A progress report (brief) to be submitted not later than November 30, 1975.
- A final report to be submitted not later than February 28, 1976.

Progress reports are intended to keep Parks Canada informed (officially) as to the status of the study, and to identify any observations which may be of immediate importance for the management, planning, or interpretation of the Park.

Guidelines for 1975 were the same in principle. Specific instructions are outlined in the next section. These guidelines pertain to responsibilities by other research officers as well, and therefore only those references to avifauna, large and small mammals are applicable to this study.

PROJECT OUTLINE
FOR AN
ENVIRONMENTAL ASSESSMENT OF THE RABBITKETTLE HOTSPRINGS
AND RABBITKETTLE LAKE AREAS IN NAHANNI NATIONAL PARK.
(1975)

1. OBJECTIVES

The Rabbitkettle Hotsprings have been recognized as one of the unique natural features of Nahanni National Park. Because of its uniqueness and relatively easy access from the river, increased visitor use of the area is expected. The interim management guidelines for the Park identifies Rabbitkettle Lake as the upstream departure point for travellers into the Park. The purpose of this study is to assess the present environmental conditions of the area, and to assess the potential impact of increasing visitor use, including aircraft on Rabbitkettle Lake. This study will include input from Dr. G. W. Scotter; Dr. L. Carbyn and R. Wickstrom.

2. STUDY AREA

The study area encompasses approximately 1,840 square miles as delineated on the attached map. (Map was not supplied with the guidelines).

3. PROJECT REQUIREMENTS

3.1 Map, describe and analyse the plant communities of the study area including species composition, abundance and distribution;

3.2 Assess the relative fragility of the various plant communities in terms of their susceptibility to human trampling. This aspect

- of the study will require follow-up over the next 2-3 years before any final quantitative assessment of changes in the plant communities can be made;
- 3.3 Document the small mammal diversity of the areas i.e. species present and habitat descriptions;
 - 3.4 Observations of avian species present in the areas including relative abundance, species composition, nesting areas or areas of concentration;
 - 3.5 Observations of other local wildlife which seem pertinent to the study;
 - 3.6 Determine the water quality of the two sites (i.e. physical and chemical characteristics);
 - 3.7 Prepare a bathymetric map of Rabbitkettle Lake;
 - 3.8 Where possible assess the fish populations (species; relative abundance) of Rabbitkettle Lake;
 - 3.9 Assess the relative fragility of the Hotsprings feature itself.

4. DISCUSSION

In addition to the general data, summaries in the report should include:

- 4.1 A discussion on the relative fragility of the plant communities to human trampling;
- 4.2 A discussion on the significance of the small mammal diversity and the susceptibility to human use;
- 4.3 Recommendations regarding the siting of a float plane dock on the Lake, and a docking site on the river where visitors may be required to pull out their boats and "register in";

- 4.4 Recommendations regarding the siting of a warden patrol cabin in the Rabbitkettle Lake area;
- 4.5 Recommendations regarding the siting of a fuel storage area and helicopter landing site at the Rabbitkettle Lake and Hotsprings areas;
- 4.6 Recommendations regarding the maintenance of water quality in the Lake and measures that should be taken to ensure that water quality is maintained;
- 4.7 Recommendations regarding the use of the Hotsprings site for interpretation keeping in mind the uniqueness, the accessibility and the interpretive potential of the site;
- 4.8 Recommendations regarding potential camping sites in the Rabbitkettle Lake area.

5. PROJECT FUNDING AND SCHEDULING

- 5.1 The project will be conducted over a one year period at a total funding level of \$57,000.00. The breakdown is as follows:

(1) Vegetation	\$27,000.00
(2) Wildlife	\$25,000.00
(3) Limnology	\$ 5,000.00
- 5.2 A final report will be prepared not later than March, 1976. A progress report will be prepared by November, 1975.

1. INTRODUCTION

Nahanni National Park was declared a park by an amendment to the National Parks Act in May 1974. Declaration as a park was preceded by an Order in Council (P.C. 1971-649) when 870 square miles of land were withdrawn "for the purpose of the future development, thereof, as a National Park". On 22 February 1972 it was announced that a National Park would be created and that the area would contain 1,840 square miles (Addison 1974). Final establishment as a park apparently depends on negotiations relating to native land claims.

Both before and after acquiring park status, the area had been widely publicized. Visitation by canoers, kayakers, jet boat tour operators, rafters and airplane passengers has increased considerably in the last few years with an apparent decline in the summer of 1975 (Ray Frey pers. comm.). Scotter and Simmons *et al.* (1971) predicted this increase and recommended certain areas for potential campground development. Another study (Binns and Moorhead 1973), directed at the human visitation and human history of the area, supported the above site selections. Parks Canada then requested that initial studies of the natural features in these areas be carried out. Canadian Wildlife responsibilities were assigned to Scotter (soils and vegetation), to Carbyn (mammals and avifauna) and to Wickstrom (limnology).

This report summarizes the results of the vertebrate surveys conducted at Nahanni¹ Hotsprings and Virginia Falls during the first field

¹ The name Nahanni Hotsprings is used here since, as far as we are aware Kraus' Hotsprings has not been officially recognized.

season (June to August 1974) and Rabbitkettle Lake, Rabbitkettle Hotsprings during the second summer (June to August 1975). Preliminary recommendations are summarized and presented for discussion with parks officials.

We have tried to restrict our remarks to the results of this study, since voluminous reviews of the human history, general natural history (i.e. geology, geography, floral and faunal reviews, climate etc.) have already been presented elsewhere (Scotter *et al.* 1971, Addison 1974, Marsh and Scotter, 1975).

Guidelines for the study were submitted by Prairie Regional Office, Winnipeg, and these were discussed with Greg Wickware. Our responsibility was to identify wildlife species, (in its broadest definition), that could be endangered by increased human activities. Emphasis was to be placed on grizzlies and birds of prey (see terms of reference).

As the program developed, a new dimension was added. In addition to the assessment of actual or potential problems (impact assessments) that predictably could be incurred through development, we have also directed some attention as to how facilities could enhance park visitor experience through gaining a better understanding of the park resources. That is, campgrounds and day use areas could be located in such areas where, not only the impact is minimized, but the interpretive benefits are maximized.

By virtue of the broad terms of reference and the short field season, this aspect is superficial and introductory. However it has been the writers' experience that canoeists literally are "starved" for information. Days on end they strain to the "heave-ho" of the paddle. They constantly view the area from the vantage point of a "floating log" down the river. Ford (1974) makes a very eloquent plea for interpretation from a geographer's

point of view. He states that the interpretive literature and programs for South Nahanni Park should be based upon the description of its magnificent and diversified geomorphology. This is a defensible argument, however at the same time visitors travelling through the park come into intimate contact with 'nature in the north'. We believe that the large, unusual and spectacular should not detract from those common, but often poorly understood, fundamentals of boreal ecology.

Visitors generally establish campsites for short durations and the hikes are generally not far from familiar surroundings. Canoeists do get occasional glimpses of large mammals, principally moose and black bear, occasionally grizzly, wolves, dall sheep and caribou. They may see a bald eagle or two towards the headwaters, and frequently see the ubiquitous night hawk swooping over the water surface. Wilderness travellers were curious to know what the bird was. About 30% of the visitors could not name the bird (See Appendix G) nor did many realize the purpose of its antics, or could relate other interesting facts about its natural history. As resource people we provided most travellers with a welcome opportunity to obtain information on what they saw. Even more important, it seemed, they were eager to hear about things they could not see. Visitors often crowded around our specimens to learn that a 'mouse' is not simply a 'mouse' but it could be a red-backed vole, a deer mouse, a bog lemming, a meadow jumping mouse, long-tailed vole or a meadow vole. Imaginative programs by parks planners are required to bring the resources closer to the people. Obviously, the first step is to determine what some of those resources are, and secondly, in what way impairment can be minimized.

Therefore, by enlarging upon the scope, here we included another dimension to the field work. Unlike soils and vegetation, the wildlife

component is not a "patient" element that "waits" to be studied by the field worker when he is ready to quantify its presence or absence. Wildlife inventories present different problems. To effectively carry out inventory work it is necessary to be in the field for extended periods, both seasonally and on a daily basis. Bird populations, for example, in early summer often are different from those in late summer. Similarly, large mammals shift their activity patterns and ranges, depending on a number of factors i.e. period of parturition, seasonal availability of food etc. Furthermore, one has to try to get a balanced field crew together, in order to maximize the efficiency of the field operations as required by Parks Canada. Rarely are all the qualities found in one person; for example, abilities to lead a crew in the wilderness environment, expertise in bird identifications (one who is a specialist in identifying birds of prey may be a novice with other species), ability to routinely check traps and prepare study skin after study skin etc.

II. METHODS

Field camps were established at Nahanni Hotsprings, Virginia Falls (1974), Rabbitkettle Lake and Rabbitkettle Hotsprings (1975).

At the outset, aerial photographs were examined to evaluate the general plant communities. These areas were then examined on the ground and the vegetation described in very general terms. This enabled us to direct small mammal trapping schedules to specific habitat types.

Daily records were kept of all wildlife species seen in the area, while we were engaged in regular field work activities. Particular attention was directed towards documenting the presence of bears. For each site, potential grizzly bear habitats were mapped by Jack Nolan around a 15 mile (24 km) radius of the sites. The number of bear diggings around Rabbitkettle Lake for *Hedysarum* roots were recorded.

Bear habitat interpretations were based on gross physical landforms, broad vegetation zones and proximity to major landform units. Criteria were established by the Canadian Wildlife Service, Wildlife Habitat Inventory studies group (Nolan, Goski and Wilde 1973). These are not detailed habitat evaluations and their accuracy leaves a lot of scope for improvement. There are no comprehensive studies available on this subject for the lower Mackenzie Mountain area, although the study by Pearson (1975) in the Yukon area provides useful insights into what could be expected for Nahanni National Park area. S. Miller of the territorial government has been conducting research on the species in other areas of the Mackenzie Mountains.

Habitat classes were defined as follows:

Class 1 unit has no obvious factor which may limit grizzly bear numbers (i.e. alpine areas with "adequate" alpine vegetation). These units

possess habitat requirements of good interspersed landforms, suitable vegetation types, abundant food sources and available denning sites.

Class 2 unit has minor theoretical limitations for grizzly bears (i.e. uniform coniferous forests).

Class 3 unit has moderate to severe theoretical limitations for grizzly bears (i.e. barren rocky slopes).

Trap lines for small mammals were set out for all main habitats at each site. Snap traps were set out in 2 sets of 3 traps each at intervals dictated by habitat diversity. Each line was left in position for 1 to 3 days depending on the nature of the terrain and extensiveness of the area. Some experimental work was carried out, that is leaving the traps out during the day, however, disturbances by birds [particularly grey jays (*Perisoreus canadensis*) and red squirrels (*Tamiasciurus hudsonicus*)] made this impractical. Traps were checked early in the day to prevent spoiling of specimens.

All materials collected were preserved, either as study skins, or as study pelts. Methods were standardized with those used by the University of Alberta vertebrate museum.

Standard measurements, taken for possible future use of the data, included weight, total length, tail length and length of hind foot. The reproductive status of the specimens was examined i.e. reproductive organs were measured. Placental scars were checked and numbers recorded.

The caves around Nahanni Hotsprings were periodically checked for the presence of bats. Mist nets were taken into the field, but due to the

very low densities of these mammals in the areas visited, it became impractical to catch bats by using them. Several side trips were made into adjacent areas to gain insight into the large mammal population densities observed at the proposed campsite areas in relation to adjacent regions (Table 1).

Systematic observations of the avifauna were carried out, and checklists kept for each region. Particular emphasis was placed on the presence of birds of prey as required per terms of reference.

Records were kept of the numbers and feeding areas of aquatic birds resident at Rabbitkettle Lake. Feeding locations were plotted on special maps.

Alur maps (Appendix A) were checked to document past records of large mammal distributions in the park. Interviews with park visitors provided information on the general wildlife sightings noted along the river.

In 1974 all human use of the river was recorded, whenever, tourists were seen.

The Nahanni National Park - 1975 Park Visitor Survey was carried out as a service to Parks Canada (Socio-Economic Research Division) through the coordination of Art Houle, Parks Planner, Western and Northern Region. Interviews consisted of filling out interviews designed by Parks Canada and an extension of the same to cover resource oriented questions.

Table 1. Main areas studied by the vertebrate field crew during the summers 1974, 1975.

Base Camp		Fly Camps and Side Trips	
Location	Dates	Location	Dates
1974			
Nahanni Hotsprings	15 June - 14 July	Deadmen Valley	6 July - 9 July
		Tlogotsho Range	9 July - 11 July
		Splits to Nahanni Butte	11 July - 18 July
Virginia Falls	18 July - 12 August	Marengo Creek	19 July
		Mt. Sunblood	21 July
		Oxbow Lake	22 July
		Mt. Sunblood	24 July
		Mt. Sunblood	27 July - 28 July
		Oxbow Lake	1 - 2 August
Nahanni Hotsprings	13 - 23 August	George's Riffle	
		Splits to Nahanni Butte	22 August
1975			
Nahanni Hotsprings	10 - 18 June	Flat River	16 - 18 June
		Flat/Nahanni Jct.	
Rabbitkettle Hotsprings	1 - 8 August		
Rabbitkettle Lake	18 June - 31 July	Virginia Falls	16 - 20 August
	9 - 16 August	Nahanni Hotsprings	21 - 25 August

III. RESULTS AND DISCUSSION

A. Habitat types.

1. Nahanni Hotsprings.

We identified 10 different plant zones for the area around Nahanni Hotsprings. These areas were as follows (Figure 1):

North side of the river:

1. Mature white spruce - feathermoss (Figure 2)
2. Poplar (*Populus* spp.) - white birch (Figure 3)
3. (a) Open white spruce (overmature) - white birch
- (b) White spruce - white birch
- (c) Spruce - heavy underbrush
- (d) Mature white spruce - feathermoss - equisetum (Figure 4)
- (e) Flood plain, overmature poplar (*Populus balsamifera*) - scattered white spruce.

South side of the river:

4. Balsam poplar - chokecherry-saskatoon (Figure 5)
5. Semi-open to open grassland area around hotsprings and the main cabin
6. Mature white spruce - rose - alder - equisetum
7. Aquatic fringed vegetation; variable.

2. Virginia Falls.

Eleven plant zones were identified around the Virginia Falls area (Figure 6). These were as follows:

Figure 1. Aerial photograph of the Nahanni Hotsprings area.



- Figure 2. Mature white spruce forest (area 1) forms the climax vegetation on alluvial soils. This was the only location in which the shrew *Sorex vagrans* was collected. (Photo L.N. Carbyn)
- Figure 3. Poplar/white birch forest covers an extensive area on the north side of the Nahanni River and is situated northwest of the hotsprings. (Photo L.N. Carbyn)
- Figure 4. Mature white spruce forest (area 3C and D complex) with large component of equisetum ground cover. (Photo L.N. Carbyn)
- Figure 5. Balsam poplar/saskatoon/chokecherry bushes form a uniquely lush vegetation cover around the Nahanni Hotsprings area. This is reflected particularly in the avifaunal diversity of the area. Development in this area should be restricted to a bare minimum and directed towards interpretive programs only. (Photo L.N. Carbyn)



Fig. 2



Fig. 3



Fig. 4

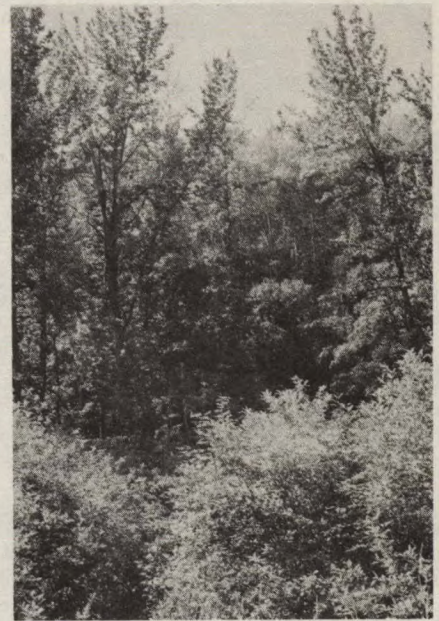


Fig. 5

Figure 6. Aerial photograph of the Virginia Falls area.



South side of the river:

1. Wet areas adjacent to streams and ponds; sedge-larch-stunted black spruce (Figure 7)
2. Open, dry black spruce - lichens (Figure 9)
3. White spruce - feathermoss
4. White spruce - feathermoss - white birch
5. Black spruce - alder (Figure 13)
6. Lodgepole pine - birch - spruce; open vegetation cover in shrub strata

North side of the river:

7. River bank vegetation (variable), *Calamagrostis* intrusions
 8. Open spruce - white birch forest
 9. (a) Wet black spruce with isolated intrusions of sphagnum moss cover
(b) Black spruce - larch - feathermoss
(c) Black spruce - lichen (knoll)
 10. Lodgepole pine at lower elevations of Mt. Sunblood (Figure 19)
 11. Variable spruce forest with extensive stream-pond formations and aquatic fringed habitats.
3. Rabbitkettle Lake.

Nine different major plant zones were identified (Figure 15). These were as follows:

1. Emergent vegetation around the edge of Rabbitkettle Lake
(Figure 16)
2. Glandular birch growing in depressions and moist areas
3. Variable areas with graminoid vegetation, some of which are
sedge borders around small waterbodies
- 3a. Dry, undulating area with upland grassland conditions
4. Extensive burned over areas with aspen regeneration
(Figure 17)
5. Heterogenous, wet areas with a diverse plant cover
6. White spruce forest
7. Spruce forest; left after a burn went through the area
8. Black spruce-sedge area surrounding ponds
9. Open dry slopes surrounding pond area

4. Rabbitkettle Hotsprings

Seven major plant zones were designated (Figure 18) for the area around Rabbitkettle Hotsprings. These were as follows:

1. Open, dry spruce forest
2. Mature spruce forest, little underbrush
3. Open, karst-like area with many bare spots
- 4a. Black spruce, larch stand with depressions of small pools
and moister conditions
- 4b. Open, grassland slope
- 5 & 6. Old burned over areas with area 6 having more recent evidence
(about 25 years) of burn conditions

Figure 7. Sedge/larch and stunted black spruce plant cover predominates in poorly drained areas. (Photo L.N. Carbyn)

Figure 8. Winter moose droppings attest to the use of the various plant communities, particularly those associated with willow clumps. (Photo L.N. Carbyn)

Figure 9. Upland black spruce/lichen/moss community is an extensive area on the south side of the Nahanni River and west of the Falls. (Photo L.N. Carbyn)

Figure 10. Caribou droppings within upland black spruce/lichen community attest to the use of this area in the fall and/or winter period. (Photo L.N. Carbyn)



Fig. 7



Fig. 8



Fig. 9



Fig. 10

Figure 11. A small pond close to the proposed campgrounds provides an opportunity for interpretation of aquatic life, plant succession and associated vertebrate communities within a boreal environment. (Photo L.N. Carbyn)

Figure 12. Squirrel midden in a white spruce stand near the pond mentioned above. (Photo L.N. Carbyn)

Figure 13. Black spruce/larch stand present south of the portage. (Photo L.N. Carbyn)

Figure 14. Portage around Virginia Falls in mid-summer. (Photo L.N. Carbyn)



Fig.11



Fig.12



Fig.13



Fig.14

Figure 15. Aerial photograph of the Rabbitkettle Lake area.¹

¹P1 to P6 are designations for small ponds.
P1 and P2 in lines are designations for portages.

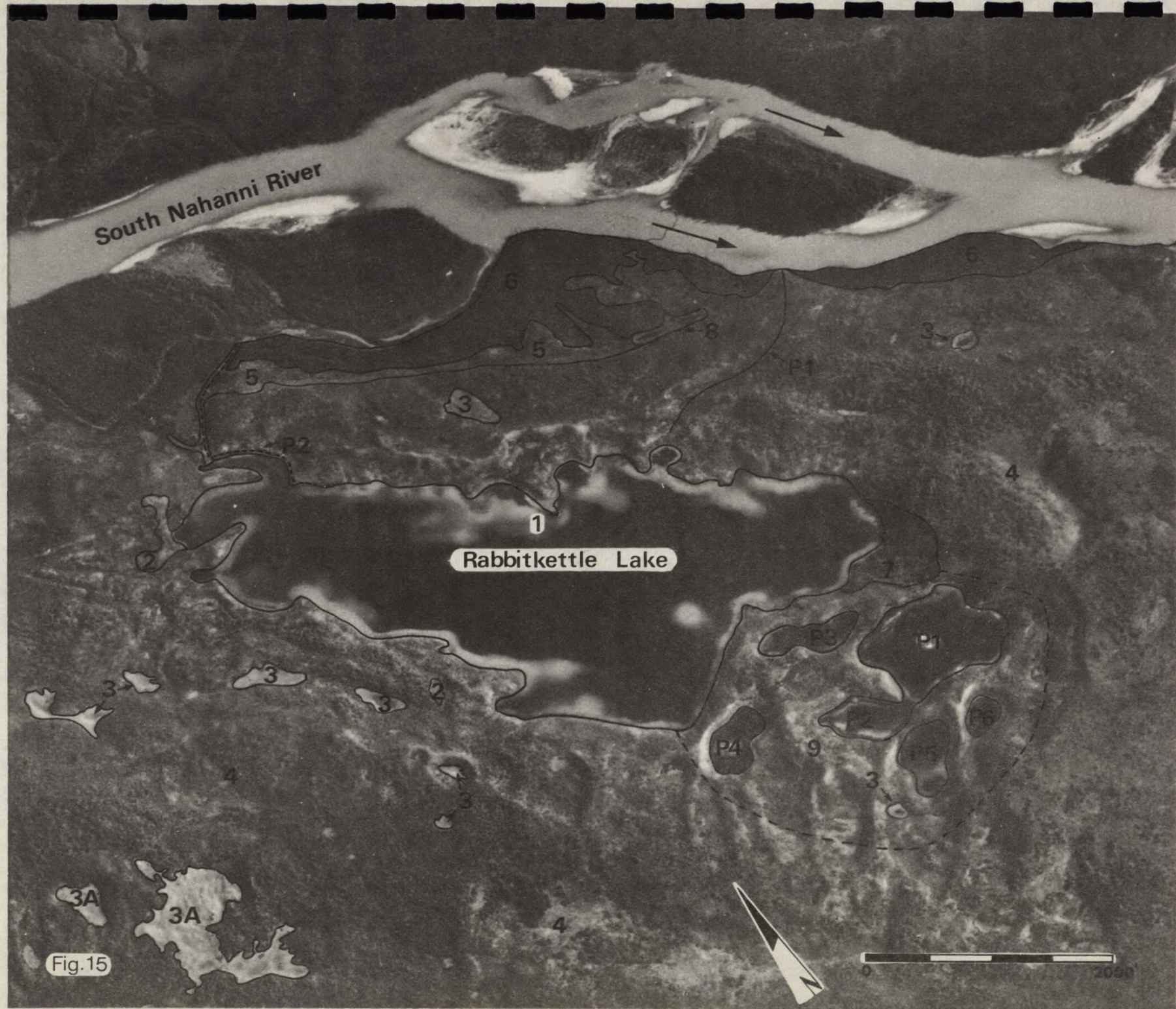


Fig.15

Figure 16. Emergent vegetation around the edge of Rabbitkettle Lake. Tall "reeds" are rushes (*Juncus* spp.) bordered by a belt of sedges (*Carex* spp.). (Photo L.N. Carbyn)

Figure 17. Extensive burned over areas surround Rabbitkettle Lake. Note the aspen regeneration. Soapberries and Lupines are dominant in the foreground. (Photo L.N. Carbyn)



Fig. 16



Fig. 17

Figure 18. Aerial photograph of the Rabbitkettle Hotsprings area.



Fig. 18

0 2000'

7. Largely burned over area with black spruce remains.

B. Brief descriptions of habitat types.

Brief descriptions of habitat types are discussed below with particular reference to floral characteristics that have obvious affects on faunal components. No attempts were made to quantify the floristic components, as this would entail more detailed plant ecological studies, that are included in the soils/vegetation studies by Marsh and Scotter. However, in order to study the vertebrate/habitat relationships, we had to pay some attention to the plant communities. The lines drawn around habitat types in Figures 1, 6, 15 and 18 could be misleading if not interpreted with caution. Most plant communities do not show sharp lines of separation. These communities integrate and often a large area described as one type may have elements of other plant communities within it. We have further concentrated on the major plant communities which could be related to distribution of the wildlife species. For example, from a floristic point of view, several discrete herbaceous communities were noticed in the environs of the hotsprings. No efforts were made to segregate these.

Scientific names were only used in the text where it would clarify matters. Appendix B lists some of the species referred to, and their scientific names.

1. Nahanni Hotsprings

1. Mature white spruce forest with a lush feathermoss cover represents an interesting plant community (Figure 2). Because of the climax condition this vegetation could be ecologically important for interpretive programs. The area is similar to area 6, in that both plant communities are dominated by white spruce. However, the area on first impression seems to be more diverse, and therefore ranks higher in interpretive potential. This in fact, was reflected in the small mammal populations.

Indications are that the spruce trees are overmature and hence vulnerable to decay and windfall. Fungi in a multitude of colours, shapes and sizes flourished in this community. There are some scattered birch trees to be found in this community.

The shrub layer was variable and in the western section, far less pronounced than in the area closer to the island. Highbush cranberry, alder, and rose were the most conspicuous components in the shrub layer. Typically, boreal forest herbs such as twinflowers and bunchberry were dispersed in the moss cover.

2. Poplar/white birch forest (Figure 3) covers an extensive area along an apparently old floodplain. White spruce occur in patches. The understory consists of scattered white spruce saplings. Red osier dogwood, labrador tea, rose and scattered alder, buffalo-berries, highbush cranberry, cinquefoil and juniper (*Juniperus communis*) predominate in the shrub cover. The litter consists mainly of deciduous leaves. In some areas the ground cover consisted of mosses and various low shrubby plants e.g.

Vaccinia vitis idaea. This area could be a potentially suitable area for

campgrounds i.e. from the point of view of soils, vegetation and water supply. However, we recommend against it for the following reasons:

- a. Proximity to frequently visited black bear habitat (area 3A) - see section on carnivores.
- b. Difficulty in getting to the main features around the hotsprings. If use of hotspring area increased then there may eventually be pressures to build a bridge or have a ferry service i.e. "jet boat" type operation to carry people from the campground to the hotsprings.
- c. Hole breeding habitat for birds (see avifaunal section).

3A. Open white spruce/white birch forest covered an area that may also be considered as a potential campsite location. Large windfalls of white spruce are indicative of the age of the stand. Rotten wood in places creates open ground cover. Feathermoss is common and in places interspersed with a herbaceous cover, including *Arctostaphylos uva-ursi*. High-bush cranberry and buffalo-berry were common. Bear scat indicated that this species commonly frequents the area, as the combination of berries and rotting wood (i.e. availability of insects) attracts this omnivore. Juniper, rose, alder, dogwood and fireweed were scattered throughout the shrub layer. In certain areas dense regeneration of white spruce saplings was noted.

3B. A mature spruce-feathermoss community with scattered interspersions of white birch and balsam poplar. Generally open, but scattered alder, rose and highbush cranberry, labrador tea and shrubby cinquefoil form the shrub cover. We noted numerous woodpecker holes in the overmature white spruce trees. The area is well-drained.

3C, D, E complex. This area is predominantly composed of a white spruce forest cover (Figure 4), although some sections (notably 3E) have intrusions of deciduous trees. Along 3E, there is evidence of extensive flooding and the area contains mature balsam poplar trees. These areas have a profuse cover of horsetail on silty soils. A few lower depressions along 3C contain ephemeral or apparently seasonal water bodies which are attractive to moose (summer sign was abundant).

The eastern portion of 3C is located on higher ground than 3E, portions of 3D and the western portion of 3C. A fairly even aged spruce forest and feathermoss carpet characterizes the plant community in this area. The area may have some potential as a campground for canoeists.

Along 3D, mature white spruce forests were present on well-drained terrain. A stove and other remains, indicated that the area was previously used for camping.

Again, feathermoss is a common ground cover with wetter areas having horsetail (*Equisetum*) interspersions. Rose, highbush cranberry and dogwood were noted in the shrub layer.

4 and 5. Balsam poplar/saskatoon/chokecherry bushes form a uniquely lush vegetation cover around Nahanni Hotsprings (Figure 5). The lush deciduous foliage provides suitable habitats for bird species not commonly found elsewhere in the region (*cf.* 12 warbler species at the hotsprings as compared to only 2 species encountered at Virginia Falls).¹ Similar observations were made by ornithologists studying the avifauna in the upper Liard region (A. Erskine, pers. comm.).

¹This work has to be interpreted with some caution as all the early summer work i.e. a time when warblers are conspicuous, was concentrated at the hotsprings. Nevertheless the trend probably is real.

The Balsam poplar/chokecherry community is another feature which makes the hotsprings area unique. In all our travels through boreal areas (both in the Yukon and Northwest Territories), we have not yet seen a similar dense stand of chokecherry shrubbery. Other shrubs within this community were saskatoon bushes, low bush cranberry and scattered rose shrubs. Leaf litter was the main ground cover.

It seems obvious that the special soil conditions and possible microclimatic temperature conditions that result from the proximity of the hotsprings, account for the presence of this plant community. Because of its uniqueness (the oasis effect is not just "legendary"), it is recommended that facilities other than interpretive facilities not be established in areas 4 and 5.

Openings within the deciduous forest and shrub community (area 5), are covered by grasslands and herbaceous communities. The diversity and interspersions of these communities greatly adds to the diversity of the area. Scotter *et al.* (1971) commented on the lack of information on the flora at this site, and recommended that major floristic and ecological studies be undertaken to document their status before development or visitor use commences. Plant communities within this area have undergone considerable modifications by humans (W. Addison and F. Marsh pers. comm.). One plant community is dominated by the western Canada violet and has interpretive potential (F. Marsh pers. comm.). The vegetation around the cabin is largely a result of human activities. Balsam poplar and chokecherry community surround it. Six different plant species within this area are exotics, these are kentucky blue grass, alfalfa, yellow sweet clover, alsike clover, dandelion and red clover (Scotter and Cody 1971).

The fauna, particularly the avifauna, makes this area unique and provides interpretive opportunities which could be combined with an interpretive program about the hotsprings. It was also in this zone that a new mammal species *Zapus hudsonius* or western jumping mouse was added to the park list.

6 and 7. The major portion of this area consists of a mature white spruce forest in which areas marked as 7, are wet areas with broad leaved plant cover. Not all the wet areas within the zone are recorded, as some of them were narrow or limited in area.

The spruce forest is generally open with the ground cover varying considerably. Scattered balsam poplar are interspersed along poorly drained areas, equisetum is common which is an indication of silty soils. A carpet of mosses (particularly feathermosses) appear extensively in the climax white spruce forest. This would seem to indicate that these areas are not subjected to frequent flooding (siltation), since those areas which do indicate obvious signs of flooding have silty soils and an equisetum ground cover.

Rose is a common understory. Alder increases in importance in some areas, probably depending on drainage conditions. Scattered high bush cranberry, balsam poplar saplings and red osier dogwood can be found in the plant community. Game trails are common and, for the most part maintained by moose feeding along the areas marked as 7 and along Clausen Creek. Heavy use of some areas are indicative that the soils are also used as mineral licks.

If drainage patterns are adequate, then this area could be suitable for campsite and/or day use areas. Such facilities could be established far enough away from the hotsprings so that the latter would not be

destroyed by its physical proximity to a visitor use facility. From the campgrounds a trail could lead to the hotsprings and the floral and faunal features discussed in special pamphlets, as the trail winds through areas 4, 5, 6 and 7. The relationships of timing and intensity of flooding to plant succession along Clausen Creek could form the basis for an interpretive program.

D. Patriquin found what appeared to be a grave at the location marked by an X (Figure 6). The origin of this should be checked and its integrity maintained (see Marsh and Scotter, 1975 - p. 42).

2. Virginia Falls

1. Sedge/larch and stunted black spruce vegetation (Figure 7) predominates in poorly drained areas, around ponds and streams. Some of the lakes contained water lilies. Shrubby cinquefoil, birch (probably glandular birch), and larch form an open shrub cover. Sedges and other graminoid species predominate in the ground cover.

Moose sign (both winter and summer) was common (Figure 8). Shotgun shells (#2 with plastic covering) attests to the fact that waterfowl were probably shot on the ponds in the fall.

2. Upland black spruce/lichen/moss community with white spruce interspersions form an extensive vegetative cover along the south side of the river at Virginia Falls (Figure 9). Lichens form the main ground cover, however, mosses are interspersed particularly in white spruce stands. Labrador tea, blueberries (*Vaccinium uliginosum*), bog rosemary, birch, cranberries, bearberries (2 species), cinquefoil and buffalo-berry bushes form an open shrub layer. White spruce/black spruce stands became more

prevalent along the river (north of the dotted line) where they then integrate with the complex plant communities bordering along the river bank.

Caribou antlers and numerous other signs (droppings Figure 10) is an indication that this may be part of an important wintering and/or staging area for this species.

3. In certain localities within 1 and 2, white spruce clumps are found growing in places probably exhibiting specific types of edaphic conditions (Figure 11). Most of the shrubs found in 2 are present here, the major difference in ground cover being that mosses are more prominent. Such islands are important ecologically as they create a diversity that attracts a variety of mammals (Figure 12) and birds (e.g. crossbills, warblers). The ponds associated with this area (Figure 11) contained a variety of aquatic insects and could be used for interpretive purposes. Moose use this area in summer (as evidenced by droppings), shorebirds (lesser yellowlegs and solitary sandpipers) were often seen along the margins. Muskrats were seen and there is evidence (old beaver cuttings) that beaver once were also found here.

This pond with associated plant communities provides an opportunity for interpretive activities. An old abandoned den (most likely a fox den) was located within the white spruce forest.

4. White and black spruce trees are commonly intermixed with white birch in the northern portion. Black spruce becomes increasingly more important southward to the poorly drained areas. Alder, willow, labrador tea and blueberries were major components in the shrub cover.

5. The white spruce stand in area 4 integrates with the predominantly

black spruce/larch forest of area 5 (Figure 13). Willows are interspersed within this area. Mosses and bearberry (both species) form the main ground cover. Shrubs listed in 4 are also fairly common in this vegetation zone. The existing portage roughly separates the boundaries between 4 and 5 (Figure 14).

6. Along the rim of the canyon, an open forest cover forms the transition with area 4. Lodgepole pine predominates and is extensively interspersed with white birch and spruce. Rocky outcrops are in evidence, especially closer to the escarpment. Juniper, alder, willow, buffalo-berry, cinquefoil, blueberries and labrador tea are commonly found in the shrub cover. Ground cover is variable but characteristically has dense mats of cranberries, crowberries, and bearberries (particularly *A. rubra*). This region had the greatest apparent diversity and biomass of berries. This together with the substrate probably accounts for the high densities of voles and deer mice, as evidenced from the trapping results.

7. River margin vegetation is variable but generally contains a large graminoid component and is bordered by alder thickets. This area shows extensive winter use by moose as evidenced by droppings.

8. This zone is an open, well-drained area situated on a knoll. Black spruce is the most common tree species, however, lodgepole pine, white spruce and white birch are present. Alder, labrador tea, rose, cinquefoil and extensive clumps of blueberries form the greater percentage of a very open shrub cover. Bear, presumably black bears, as evidenced by scat, were attracted to this area. The ground cover did not indicate a uniform pattern and largely consisted of lichens, mosses and bearberry (both species).

9A, B and lower portion of 10. No distinct pattern could be discerned here. Most of 9A, B and southern portion of 10 were predominantly black spruce forest and variations occurred with the degree of drainage; 9A was the wettest area in which occasional clumps of sphagnum moss grew on elevated "knobs". Shrub cover consists mainly of Ericaceous plants. Larch are quite common particularly in area 9B. Lodgepole pine becomes more important with an increase in elevation (Figure 19) and provides a suitable habitat for blue grouse.

9C. Area 9C is located on a small, well-drained knoll and is covered by a black spruce/lichen vegetative cover (similar to area 2). The reason it was treated separately, even though covering a small area, was that it contained a carnivore den site, most likely that of a fox.

11. This is an extensive and variable area. There is no uniform plant cover except that spruce is generally the dominant tree species. A few mature white spruce stands are found along pond margins (Figure 20). The ponds have various stages of plant succession along the shorelines. It would appear that some, probably not all, of the small lakes are either of a thermokarst origin (F. Marsh pers. comm.) within lacustrine deposits or piping sinkholes. Bear, wolf and moose signs were common. This is undoubtedly an important area for these large mammals. Diversity created by the ponds and vegetation attracts a variety of aquatic and terrestrial vertebrates. The area, therefore, is of prime interest for interpretive purposes and a nature trail could be effectively established.

12. The alpine area on Mt. Sunblood (Figure 21) is accessible from the falls i.e. about a 2½ hour hike. The western exposure of the main ridge (Figure 21) is more barren than the eastern slope (leeward side). Due to

- Figure 19. Area 10 towards the base of Mt. Sunblood. Lodgepole pine gains in importance with an increase in elevation in the area. (Photo L.N. Carbyn)
- Figure 20. Area 11 is "riddled" with small lakes and ponds which probably are mostly of a thermokarst and sinkhole origin within lacustrine deposits. Note the presence of water lilies and an abandoned beaver lodge in the background. Bird and mammal life is extensive and this area has a great interpretive potential. (Photo L.N. Carbyn)
- Figure 21. Alpine region on Mount Sunblood. Western exposure is more barren (xerophytic) than the eastern slope. Birds of prey (2 species) were frequently observed in this area hunting alpine mammals, particularly arctic ground squirrels. (Photo L.N. Carbyn)*
- Figure 22. Mt. Sunblood provides a spectacular view over the surrounding countryside. It is also a point from which interesting weather patterns can be viewed. (Photo L.N. Carbyn).

*Area rates high for interpretive potential.

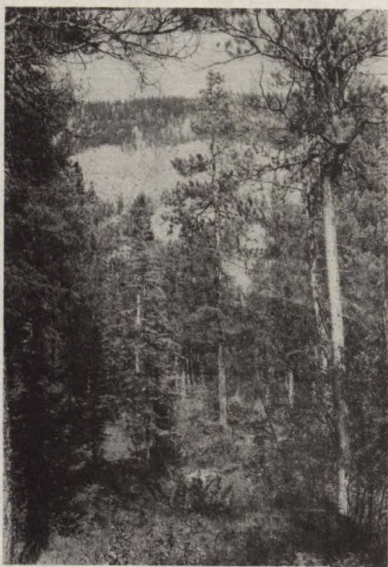


Fig.19

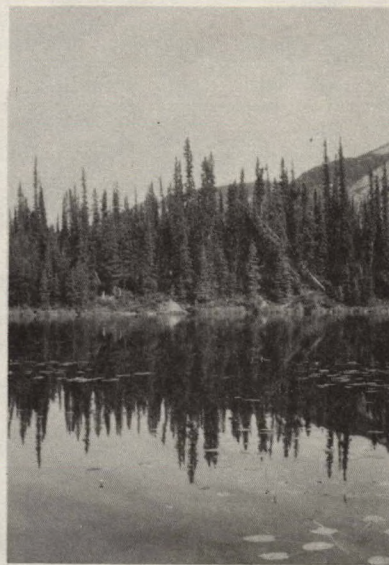


Fig.20



Fig.21



Fig.22

the greater diversity in alpine vegetation and fauna, the leeward side is a potentially important area for interpretation. On 3 separate occasions, goshawks and golden eagles were seen hunting alpine mammals (Arctic ground squirrels and pikas) along the open slopes. This could be developed into a special interpretive feature. A spectacular view (Figure 22) of the countryside is possible from the top.

On several occasions we have had the opportunity to observe weather patterns move in from the Pacific. At times, valleys or portions of valleys were obliterated from view by heavy rain, while adjacent areas were exposed to sunlight. Such showers often lasted for brief periods then moved on.

This phenomenon and the mechanisms behind the observed weather patterns could appropriately form part of the interpretive "package" on Mt. Sunblood.

13. Subalpine areas are interesting transition areas (Figure 23). It was near this area that a breeding bird range extension was made for the Northwest Territories i.e. the golden-crowned sparrow (*Zonotrichia atricapilla*) (Appendix C). Tree sparrows (*Spizella arborea*) and white-crowned sparrows (*Zonotrichia leucophrys*) probably are common breeding birds in this zone.

3. Rabbitkettle Lake.

1. The margin of the lake is bordered by a band of sedges (*Carex* spp.*). Extending into deeper water are growths of rushes (*Juncus validus*, Figure 16).

The greatest diversity of aquatic vegetation is found within the shallow bays of the west side. The bottom of the lake is clearly visible from the surface and a "translucent board walk" could effectively be used here.

*(*Carex aquatilis*, *C. garberi*, *C. capillaris* - F. Marsh pers. comm.)

Figure 23. Dense birch shrubland areas form the transition between the alpine areas and forested region on the northern slopes of Mt. Sunblood. Tree sparrows are particularly common in this zone. (Photo L.N. Carbyn)

Figure 24. Heavy browsing pressure on willow was noted in some areas. *Salix glauca* in this instance, shows evidence of utilization by moose along the Oxbow Lake area. (Photo L.N. Carbyn)

Figure 25. Wolf tracks along Clausen Creek. (Photo J. Nolan)

Figure 26. Wolf den located along a ridge in the Deadmen Valley. A rendezvous site was also located and outfitters killed a wolf in this area during July 1974. (Photo J. Nolan)



Fig.23



Fig. 24



Fig.25



Fig.26

The emergent vegetation probably has a significant influence on the abundance of invertebrates in the lake. These in turn are at the bottom of the food chain for the aquatic birds attracted to the lake (see later section).

Mackenzie hedysarum (*Hedysarum mackenzii*) is an important legume species growing along the banks of the lake. Grizzly bears dig out the roots for a source of early spring food supply (see section under bears). 2 and 3. The areas are variable and have one thing in common, in that these are depressions with moist conditions. Some are filled with standing water (sedge margins) others are boggy that are dominated by glandular birch, willows and clumps of black spruce.

Ponds with sedge margins probably evolve in time to pure sedge meadows. Depressions with, or without water bodies break up the uniformity of vegetation and, therefore, add to the biotic diversity.

Area 3A is a large, undulating upland grassland area. This area is different from other aquatic oriented habitats.

4. The majority of the vegetation at Rabbitkettle Lake is a result of fire succession. Bearberry (Figure 27) is a common ground cover, often intersperced with lichens or bare areas. These berries from the previous season form an important part of the early season food items of bears. Lupines and roses are particularly showy components that flower early in the season and are lost to most visitors because of their peak periods of visitation. A spot check at one/particular point resulted in the following species list:

Spike trisetum	<i>Trisetum spicatum</i>
Blue or Bog bilberry	<i>Vaccinium uliginosum</i>
Fireweed	<i>Epilobium angustifolium</i>
Rose	<i>Rosa acicularis</i>
Scouring rush	<i>Equisetum scirpoides</i>
Lingon berry	<i>Vaccinium vitis-idaea</i>
Labrador tea	<i>Ledum decumbens</i> or <i>groenlandicum</i>
Willows and Sedges	<i>Salix</i> spp. and <i>Carex</i> spp.
White birch	<i>Betula papyrifera</i>
Black spruce	<i>Picea mariana</i>
Larch	<i>Larix laricina</i>
Buffalo-berry	<i>Shepherdia canadensis</i>
Grass of Parnassus	<i>Parnassia</i> spp.
Avens	<i>Geum</i> spp.
Common Bearberry	<i>Arctostaphylos uva-ursi</i>
Lupine	<i>Lupinus arcticus</i>
Aspen	<i>Populus tremuloides</i>
Alder	<i>Alnus crispa</i>
Toadflax	<i>Geocaulon lividum</i>
Twin flower	<i>Linnaea borealis</i>
One-sided Wintergreen	<i>Pyrola secunda</i>
Louse Wort	<i>Pedicularis</i> spp.
Golden rod	<i>Solidago</i> spp.
Bed straw	<i>Galium boreale</i>
Strawberries	<i>Fragaria</i> spp.
Alpine bearberry	<i>Arctostaphylos rubra</i>

Figure 27. Berries from *Arctostaphylos uva-ursi* (Bearberries) of the previous growing season forms an important spring and early summer food component in bears. (Photo L.N. Carbyn)

Figure 28. Grizzly bears digging of *Hedysarum* spp. roots along the shore of Rabbitkettle Lake. (Photo L.N. Carbyn)



Fig. 27



Fig. 28

5. Variable, moist area. Stream outlet on the west end is bordered by spruce trees. Generally the trend is that sedges grow along the channel margin, followed by black spruce, then larch and willow bordering unto the burn. Orchids are commonly seen in June. Willow, cinquefoil and labrador tea are common shrubs.

A stretch of poorly drained area borders the north end of the ridge that separates the lake from the river. Considerable evidence of winter browsing by moose was found in this region.

6. White spruce forest, generally open with variable understory is found along the southern portion of the river. The scattered willows indicated that there was fairly heavy winter browsing in this area by moose.

7. An "island" of spruce trees, untouched by the fire that set back plant succession in most of the area is found along the east side of the lake.

8. Black spruce trees within a boggy area surround two small lakes in the north-easterly portion of the Rabbitkettle Lake area.

9. Open dry slopes, often sparsely covered by grasses and some herbs. Sage (*Artemisia* spp.) grows frequently in large mats on the dry hillsides.

4. Rabbitkettle Hotsprings.

1. Open coniferous forest with little underbrush. Lodgepole pine trees along the border. Lichens with patches of various types of mosses form the ground vegetation. Aspen increases in the forest cover towards a south-westerly direction and only a few balsam poplar are scattered in this area.

2. Open black spruce forest with a few large larch trees are found between the two "hotsprings"; to the northeast white spruce trees become dominant within a close canopied coniferous forest. Mosses, with some lichen knolls, form the predominant ground cover. In some areas dense stands of white spruce saplings or small stands of paper birch prevail. This opens up into a forest with an increased lichen ground cover. Dead willow attest to earlier successional stages in some areas.

3. Open black spruce area within a karst-like ground cover. Cinquefoil, creeping juniper, glandular birch, and Lapland rose-bay form an open shrub cover.

4a. Black spruce is the common tree species, with light intrusions by larch, particularly along the fringe areas. Lichen is a common ground cover with mosses gaining in dominance in moister sections. White spruce trees are intermingled with black spruce in some areas. Mature spruce in the area contained an abundant cone crop, particularly on the large white spruce trees that are found next to the grassland area along the open slope (4b).

4b. Dry grassland slope. Hairy wild rye and several legume species are common. Patches of sage in local areas. Young aspen, white spruce saplings, scattered buffalo-berry and rose form the very open shrub layer.

5. Coniferous stand (black spruce predominately) intergrading with a deciduous cover (aspen, white birch) at the higher elevations. Wet areas arising from ground water oozing to the surface. Very wet areas have small sphagnum mounds with bog cranberries and sundew plants.

6. Burn area that contains islands of lodgepole pine (approximately 25 years old). Open area with scattered white spruce, larch and pine saplings. There is a lush shrub layer consisting of glandular birch, willows and poplar. In July buffalo-berry bushes carried a heavy berry crop. This area showed extensive winter use by moose, and some evidence of caribou utilization.

7. Lake area with black spruce fringe. Sedges and other aquatic plants form the border around sections of these ponds.

C. Small mammals.

A total of 11 different species of small mammals (*Families cricetidae* - 6 species; *Zapodidae* - 1 species; *Sciuridae* - 3 species; *Ochotonidae* - 1 species) were trapped at 6 different locations (Nahanni Hotsprings, Virginia Falls, Mt. Sunblood, Oxbow Lake, Rabbitkettle Lake, Rabbitkettle Hotsprings.¹ Of these, the meadow jumping mouse is a new record for the park. This species was placed in the "expected" column by Scotter *et al.* (1971). Trapping over larger areas undoubtedly will increase the number of species, as a greater range of habitats could then be sampled. Collection of a bat (*Myotis keenii*) resulted in an interesting range extension for that species (Appendix C).

Tables 2, 3, 4 and 5 list the number of individuals and densities (number per 100 trap nights) of small mammals (mice and voles only) collected at the various sites. Because of the field schedule and because of the difference in size of various habitats, unequal sample sizes were obtained. By calculating relative densities, this problem was partly solved.

¹See Figure 45.

Table 2. Number and Relative Density (no. per 100 trap nights) of small mammals caught in snap trap lines at the Nahanni Hotsprings, June to August 1974.

Habitat*	1 + 3B		2		3A		3C		3D		3E		4 + 5		6		7		Total
Number of trap nights	82		146		20		17		18		15		146		417		317		1178
Species	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	
<i>Sorex cinereus</i>	0	-	0	-	0	-	0	-	0	-	1	6.7	0	-	0	-	0	-	1
<i>Sorex vagrans</i>	1	1.2	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1
<i>Peromyscus maniculatus</i>	2	2.4	5	3.4	7	35.0	2	11.8	4	22.2	5	33.3	27	18.5	4	1.0	37	11.7	93
<i>Clethrionomys rutilus</i>	2	2.4	1	0.7	0	-	0	-	1	5.6	0	-	0	-	1	0.2	0	-	5
<i>Microtus pennsylvanicus</i>	0	-	0	-	0	-	0	-	0	-	0	-	15	11.0	4	1.0	3	0.95	22
<i>Microtus longicaudus</i>	0	-	0	-	0	-	0	-	0	-	0	-	4	4.8	0	0.0	7	2.21	11
<i>Zapus hudsonius</i>	0	-	0	-	0	-	0	-	0	-	0	-	2	1.4	0	-	0	-	2
Total	5		6		7		2		5		6		48		9		47		135

* For description of habitat see Table 6 and description in the text.

Table 3. Number and Relative Density (no. per 100 trap nights) of small mammals caught in snap trap lines at the Virginia Falls and Oxbow Lake, June to August 1974.

Habitat*	1		3 + 4		5		6		8		9A + 9B		9C + 2		10		11		Oxbow		Total
Number of trap nights	179		250		100		50		96		156		396		171		181		100		1679
Species	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	
<i>Sorex cinereus</i>	2	1.1	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	2
<i>Sorex vagrans</i>	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0
<i>Peromyscus maniculatus</i>	1	0.6	0	-	0	-	4	8.0	0	-	0	-	0	-	0	-	0	-	1	1.0	6
<i>Clethrionomys rutilus</i>	1	0.6	1	0.4	0	-	1	2.0	6	6.3	5	3.2	0	-	4	2.3	0	-	1	1.0	19
<i>Microtus pennsylvanicus</i>	1	0.6	1	0.4	0	-	0	-	0	-	1	0.6	0	-	0	-	1	0.6	1	1.0	5
<i>Microtus longicaudus</i>	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1	1.0	1
<i>Zapus hudsonius</i>	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0
Total	5		2		0		5		6		6		0		4		1		4		33

*For description of habitat see Table 7 and description in the text.

Table 4. Number and Relative Density (no. per 100 trap nights) of small mammals caught in snap trap lines at Rabbitkettle Lake, June to August 1974.

Habitat*	1		2		3		3A		4		5		6		7		8		9		Total
Number of trap nights	176		48		139		100		381		303		250		100		115		300		2062
Species	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	
<i>Sorex cinereus</i>	2	1.2	-	-	7	5.0	1	1.0	3	0.8	5	1.7	-	-	-	-	4	3.5	5	1.7	27
<i>Sorex vagrans</i>	-	-	-	-	1	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
<i>Peromyscus maniculatus</i>	-	-	1	2.1	1	0.7	-	-	14	3.7	-	-	1	0.4	3	3.0	1	0.9	-	-	21
<i>Clethrionomys rutilus</i>	1	0.6	8	16.7	1	0.7	-	-	11	2.9	1	0.3	2	0.8	-	-	-	-	-	-	24
<i>Microtus pennsylvanicus</i>	4	2.3	1	2.1	10	7.2	1	1.0	2	0.5	3	1.0	1	0.4	-	-	2	1.7	-	-	24
Total	7		10		20		2		30		9		4		3		7		5		97

*For description of habitats see Table 8 and description in text.

Table 5. Number and Relative Density (no. per 100 trap nights) of small mammals caught in snap trap lines at Rabbitkettle Hotsprings, August 1975.

Habitat*	1		2		3		4a		4b		5		6		7		Total
Number of trap nights	112		52		-		25		25		68		42		160		484
Species	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	No.	Den.	
<i>Peromyscus maniculatus</i>	2	1.8	1	1.9	-	-	-	-	-	-	-	-	2	4.8	-	-	5
<i>Microtus pennsylvanicus</i>	-	-	-	-	-	-	-	-	-	-	2	2.9	-	-	1	0.6	3
<i>Clethrionomys rutilus</i>	-	-	1	1.9	-	-	1	4.0	4	16.0	-	-	-	-	-	-	6
Total	2		2		-	-	1		4		2		2		1		14

*For description of habitat see Table 8 and description in the text.

Species diversity was calculated using Brillouin's formula (Brillouin 1960 - Tables 6, 7 and 8). This method takes into account not only number of species but also number of individuals. That is, species diversity is greatest if numbers are distributed evenly, and conversely, the diversity is lower for the same number of species if only a few species comprise the bulk of the population.

Such a treatment of the data is of heuristic importance and is of little practical value. The importance of habitats to rare small mammal species (e.g. in this case *Zapus hudsonius* in areas 4 and 5 of the hotsprings) provides enough information to identify significant habitat types. Another consideration would be total biomass (e.g. area 6 at Virginia Falls) where common species existing at high densities provide an important food base for other species. Since the proposed areas for campground developments are small in size, compared to the total park area, this consideration is not important as an impairment factor.

Brillouin's formula for species diversity is used in situations where collections are small enough for all individuals to be identified and counted.

The formula is as follows:-

$$H = \frac{1}{N} \log \frac{N!}{N_1! N_2! \dots N_S!}$$

N is the total number of individuals, S the number of species and N_i the number of individuals in the i th species, so that

$$\sum_{i=1}^S N_i = N. \text{ That is, in terms of real values this would}$$

be as follows:

Table 6. Species diversity of small mammals sampled by snap trap lines in the Nahanni Hotsprings, June to August 1974.

Habitat	Number of Species	Number of Individuals	Species Diversity (decimal digits)
1 + 3B Mature white spruce feathermoss	3	5	0.2954
2 Poplar/birch	2	6	0.1297
3A Open white spruce/white birch	1	7	0.0000
3C Spruce stand, heavy underbrush	1	2	0.0000
3D Mature white spruce feathermoss with variable density of dominant trees	2	5	0.1398
3E Flood plain area - balsam poplar	2	6	0.1297
4 + 5 Balsam poplar-chokecherry Semi-open to open grassland area	4	48	0.4014
6 White spruce/rose/equisetum/moss cover	3	9	0.3110
7 Aquatic fringed vegetation	3	47	0.2509
Total		135	

Table 7. Species diversity of small mammals sampled by snap trap lines in the Virginia Falls and Oxbow Lake, June to August 1974.

Habitat		Number of Species	Number of Individuals	Species Diversity (decimal digits)
1	Sedge/larch stunted black spruce	4	5	0.3556
3 + 4	Upland black spruce/lichen	2	2	0.1505
5	White spruce feathermoss birch	0	0	0.0000
6	Black spruce/alder	2	5	0.1398
8	Lodgepole pine/birch	1	6	0.0000
9A + 9B	Knoll-open mixed forest	2	6	0.1296
9C + 2	Black spruce/moss	0	0	0.0000
10	Lodgepole pine-transition	1	4	0.0000
11	White spruce/black spruce/ sedge-variable community	1	1	0.0000
Oxbow Lake - Stream edge and flood- plain		4	4	0.3451
Total			33	

Table 8. Species diversity of small mammals sampled by snap trap lines in the Rabbitkettle Lake, Rabbitkettle Hotsprings area, June to August 1975.

Habitat	Number of Species	Number of Individuals	Species Diversity (decimal digits)
Rabbitkettle Lake			
1 Emergent vegetation	3	7	0.2887
2 Vegetation (shrub) in depressions	3	10	0.0096
3 Graminoid vegetation associated with moist areas	5	20	0.4061
3A Upland grassland area	2	2	0.1505
4 Burned area, variable	4	30	0.4266
5 Heterogeneous plant cover; moist area	3	9	0.3003
6 White spruce forest	3	4	0.2698
7 White spruce forest (island effect)	1	3	0.0000
8 Black spruce (sedge surrounding ponds)	3	7	0.2887
9 Open dry slopes	1	5	0.0000
Rabbitkettle Hotsprings			
1 Spruce forest, open	1	2	0.0000
2 Mature spruce forest	2	2	0.1505
3 Open; karst-topography	-	-	-
4A Black spruce, larch forest, moist	1	1	0.0000
4B Open grassland slope	1	4	0.0000
5 Old burn	1	2	0.0000
6 Old burn	2	2	0.1505
7 Burn with spruce islands	1	1	0.0000

Total number of individuals ⁽⁵⁾ of 3 species in a given habitat is 1, 2, 2 and hence species diversity is

$$H_{10} = \frac{1}{5} \log 5! - (\log 2! + \log 2! + \log 1!) \\ = \frac{1}{5} 2.07 - (.3010 + .3010 + 0) = .29544$$

Based on this formula the greatest species diversities were in areas 4 and 5 (Nahanni Hotsprings), the Oxbow Lake area near Virginia Falls, areas 3 and 4 at Rabbitkettle Lake. These indices are affected by the degree of trapping intensity and therefore are not completely representative of the true potential diversities of each habitat.

Two items of general interest were an observed shift in sex ratio of deer mice (1974), and reproductive data of all species (Tables 9 and 10). A shift of greater mortality from females to males has been observed elsewhere (W.A. Fuller pers. comm.). A tentative explanation for this is that males are more explorative and hence more vulnerable to predation. Such information, when used in a broader context of the life history of the species can be used in interpretive programs. As already mentioned, we found that canoeists were eager to learn more about the animals when we showed them study skins of these poorly known "wildlife" species.

D. Large mammals.

1. Bears

Grizzly bears were not sighted nor were clearly identifiable grizzly bear signs seen at Nahanni Hotsprings or at Virginia Falls. Jack Nolan, who has some experience in assessing bear populations in the Yukon

Table 9. Monthly sex ratios of the three most common species of Cricetids and reproductive information (placental scars and in utero foetal counts) of the small mammals collected at Nahanni Hotsprings and Virginia Falls.

Species	Monthly Sex Ratio						Litter Size			
	June		July		August		Nahanni Hotsprings		Virginia Falls	
	♂	♀	♂	♀	♂	♀	Ave. number of young	Number of specimens	Ave. number of young	Number of specimens
<i>Peromyscus maniculatus</i>	54.7	45.3	46.2	53.8	21.2	78.8	6.2	20	3.0	1
<i>Microtus pennsylvanicus</i>	60.0	40.0	57.1	42.9	37.5	62.5	5.3	8	4.0	1
<i>Microtus longicaudus</i>	40.0	60.0	40.0	60.0	00.0	100.0	5.8	5	5.0	1
<i>Clethrionomys rutilus</i>	100.0	00.0	57.1	42.9	56.3	43.7	4.0	1	5.0	6
<i>Sorex cinereus</i>	-	-	-	-	-	-	-	-	7.0	1
<i>Eutamias minimus</i>	-	-	-	-	-	-	-	-	4.5	2

Table 10. Monthly sex ratios of the four most common species of Cricetids and reproductive information (placental scars and in utero foetal counts) of the small mammals collected at Rabbitkettle Lake and Rabbitkettle Hotsprings.

Species	Monthly Sex Ratio						Litter Size			
	June		July		August		Rabbitkettle Lake		Rabbitkettle Hotsprings	
	♂	♀	♂	♀	♂	♀	Ave. number of young	Number of specimens	Ave. number of young	Number of specimens
<i>Peromyscus maniculatus</i>	50	50	47	53	60	40	4.6	5	5	1
<i>Microtus pennsylvanicus</i>	70	30	36	64	68	32	5.0	7	5	1
<i>Clithrionomys rutilus</i>	80	20	53	47	50	50	5.0	4	5	2
<i>Sorex cinereus</i>	25	75	57	43	-	-	6.3	3	-	-

and Northwest Territories, remarked at the surprising lack of grizzly bear sign. He was furthermore surprised at not seeing more bear sign on the Tlogotsho plateau.

Frequent sign, which were judged to be of black bear during the 1974 field season areas 1, 3A and 2 at Nahanni Hotsprings. Sign of black bear was particularly common in area 3A. Black bears were seen at the hotsprings cabin on 20, 21 and 24 August and opposite the cabin 17 August. On 17 August fresh tracks were also seen along the road leading to the cabin. Another set of tracks were found along the gravel bar below the cabin. In all cases it would appear that it could have been the same individual as the sightings and tracks were all of a subadult.

In 1975 a black bear was seen feeding on garbage at Nahanni Hotsprings on 20 August.

Most concentrated bear sign at Virginia Falls in 1974 was noted in areas 2, 8 and 11. Areas 8 and 11 were judged to be "attractive" bear habitats. Three sightings were made. These sightings were as follows:

- 22 July, two black bears reported seen 2 miles below the falls and on the portage trail
- 23 July, a subadult black bear seen along the east end of the portage.
- 15 August, one subadult black bear seen on the portage.

Bear sign was further noted at the Oxbow Lake area, Deadmen Valley west of Nahanni Hotsprings. The fact that all the actual observations made of black bear were young animals (subadults) is interesting and one could speculate on the significance of this. It is possible that the habitats around the two sites are marginal habitats for black bear. Increased human activity would no doubt attract more black bears if the garbage handling facilities are not carefully managed.

Black bear scat and actual sightings were common around Rabbitkettle Lake in 1975. Several sightings were made (14, 23, 24, 27 and 29 July). It was interesting to note that despite the "open air" kitchens of two camps, no bear problems were experienced.

In 1974, unconfirmed grizzly sightings by canoeists were most often made at the Rabbitkettle Hotsprings area where apparently a sow and 2 cubs were frequently seen. The building of a cabin at the junction of the Flat and Nahanni rivers was interrupted during the summer because of the presence of a grizzly bear (R. Frey pers. comm.). Canoeists and others reported unconfirmed sightings of grizzlies from the following areas:

1974

<u>Date</u>	<u>Observer</u>	<u>Circumstances</u>
Early June	J. Poirer	Reported having been "mock" charged by a sow with a yearling at Rabbitkettle Hotsprings.
Early June	Canoeists	Observed a sow with two cubs at Rabbitkettle Hotsprings.
Early July	Kayakers	Saw a single grizzly along an unnamed creek between Hell Roaring and Flood creeks.
30 July	Canoeists	Reported seeing a bear (presumably a grizzly) on the north bank near Flood Creek.

1974 (*continued*)

<u>Date</u>	<u>Observer</u>	<u>Circumstances</u>
5 August	Canoeists	Reported seeing a "large bear track with claws" near the Moose Ponds (outside Park boundary).
5 August	Canoeists	Reported seeing a "small grizzly" bear about 10 miles from Virginia Falls along the north bank.
7 August	Canoeists	Reported seeing "large" bear tracks while hiking between Rabbitkettle and Hole-in-the-Wall Lake.

1975

26 May	R. Frey	Adult grizzly at Rabbitkettle Lake cabin site.
Early June	L. Carbyn	Abundant sign of grizzly diggings around Rabbitkettle Lake.
23 June	D. Patriquin	Fresh tracks along Hole-in-the-Wall Creek.
1 July	J. Tutt	Bear, believed to be a grizzly seen along the new portage at the west end of Rabbitkettle Lake.
23 July	D. Patriquin	Grizzly bear tracks at the sheep lick east of Rabbitkettle Lake along the river bank.
2 August	L. Carbyn	Small (probably yearling) grizzly track sighted along Rabbitkettle River near the hot springs.

1975 (continued)

<u>Date</u>	<u>Observer</u>	<u>Circumstances</u>
4 August	D. Patriquin	Fresh tracks (12 x 19.5 x 24 cm) reported from Rabbitkettle River near the hotsprings.
5 August	F. Marsh	Found a large fresh bed dug up by a bear (presumably grizzly because of associated size of scat) near Rabbitkettle Hotsprings.
15 August	D. Patriquin	One very fresh track at the old cabin site at Flood Creek.
28 October - 7 November	Frey	Bear damaged cabin and skiddoo at Rabbitkettle Lake.

All evidence, indicates that the Rabbitkettle area is better "grizzly country" than either Virginia Falls or Nahanni Hotsprings. This does not mean that where bears are not sighted e.g. Virginia Falls area, that they could not quickly be drawn into the region if the available food supply increases. From personal experience in Jasper National Park, we have found that a carcass of a large mammal e.g. a moose, can quickly draw a grizzly bear into an area which generally was thought to be devoid of bears.

The situation at Rabbitkettle Hotsprings warrants careful attention. Grizzly sows in the Yukon have smaller home ranges (average 33 square miles) than boars (Pearson 1975). Sows with cubs always pose a potential threat to humans. Furthermore, where there are adult sows there will be young, recently weaned animals.

In the meantime, every effort should be made to make sure that any human activities in the area do not attract bears to the site. This means efficient garbage disposal systems right from the start. Some areas e.g. Virginia Falls, already have a few picnic tables. It is poor management to haul such facilities into these areas prior to having set up a proper garbage disposal system.

A total of 15 scat samples were collected in 1974 and 90 samples in 1975. The 1974 sample presumably was all of black bear whereas the 1975 sample consisted both of grizzly and black bear. Results are listed in Tables 11, 12 and Appendix E.

The results indicate that vegetable matter is by far the most important food source. In 1974 one scat contained young spruce cones. Another sample from Deadmen Valley contained mammal hair which most likely is that of Dall sheep. This could have been obtained from scavenging on wolf kill remains. Ants were important items in 2 scats and occurred in 7 out of 15 scats (47% occurrence).

Food habits in northern bears (both black and grizzly) shift with the seasonal variation in available food sources (A. Pearson pers. comm.). Because of the proximity, Pearson's study in the Yukon is most applicable to the bear populations within the Nahanni River watershed area. Pearson found that in early spring (April - May), grizzly bears first foraged along open hillsides near the den sites. *Hedysarum* and catkins of willows (*Salix* spp.) were preferred food items. This was supplemented by whatever other food e.g. carrion, that was available. During the early summer period (June - July), bears left the open areas and moved

Table 11. Percentage of food items as determined from examination of 15 bear scat samples (1974).

Unidentified vegetation	48.5%
<i>Vaccinium vitis-idaea</i>	15.6%
<i>Vaccinium uliginosum</i>	10.1%
Ants	9.5%
<i>Picea</i> seeds and cones	3.4%
Animal hair	3.0%
Unidentified berries	2.8%
Wood chips and twigs	1.5%
<i>Gramineae</i>	1.4%
<i>Picea</i> needles	1.3%
<i>Arctostaphylos uva-ursi</i>	1.0%
<i>Vaccinium vitis-idaea</i> leaves	T*
Lichen	T

*T = trace

Table 12. Percentages of food items as determined from examination of 90 bear scat samples (1975).

<i>Arctostaphylos uva-ursi</i>	32.3%
<i>Shepherdia canadensis</i>	28.2%
Unidentified vegetation	25.5%
<i>Vaccinium uliginosum</i>	7.6%
<i>Arctostaphylos rubra</i>	1.9%
Ants	1.4%
Graminoid stems	1.2%
<i>Hedysarum</i> roots	1.1%
Wood chips	1.0%
Ungulate hair	T*
Aspen leaves	T
<i>Viburnum edule</i>	T
Snail shells	T
Fishing line	T

*T = trace

into forested areas apparently spending most of their time in the forest/alpine transition areas and within sub-alpine willow flats. Dry berries of bearberry can be important locally. As the summer progressed, grasses increased in the incidence of their diet, with a concomittant reduction in the willow/catkin component. Buffalo or soapberries then increased in importance. During early August this foraging pattern was maintained. By mid-August most of the berries had dried up or fallen from bushes and the bears then began to move to either higher elevations or alluvial islands. Late developing berries and *Hedysarum* roots then constituted the major food sources until the denning period.

Within the Nahanni area, berries undoubtedly are an important source of staple food. Blueberries, bog cranberries, crowberries, soapberries and highbush cranberries are the most widespread in the area. Other species such as Saskatoon, chokecherries and raspberries are not as widespread and become locally abundant.

Buffalo-berries and bearberries were particularly important in the Rabbitkettle area. Judging from the scat, the latter formed an important spring and early summer food component (Figure 27). Roots of *Hedysarum* are dug up and are an important source of food (Figure 28).

Spring and early summer utilization of *Hedysarum* was also observed for the Flat/Nahanni junction area and around Rabbitkettle Lake (Figure 29). Suckers (*Catostomus* spp.) are commonly seen swimming in shallow water along the shore of Rabbitkettle Lake. Ray Frey (pers. comm.) saw a grizzly feeding on one left on the shore by a fisherman. It is quite possible that bears may catch a few, however there was no evidence of this from the scat analyses.

Figure 29. Locations of grizzly bear "diggings" for *Hedysarum* roots near Rabbitkettle Lake.

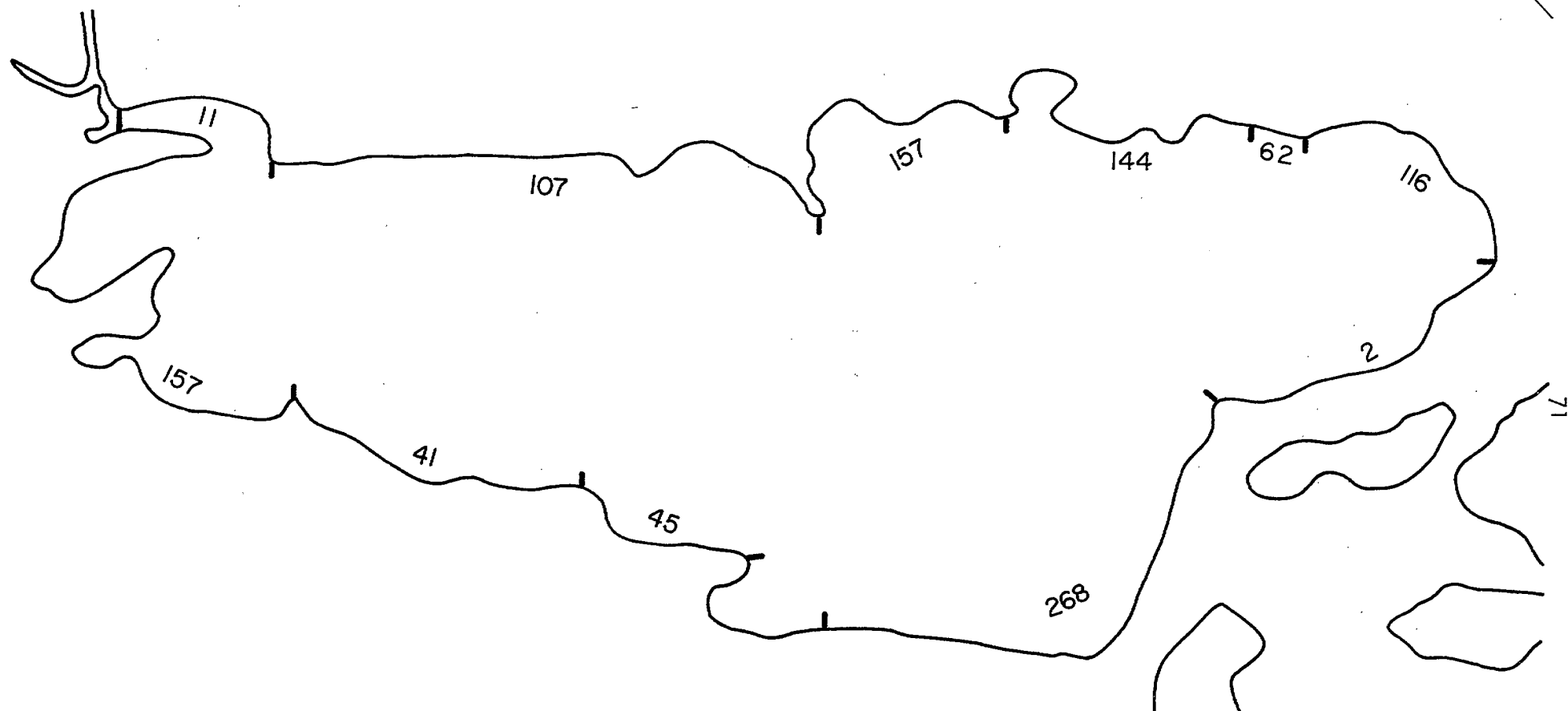
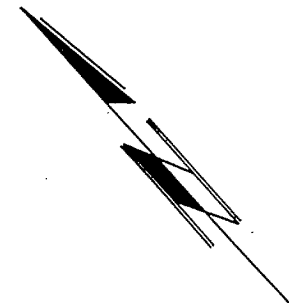
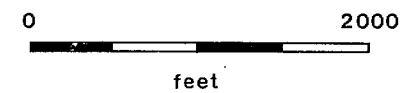


Fig. 29

Rabbitkettle Lake



Rabbitkettle Lake area therefore can be considered within suitable grizzly range and from evidence *Hedysarum* digging probably is not far removed from grizzly bear den sites. Pearson (1975) found that as the summer progressed, bears migrated to higher elevations, and the lack of sightings around the lake could be attributed to the same phenomenon. During field work around Rabbitkettle Hotsprings more grizzly sign was seen. It is quite possible that the ripening of buffalo-berries attracted the bears back into lower elevations.

Spring and early summer (mid-June) grizzly bear activity was noted along the Flat/Nahanni rivers confluence, and extended all along the Flat River up to the mouth of the Caribou River. Areas further up the Flat River were not examined.

The paucity of grizzly sign at Nahanni Hotsprings and Virginia Falls is interesting. As already mentioned these two sites differ noticeably from the Rabbitkettle and Flat/Nahanni junction areas. Tentative grizzly bear habitat classification categories are summarized below:

Class 1 -

This unit designation is an area which possesses the theoretical habitat requirements of good interspersed landforms and vegetation types.

Class 2 -

A class 2 unit is an area that is judged to be one with possible minor limitations for grizzly bears.

Class 3 -

A class 3 unit has moderate to severe theoretical limitations as grizzly bear habitat.

It should be stressed that the above interpretations are theoretical ones, and were extrapolated from what is generally known about grizzly bears. Results are shown in Figures 30, 31, 32, and 33.

A brief discussion of the areas within each classified zone is given in Appendix F.

Table 13 lists the breakdown by percentages of the various grizzly habitat designations as calculated for Nahanni Hotsprings, Virginia Falls, Flat/Nahanni junction and Rabbitkettle Hotsprings areas.

Table 13. Percentages of potential grizzly bear habitat types within a 15 mile radius of the Nahanni Hotsprings, Virginia Falls and Rabbitkettle study areas.

Study area	Units		
	Class 1	Class 2	Class 3
Nahanni Hotsprings	37	48	15
Virginia Falls	96	4	-
Flat/Nahanni junction	99	1	-
Rabbitkettle Hotsprings	95	5	-

In all cases the values were derived from what seemed to be potentially good or poor grizzly habitats. Factors which could not be assessed from this impact oriented study, therefore, are not considered. Only detailed studies of the species can reveal that kind of basic information which would answer some of the questions as related to why bears are in "this" area but not in "that" area.

Figure 30. A superficial grizzly bear habitat analysis for the Nahanni Hotsprings area.

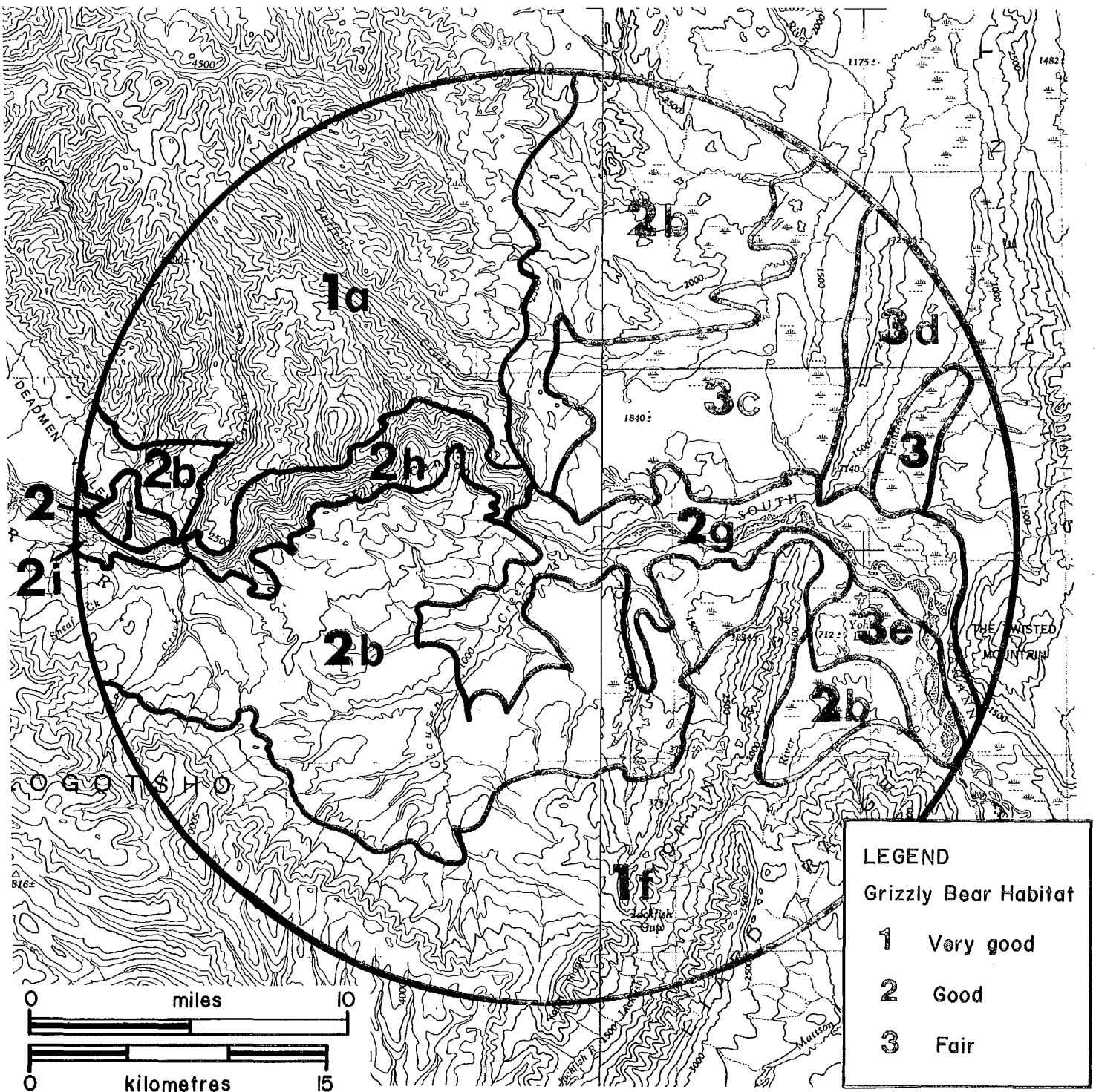


Figure 31. A superficial grizzly bear habitat analysis for the Virginia Falls area.

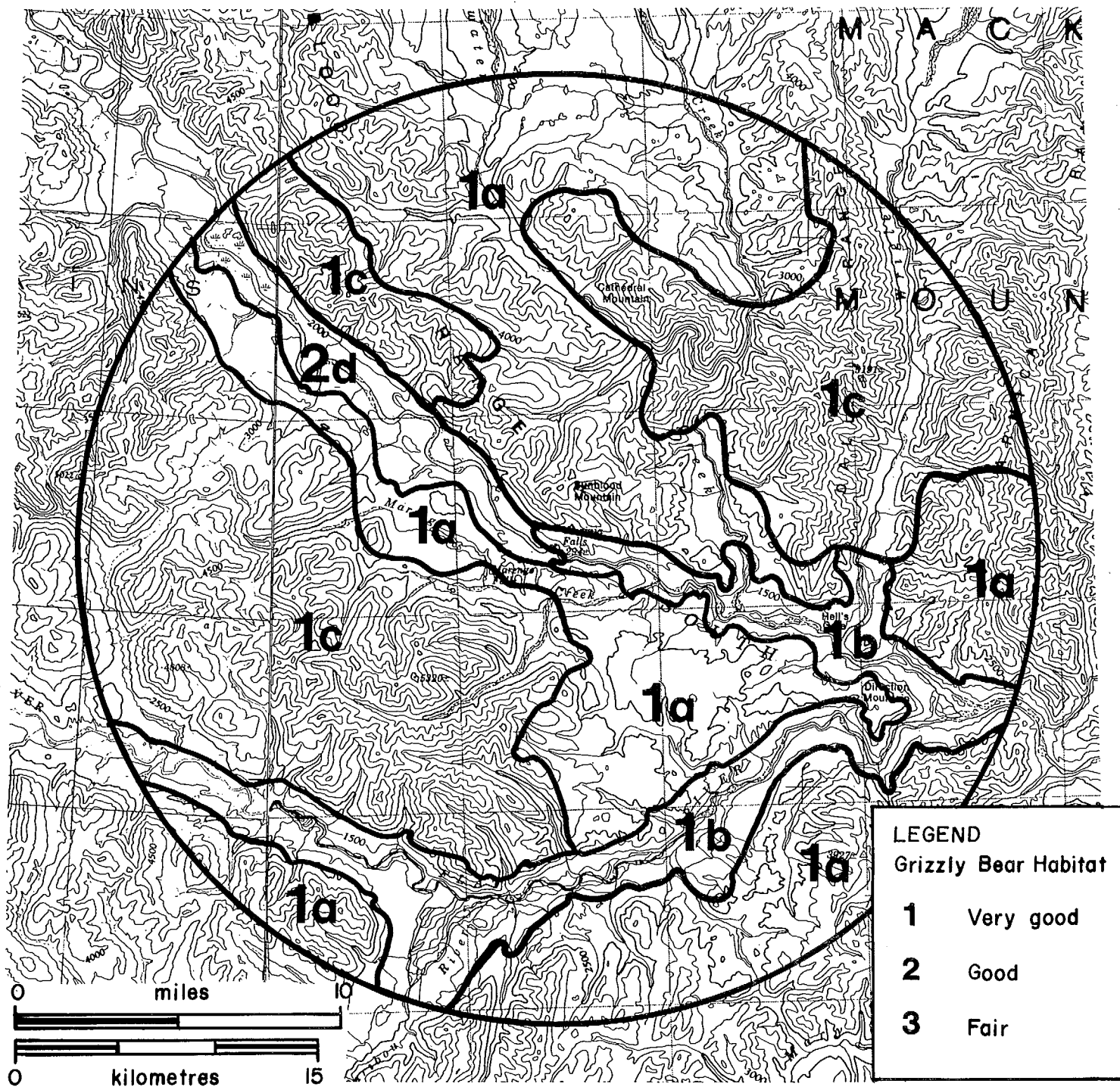


Fig. 31

Virginia Falls Area

Figure 32. A superficial grizzly bear habitat analysis for the Flat River area.

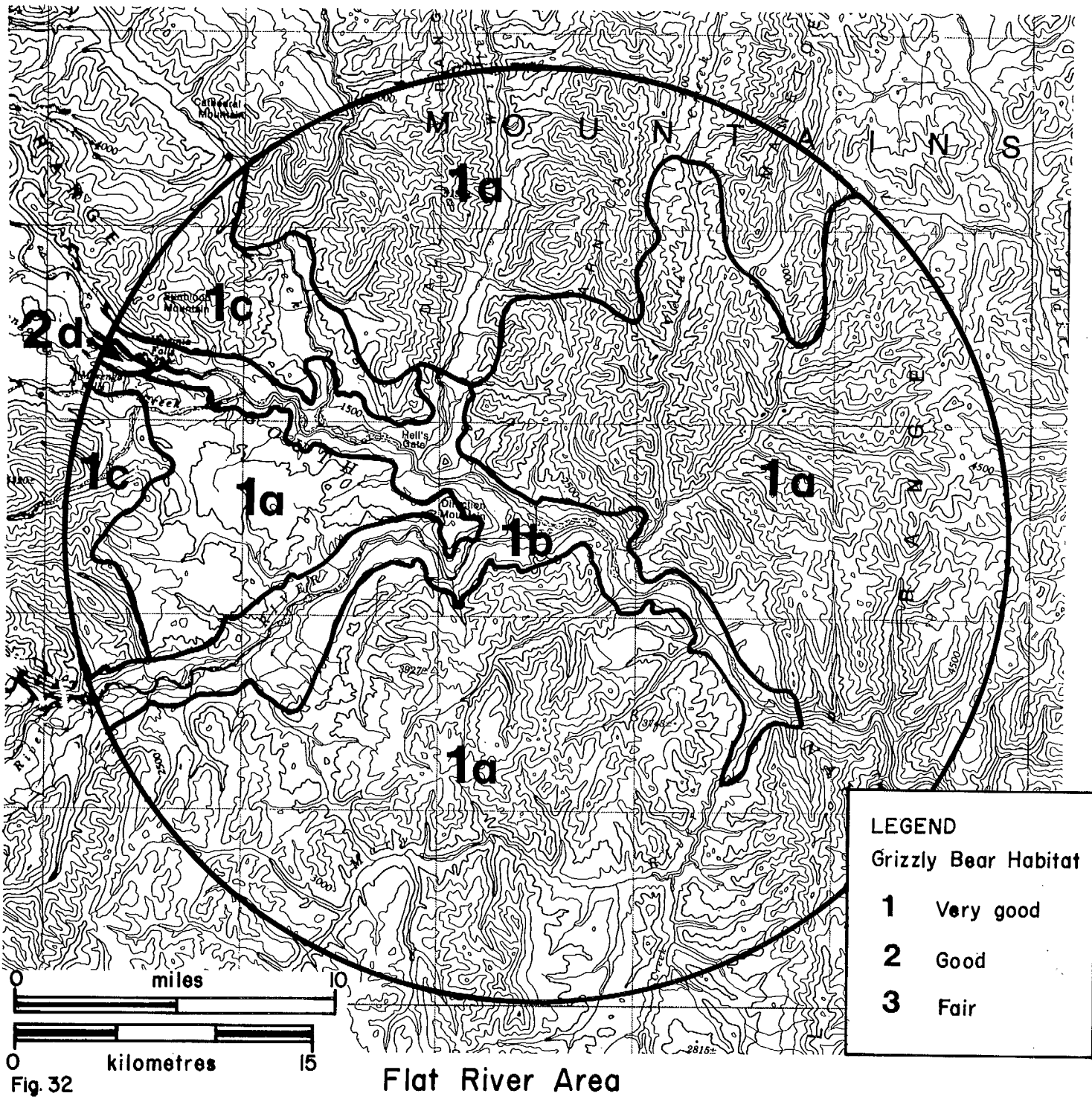


Figure 33. A superficial grizzly bear habitat analysis for the Rabbitkettle area. This map also shows the locations of the bald eagle nest and ungulate lick (mainly sheep).

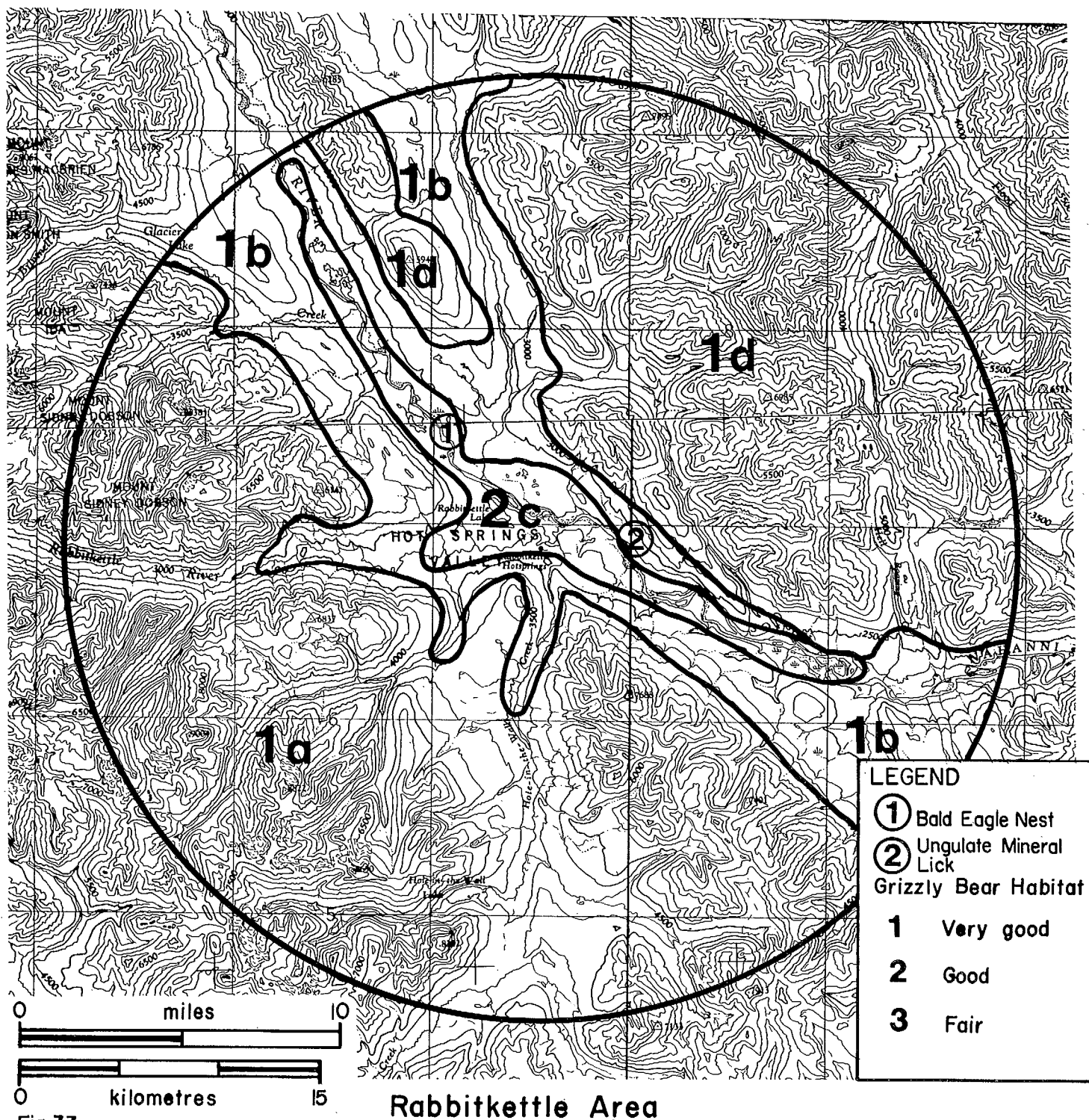


Fig. 33



2. Wolves and other predators

A wolf den was found along Deadmen Valley (Figure 26) by Jack Nolan and David Pitt-Brooke. A dead wolf (shot by outfitters) was found on the alluvial fan.

Tracks of wolves were frequently seen at several points along the banks of the south Nahanni River and tributaries.

Frequent sightings of tracks (Figure 25) along Clausen Creek (1974 - 20 June, 26 June, 28 June, 1 July and 15 August; 1975 - 12 June, 20 and 23 August) strongly suggest that wolves were denning somewhere in that region. Howling from the hotsprings area was not heard at identifiable rendezvous sites. On 20, 21 August, 1975 howling of wolves was again heard in the Clausen Creek area. Development of campgrounds around the hotsprings is not judged to be detrimental to this species. It would appear to be prudent, however, not to allow extensive human utilization of the Deadmen Valley area until after the end of June (denning period), if in fact the den site in that area is a traditional one, and it is to be preserved.

On 19 August 1975 F. Marsh saw 3 wolves (one identified as a pup) in area 11 at Virginia Falls. Furthermore in 1975 single wolves were sighted at Rabbitkettle Lake on 9 and 25 July. Tracks were seen on 18 July and 7 August.

An old track of a single carnivore on Mt. Sunblood was probably that of a cougar. Because of the age of the track it could be misidentified. However, we looked at the track very carefully and it did not seem to be that of a wolf; the only other carnivore that it could therefore have been, was a cougar.

Dr. Schroeder, speleologist at Nahanni Hotsprings reported seeing a pair of otter in the hotsprings stream on 7 August. John Vital, trapper from Nahanni Butte, assured us that otter are common along the south Nahanni

River. Extensive sport fishing could have an impact on this carnivore. Mink tracks were noted near the Nahanni Hotsprings (north bank of the river).

Fresh wolverine tracks were noted on 23 June 1975 along the shore of Hole-in-the-Wall Creek near the mouth of Rabbitkettle River.

3. Ungulates

Moose sightings and signs were frequently noted near the four study areas. Moose is the most widespread ungulate and was often seen along the river by ourselves and canoeists. Cone shaped tops of willows (Figure 24) attest to the heavy winter browsing in some areas.

During 1974, 1975 our field party saw a total of 25 and 6 moose respectively. Out of 6 sightings of cows with calves made in 1974, 3 had twins (50%). This is a high percentage, possibly indicative of a combination of favourable range and high mortality rates; although because of the small sample size it is not conclusive evidence of either.

The Clausen Creek area seems to be an important summer and winter range for moose. Much less sign of winter use of the range was observed in the spring of 1975 than that of 1974. Campground development in area 6 could have some effect on the species, however considering the wide distribution of moose this probably may not be of great significance to the population as a whole. Larger, localized mineral licks (Figure 35) are located far enough away (at least 1 hour's hike i.e. about 3 miles from the hotsprings), so that any development at the hotsprings would not be of major significance to activities at these licks. Activity at this lick was checked out in June 1975. Approximately 26 hours were spent watching over the lick site on 12, 13 and 15 June. During this period 5 different moose (1 cow with young calf, 2 yearling bulls and one mature bull) came to the site. This is an interesting natural feature and appears to be just outside the park boundary.

It is difficult to predict how increased human visitor activities around the hotsprings will affect the moose population in that area. From Alur maps and discussions with Ray Frey, it seems that the area is an important wintering area of moose. This was substantiated by finding winter pellet groups. A theory has been put forward that proposes that sodium contents may be a limiting factor for moose numbers (Botkin, Jordan, Dominski, Lowendorf and Hutchinson 1973). That is, in mammals, sodium comprises 0.1% of live body weight and is required for the physiological processes in the body. Except for halophytes, terrestrial plants are generally low in sodium concentrations. Hence ungulates may resort to finding supplies from other sources. Therefore, it is quite possible that the hotsprings area may be important to the moose population in the region. Sodium contents in the hotsprings water were analysed and varied from 872 ppm. to 1176 ppm. (Anon. 1973). Therefore, the soils in the region undoubtedly contain high sodium levels as well. It would be interesting to test the water chemistry of the major Clausen Creek lick sites and see how they compare with those at the hotsprings. It may be that the reason moose frequent the areas further away from the hotsprings, is because of existing human activity. Such would certainly be the case, if as in the past, moose were hunted in the area around the hotsprings.

Ungulate licks were found along the north bank of the river, near Oxbow Lake (Figure 34) west of Virginia Falls and about 2 miles east of Rabbitkettle Lake. The "Oxbow Lake" lick was not very active in late July or early August and only a few old tracks of what appeared to be sheep and caribou were noted. Dall sheep are often seen by canoeists at the Rabbitkettle Lake lick. Small ungulate licks were noted along the west

- Figure 34. Ungulates (caribou and sheep) utilized exposed areas along the river as mineral licks. This site was found near Oxbow Lake in the Virginia Falls area. (Photo L.N. Carbyn)
- Figure 35. Mineral lick area located along Clausen Creek about 3 miles from Nahanni Hotsprings. John Vital, standing in the foreground, of Nahanni Butte knows the area well and is one of the natives who has an extensive knowledge of the park area. (Photo L.N. Carbyn)
- Figure 36. Canyons along the Nahanni River provide excellent opportunities for eyries of birds of prey. Jet boat traffic could effect these species. (Photo J. Nolan)
- Figure 37. Twisted Mountain near Yohin Lake is a potential peregrine falcon breeding area since it is close to areas with a significant prey base. (Photo D. Patriquin)

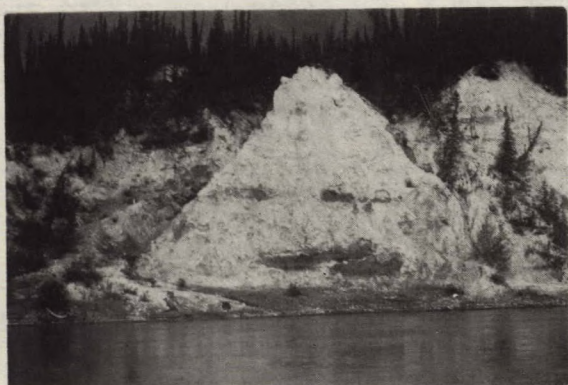


Fig. 34



Fig. 35



Fig. 36



Fig. 37

end of Rabbitkettle Lake (area 2) and near the middle "lake" in area 7 of the Rabbitkettle Hotsprings area.

Moose probably also lick the soils in the vicinity of the Nahanni Hotsprings, although no evidence of actual use of the hotsprings themselves was noted. Mrs. Mary Kraus apparently did place a salt block near the hotsprings which attracted moose.

Areas 1 and 11 are preferred summer ranges for moose in the Virginia Falls area. Cows and calves were seen in area 6 (Nahanni Hotsprings) and in areas 1 and 11 (Virginia Falls). Cows with calves pose a potential danger to visitors in the early part of the summer.

Only two caribou were seen by the CWS field party during 1974. Both sightings were made in the Virginia Falls area (3 August a single cow crossed the river just above the falls; 1 August a cow was seen along Marengo Creek). Area 2, and an extension of this, appears to be a well used fall or winter range. This is confirmed by examining the Alur map (Appendix A). Undoubtedly seasonal shifts take place and the importance of some areas during annual migrations, requires further study. The data plotted from the Alur maps provide us with a significant data bank to work with. Constant surveillance and submission of wildlife cards by the wardens, would be desirable in the future.

In 1975 caribou tracks were sporadically seen throughout June and July along the Rabbitkettle River, hotsprings, lake and Hole-in-the-Wall Creek area. A sighting at Flood Creek (15 August 1975) confirms the general importance of this area for wildlife (see earlier bear references by canoeists).

In conclusion, areas 1 and 11 (moose) and 2 (caribou) are important ungulate ranges in the Virginia Falls area. Area 6 is used extensively year round by moose in the Nahanni hotsprings area. The west end of Rabbitkettle Lake is a potentially important moose summer range.

E. Avifauna

1. Species Lists

The south Nahanni River area is an "ornithological blank" as far as previous work is concerned (Addison 1974). Scotter *et al.* (1971) published a preliminary list (57 species) based on some field work by inexperienced birders (Scotter pers. comm.) and based on extrapolations of what could be expected (121 species) by examining distribution maps (Godfrey 1966). Scotter *et al.* (1971) stated that 48 species were known to be nesting birds, although there was no evidence given for this. In more detailed ornithological surveys nesting records should only be entered upon sightings of either nests with adults in attendance or young with adults in attendance. This criteria was used for all nesting records established in our work, the only exception being the Merlin observation at Deadman Valley, where D. Pitt-Brooke observed an adult bird whose behavioral response to the investigator (consistently circling near an eyrie location) was strong evidence of a nesting bird.

A summary of the number of species observed at Nahanni Hotsprings and Virginia Falls is presented in Table 14. Similarly Table 15 summarizes the observations made at Rabbitkettle Lake.

These tables also list the number of species recorded previously by Scotter *et al.* (1971). Forty-nine new species were added onto Scotter's

Table 14. Summary of avifaunal observations from Virginia Falls and Nahanni Hotsprings.

Family	Number of species observed		Total Number of Species	Number of Species recorded by Addison 1974 for the watershed	Number of species re- corded by Scotter <i>et al.</i> 1971 for the park area
	Nahanni Hotsprings	Virginia Falls			
<i>Gaviidae</i>	-	2	2	2	1
<i>Podicipedidae</i>	-	-	-	1	1
<i>Anatidae</i>	7	8	10	13	12
<i>Accipitridae</i>	3	3	4	6	6
<i>Pandionidae</i>	-	-	-	1	-
<i>Falconidae</i>	3	1	3	1	-
<i>Tetraonidae</i>	2	3	5	7	6
<i>Rallidae</i>	-	-	-	2	2
<i>Charadriidae</i>	1	1	1	-	-
<i>Scolopacidae</i>	4	4	7	3	3
<i>Phalaropodidae</i>	-	-	-	1	-
<i>Laridae</i>	-	4	4	4	4
<i>Strigidae</i>	-	1	1	1	1
<i>Caprimulgidae</i>	1	1	1	1	1
<i>Alcedinidae</i>	1	1	1	1	1
<i>Picidae</i>	5	2	5	3	3
<i>Tyrannidae</i>	5	2	4	-	-
<i>Alaudidae</i>	-	-	-	1	1
<i>Hirundinidae</i>	3	-	3	3	3
<i>Corvidae</i>	2	2	2	2	2
<i>Paridae</i>	2	1	2	2	1
<i>Sittidae</i>	1	0	1	-	-
<i>Turdidae</i>	3	5	6	3	1
<i>Sylviidae</i>	1	-	1	1	1
<i>Motacillidae</i>	1	1	1	1	-
<i>Bombacillidae</i>	1	1	1	-	-
<i>Lanidae</i>	-	-	-	-	-
<i>Sturnidae</i>	1	-	1	-	-
<i>Vireonidae</i>	2	-	2	1	-
<i>Parulidae</i>	12	3	10	2	-
<i>Icteridae</i>	2	2	4	2	2
<i>Thraupidae</i>	1	-	1	1	1
<i>Fringillidae</i>	6	6	11	5	4
Totals	70	54	94	70	57

Table 15. Summary of avifaunal observations from Rabbitkettle Hotsprings and comparison of avifaunal observations with previous park records.

Family	Number of species observed at Rabbitkettle Lake (1975)	Number of species recorded by Scoter <i>et al.</i> for the park	Total number of species seen by observers in this study within the park (1974, 1975)
<i>Gaviidae</i>	4	1	4
<i>Podicipedidae</i>	2	1	2
<i>Anatidae</i>	10	12	16
<i>Accipitridae</i>	4	6	5
<i>Pandionidae</i>	1	-	1
<i>Falconidae</i>	2	-	3
<i>Tetraonidae</i>	2	6	5
<i>Rallidae</i>	1	2	1
<i>Charadriidae</i>	-	-	1
<i>Scolopacidae</i>	4	3	7
<i>Phalaropodidae</i>	1	-	1
<i>Laridae</i>	4	4	4
<i>Strigidae</i>	1	1	2
<i>Caprimulgidae</i>	1	1	1
<i>Alcedinidae</i>	1	1	1
<i>Picidae</i>	4	3	4
<i>Tyrannidae</i>	5	-	7
<i>Alaudidae</i>	-	1	-
<i>Hirundinidae</i>	4	3	4
<i>Corvidae</i>	2	2	2
<i>Paridae</i>	1	1	2
<i>Sittidae</i>	-	-	1
<i>Turdidae</i>	5	1	6
<i>Sylviidae</i>	1	1	1
<i>Montacillidae</i>	-	-	1
<i>Bombycillidae</i>	1	-	1
<i>Laniidae</i>	1	-	1
<i>Sturniidae</i>	-	-	1
<i>Vireonidae</i>	-	-	2
<i>Parulidae</i>	6	-	14
<i>Icteridae</i>	3	2	4
<i>Thraupidae</i>	-	1	1
<i>Fringillidae</i>	10	4	16
Totals	81	57	121

list. One of the sightings (*Zonotrichia* - golden-crowned sparrow) is a new breeding record for the Northwest Territories (Godfrey pers. comm.).

Species seen during our field work, but not recorded by Scotter *et al.* (1971), as having been seen, are listed below.

<u>Common Name</u>	<u>Scientific Name</u>
Arctic loon	<i>Gavia arctica</i>
Yellow-billed loon	<i>Gavia adamsii</i>
Red-throated loon	<i>Gavia stellata</i>
Red-necked grebe	<i>Podiceps grisegena</i>
Gadwall	<i>Anas strepera</i>
Bufflehead ⁺	<i>Bucephala albeola</i>
Barrow's goldeneye	<i>Bucephala islandica</i>
Ring-necked duck	<i>Athya collaris</i>
Old squaw duck	<i>Clangula hyemalis</i>
White-winged scoter	<i>Melanitta deglandi</i>
Rock ptarmigan*	<i>Lagopus mutus</i>
Osprey	<i>Pandion haliaetus</i>
Merlin ⁺¹	<i>Falco columbarius</i>
Kestrel ⁺	<i>Falco sparverius</i>
Peregrine falcon	<i>Falco peregrinus</i>
Upland plover	<i>Bartramia longicauda</i>
Common snipe ⁺	<i>Capella gallinago</i>
Solitary sandpiper	<i>Tringa solitaria</i>

⁺ nesting record

* identification not positive; requires confirmation

¹ young not seen

<u>Common Name</u>	<u>Scientific Name</u>
Western sandpiper	<i>Ereunetes mauri</i>
Baird's sandpiper	<i>Erolia biardii</i>
Pectoral sandpiper	<i>Erolia melanotos</i>
Solitary sandpiper	<i>Tringa solitaria</i>
Least sandpiper	<i>Erolia minutilla</i>
Northern phalarope	<i>Lobipes lobatus</i>
Hawk owl	<i>Surnia ulula</i>
Downy woodpecker	<i>Dendrocopos pubescens</i>
Northern three-toed woodpecker ⁺	<i>Picoides tridactylus</i>
Eastern phoebe	<i>Sayornis phoebe</i>
Western wood peewee	<i>Contopus sordidulus</i>
Western flycatcher*	<i>Empidonax difficilis</i>
Olive-sided flycatcher	<i>Nuttallornis borealis</i>
Trail's flycatcher	<i>Empidonax triallii</i>
Least flycatcher	<i>Empidonax minimus</i>
Eastern kingbird	<i>Tyrannus tyrannus</i>
Say's phoebe	<i>Sayornis saya</i>
Bank swallow ⁺	<i>Riparia riparia</i>
Boreal chickadee	<i>Parus hudsonicus</i>
American robin ⁺	<i>Turdus migratorius</i>
Varied thrush ⁺	<i>Ixoreus naevius</i>
Hermit Thrush	<i>Hylocichla guttata</i>
Swainson's thrush ⁺	<i>Hylocichla ustulata</i>
Gray-cheeked thrush*	<i>Hylocichla minima</i>
Water pipit	<i>Anthus spinoletta</i>
Bohemian waxwing	<i>Bombycilla garrulus</i>

<u>Common Name</u>	<u>Scientific Name</u>
Northern shrike	<i>Lanius excubitor</i>
Red-eyed vireo	<i>Vireo olivaceus</i>
Warbling vireo ⁺	<i>Vireo gilvus</i>
Starling ⁺	<i>Sturnus vulgaris</i>
Black-and-white warbler	<i>Miniotilta varia</i>
Tennessee warbler ⁺	<i>Vermivora peregrina</i>
Orange-crowned warbler	<i>Vermivora celata</i>
Yellow warbler	<i>Dendroica petechia</i>
Magnolia warbler	<i>Dendroica magnolia</i>
Yellow-rumped warbler	<i>Dendroica coronata</i>
Bay-breasted warbler	<i>Dendroica castanea</i>
Black-throated green warbler*	<i>Dendroica virens</i>
Northern water thrush	<i>Seiurus noveboracensis</i>
Wilson's warbler	<i>Wilsonia pusilla</i>
Mourning warbler	<i>Oporornis philadelphia</i>
Palm warbler	<i>Dendroica palmarum</i>
Oven bird	<i>Seiurus aurocapillus</i>
Yellow-throated warbler	<i>Dendroica dominica</i>
Rusty blackbird	<i>Euphagus carolinus</i>
Brewer's blackbird*	<i>Euphagus cyanocephalus</i>
Pine siskin	<i>Spinus pinus</i>
Gray-crowned rosy finch	<i>Leucosticte tephrocotis</i>
Pine grosbeak	<i>Pinicola enucleator</i>
White-winged crossbill	<i>Loxia leucoptera</i>
American goldfinch	<i>Spinus tristis</i>

<u>Common Name</u>	<u>Scientific Name</u>
Common redpoll	<i>Acanthis flammea</i>
Savannah sparrow ⁺	<i>Passerculus sandwichensis</i>
White-throated sparrow	<i>Zonotrichia albicollis</i>
Vesper sparrow*	<i>Poocetes gramineus</i>
Tree sparrow	<i>Spizella arborea ochracea</i>
Lincoln's sparrow ⁺	<i>Melospiza lincolni</i>
Golden-crowned sparrow ⁺	<i>Zonotrichia atricapilla</i>

Furthermore, 9 species were recorded by Scotter (*op cit.*) but were not seen in this study or whose identification was too tenuous for confirmation. The species are as follows:

Whistling swan	<i>Olor columbianus</i> (identification uncertain)
American widgeon	<i>Mareca americana</i>
Willow ptarmigan	<i>Lagopus lagopus</i>
Greater scaup	<i>Aythya marila</i>
Marsh hawk	<i>Circus cyaneus</i>
Sharp-tailed grouse	<i>Pedioecetes phasianellus</i>
American coot	<i>Fulica americana</i>
Wandering tattler	<i>Heteroscelus incanum</i>
Horned lark	<i>Eremophila alpestris</i>

Near areas of proposed campground development the nesting sites of two birds of prey (kestrel and sharp-shinned hawk) were identified, in area 3A (Nahanni Hotsprings) and area 4A (Rabbitkettle Hotsprings). A suspected

merlin nest site (bird seen) was found on the northeast wall of the first canyon. Peregrines (identification almost positive - slight margin of doubt) were seen in the area on 15 June 1974 and 21 June 1975. David Pitt-Brooke, summer student who previously worked on a falcon project for CWS, made the first observation, so that the record is from a reliable source. Kestrels were probably nesting in area 3A at Nahanni Hotsprings. This was deduced from their behavior and, as was described earlier, this plant community contained many older trees, some of which contained woodpecker nests. Kestrels utilize these nest holes. Kestrels were also nesting in area 4, south of Rabbitkettle Lake. A bald eagle nest was located along the north bank of the South Nahanni River, approximately 3 miles west of the lake (see Figure 33). This nest was frequently sighted by canoeists. Bald eagles were seen (20, 21 June, 5 July) catching fish along the margins of Rabbitkettle Lake. An osprey was only seen once (27 June) and location of its nest site was not known. Sharp-shinned hawks were seen feeding their young near the domes of Rabbitkettle Hotsprings. The open slopes northeast of Rabbitkettle Lake appear to be suitable areas for birds of prey. What appeared to be merlins are thought to be nesting in that area.

The canyons are ideal sites for eyries of merlin and peregrine falcons. Food may be a factor which could limit Peregrine falcons in some areas, however, Yohin Lake area could be a good area; both from nesting sites (Yohin Ridge, Twisted Mountain - Figure 37) and from the food supply available. Tlogotsho Plateau seems an ideal area for both gyrfalcons and peregrines.

Jet boat traffic may be a disturbance factor that should be reckoned with, in the future. This is particularly a problem when the birds of prey are incubating and raising their young. Eyries located in tall canyon walls (Figure 36), it would seem, are less affected than those on smaller cliffs or tree nests. This may be misleading since the reverberation factor is much greater in areas with tall cliffs (R. Fyfe pers. comm.). Any disturbance causing peregrines to remain off the eggs for more than 3 minutes may result in egg mortality (see Jacobson 1974, for further details).

Rivers are physically and biologically important to peregrines (Jacobson 1974). The fact that only two peregrines were seen may not be a fair indication of their absence in the area. Peregrines often appear as small specks at high altitudes and therefore they could easily escape notice in the canyon areas (R. Fyfe pers. comm.).

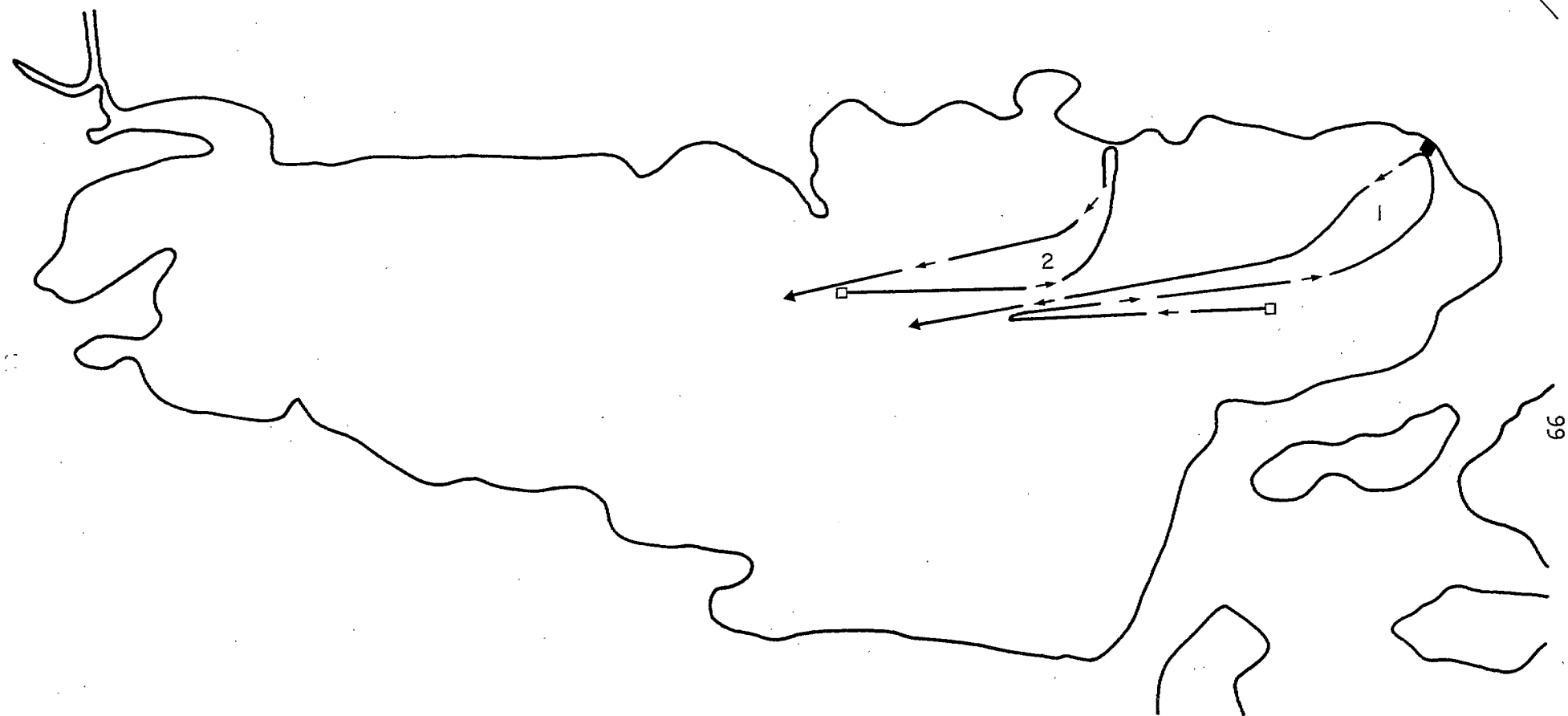
2. Aquatic birds on Rabbitkettle Lake

These observations were made on Rabbitkettle Lake from 18 June to 14 July 1975. Four main species of resident aquatic birds, namely common loon, arctic loon, red-throated loon and red-necked grebes are discussed.

Predominant flight patterns of aircraft landing and taking off were recorded. (Figures 38 and 39). Most of the observations are restricted to the area of greatest aircraft traffic (east end, since this is the location of the landing dock).

Red-necked grebes were the only birds known to have nested on the lake (17 other nests of various species were found around the lake area). It is possible that grebes are the only birds that could tolerate the spring and early summer aircraft traffic. Had the use of aircraft been banned it is quite possible that loons and other aquatic birds would be nesting at

Figure 38. General aircraft landing patterns on Rabbitkettle Lake. Wind conditions and type of aircraft partly governs the pattern used.



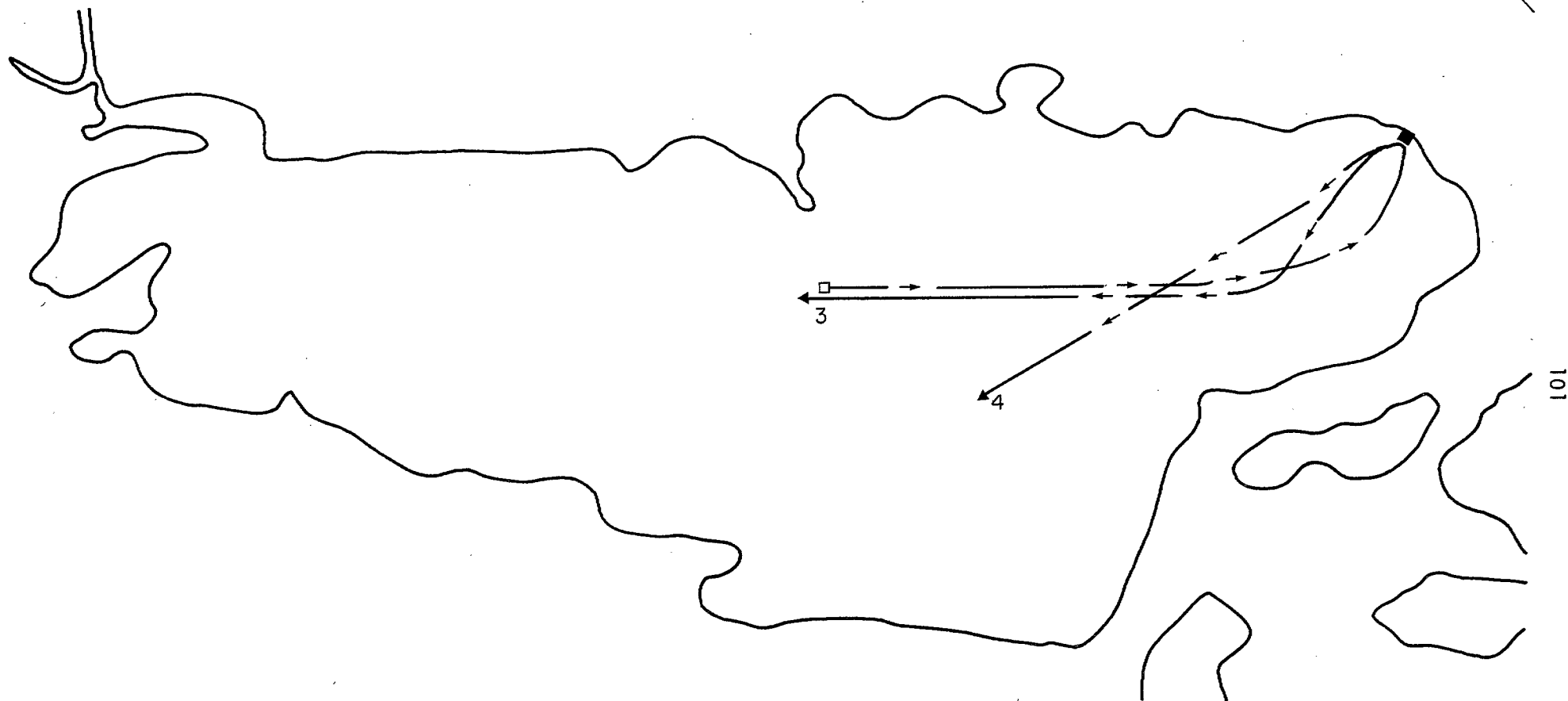
- Aircraft Landing
- ▲ Aircraft Taking Off
- Dock

Fig. 38

Rabbitkettle Lake

0 2000
feet

Figure 39. General aircraft landing patterns on Rabbitkettle Lake. Wind conditions and type of aircraft partly governs the pattern used.



- Aircraft Landing
- ▲ Aircraft Taking Off
- Dock

Fig. 39

Rabbitkettle Lake

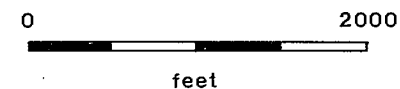
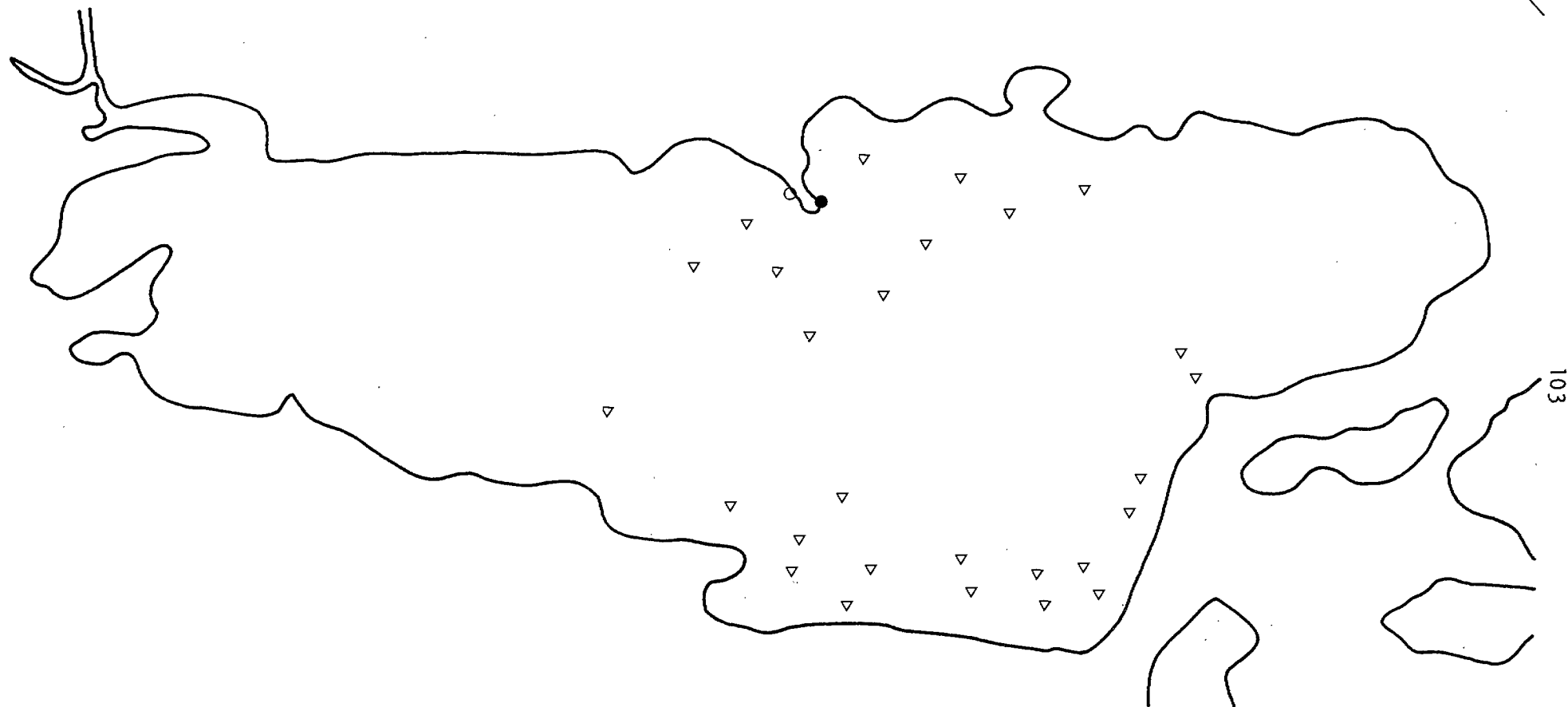


Figure 40. Feeding locations and nest sites of the red-necked grebes on Rabbitkettle Lake. Note the preponderance of activity along the shore *c.f.* with aircraft landing patterns.



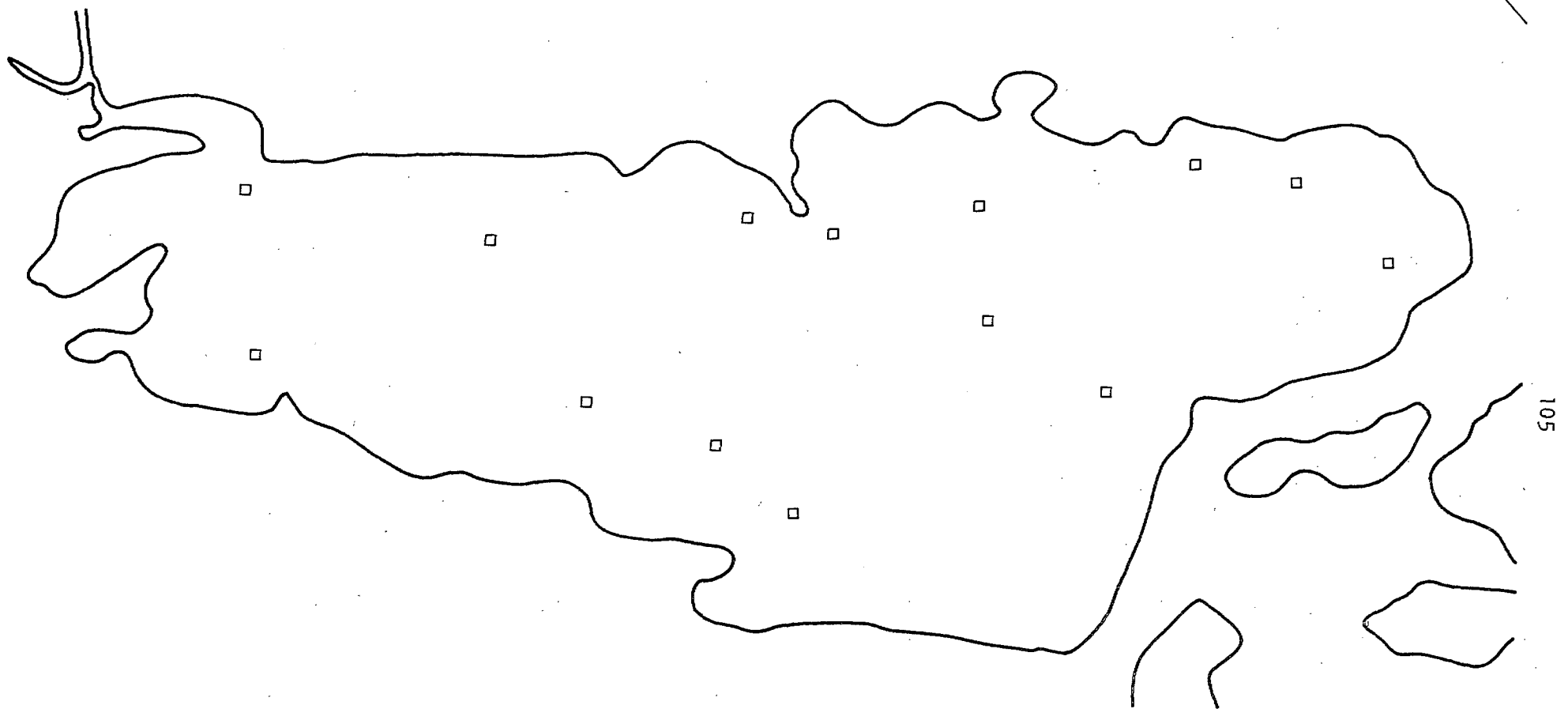
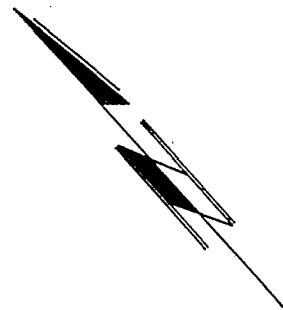
- ▽ Red-Necked Grebe Sightings June and July 1975
- Red-Necked Grebe Successful Nest 1975
- Red-Necked Grebe Unsuccessful Nest 1975

Fig. 40

Rabbitkettle Lake

0 2000
feet

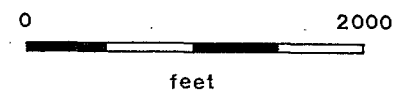
Figure 41. Feeding locations of the common loons on Rabbitkettle Lake. Their activities was less restricted to the shorelines as was the case for red-throated and arctic loons.



□ Common Loon Sightings June and July 1975

Fig. 41

Rabbitkettle Lake



this lake. The grebe nests were located in emergent vegetation (*Carex* spp. and *Juncus* spp.) at a small projection in the lake (Figure 40).

Nest (1) contained 3 eggs all of which hatched between 24 - 26 June. This nest was a floating mound of vegetation about 25 metres from shore. Nest (2) was nearby and contained 6 eggs, none of which hatched. These birds renested but failed the second time again. The feeding areas of the grebes were generally restricted to the shorelines along the south and east portions of the lake (Figure 40). Grebes were seen actively feeding from dawn to about 1000 hrs and again from 1800 hrs to twilight. When resting they were often seen floating in the middle of the lake.

Common loons were first seen on 18 June, and on every subsequent day. In the mornings, from dawn to 0900 hrs, at least one bird was present on the lake. Generally in the evenings 2 birds were seen on the lake. They always arrived from the north and flew off in that same direction. These loons may have been nesting on more secluded lakes north of the Nahanni River.

The feeding habits of the common loons were sporadic as they tended to use the whole lake at different times. They did, however, seem to stay fairly close to the shoreline (Figure 41), perhaps catching leeches and other invertebrates which were abundant in the shallow portions of the lake.

Arctic loons were residents of the smaller ponds surrounding Rabbitkettle Lake. On the ponds just east of the lake there were 3 resident birds. Other ponds to the south were also used by arctic loons (probably about 4 different individuals). Another pond to the northeast of Rabbitkettle Lake referred to as "Emerald Lake" had one resident individual. This lake is situated along a trail proposal (see Marsh and Scotter).

During the mornings (dawn to 0800 hrs) and evenings (1900 hrs to dark) there was usually at least one arctic loon feeding on Rabbitkettle Lake.

An examination of the arctic loon feeding distributions (Figure 41) indicates that this species, as with the other diving birds, tends to stay near the shoreline.

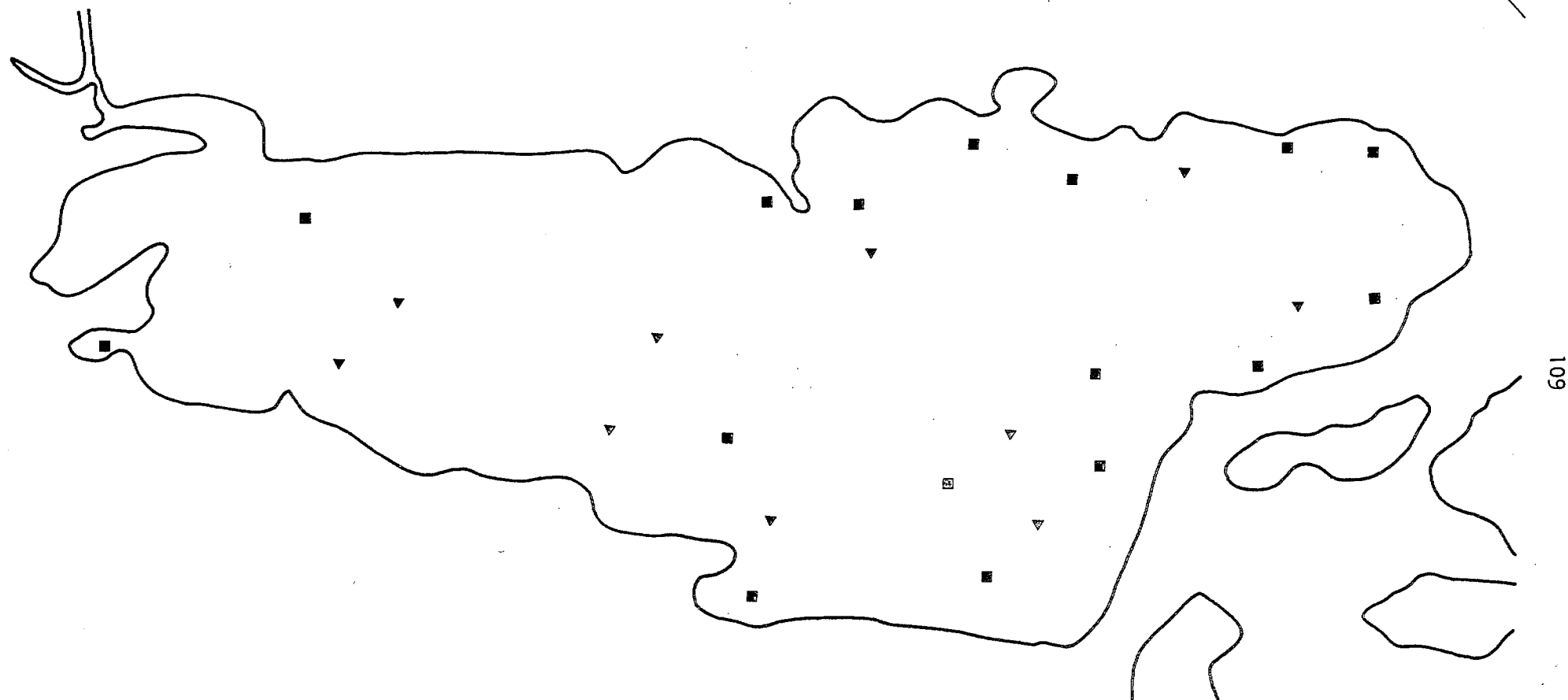
The red-throated loon was first sighted on 22 June. This lone bird remained on the lake throughout the observation period.

The activity and feeding habits of the red-throated loon are similar to those of other loons (Figure 42) and grebes. The main activity period was from dawn to 0900 hrs and from 1800 hrs to dark. Feeding area was along the shoreline, mainly in the southeastern portion of the lake. Gulls and terns were seen daily resting and feeding along the lakeshore.

All these observations indicate the importance of the lake to resident aquatic birds. The reason that it was used only as a feeding area may be because of the extensive use by aircraft. That is, if planes do not land on the lake in spring and early summer, the nesting population along the lake shore may well increase.

Future impact should be kept to a minimum. Certainly motor craft (aircraft or power boats) would not threaten the major populations of these birds in the park. Nevertheless, visitors spend most of their time on the river. Loons in particular have a great aesthetic value to wilderness travellers. Therefore, any means that would allow visitors to see and experience these birds on Rabbitkettle Lake, an area of contact with lake oriented avifauna, should be encouraged. It seems impractical to keep aircraft landings off the lake since this is an important access point to the park at present. However, if river landings become feasible, these should be encouraged in preference to lake landings.

Figure 42. Feeding locations of red-throated and arctic loons on Rabbitkettle Lake.



■ Red-Throated Loon Sightings June and July 1975
▼ Arctic Loon Sightings June and July 1975

Fig. 42

Rabbitkettle Lake

0 2000
feet



Spring and early summer aircraft traffic should be kept to a minimum as this is a time of nesting. Aircraft landings should be restricted between 1000 to 1800 hour period.

The use by fish eating birds (bald eagles, ospreys) of the lake has already been mentioned. In addition migratory birds use the lake, particularly during times of low ceiling. Large flocks of old squaw ducks were seen on the lake in May (R. Frey pers. comm.). Stragglers remain behind all summer. Large flocks of surf and white-winged scoters (flocks up to 200 birds) were seen on 18, 21, 22, 26 and 30 of June and 6 and 13 July. Northern Phalaropes were seen on the lake on 30 July.

F. Other features

1. Fish resources

Although not included in the terms of reference, some observations were made on this subject. These naturally, are very incomplete.

Canoeists often commented on the availability of arctic grayling at the mouths of numerous streams. We had the opportunity to watch this species at the mouth of a creek flowing into Oxbow Lake (Figure 43). On an experimental basis, we used a barbless hook and fly rod and without much effort, caught and released 4 fish within less than an hour. It would have been easy to quickly deplete the population within the pool if spinning rods were used. Scott and Crossman (1973) state that because of the slow growth of fish in northern waters and ease of capture, this species is vulnerable to local extirpation.

According to the above authors, grayling generally spawn from April to June. The behavior of the ones we observed, indicated that spawning was not yet completed in the area by late July. Bishop (pers. comm.)

studied the spawning behavior of the species. Males are territorial and exhibit a characteristically lateral threat display involving raising of the large dorsal fin, extending pelvic fins, gaping mouth and displaying a mating patch (Scott and Crossman 1973). Imaginative interpretive programs could get a lot of "mileage" out of this interesting phenomenon.

Dolly Varden can reach fairly large sizes (Figure 44) in the river system. Age was checked from reading of a scale and estimated at 19-21 years. It is strictly our personal opinion, but we would think it in the best interest of the park's principles, ideals and philosophy if fishing were de-emphasized in favour of interpretive and scientific studies. This would not, in our opinion preclude fishing for the sake of replenishing a fresh food supply while on wilderness travel. Unfortunate precedences have been set in southern parks which, with foresight, could be avoided in the new parks.

2. Miscellaneous

A photograph of the small mammal species caught, is presented in Figure 45.

Fossils (Figure 46) are common along the south Nahanni River. Collecting these would deplete a non-renewable resource, a fact which would be particularly damaging in moderate to high density use areas. Not even some of the CWS field party members (or seasonal wardens) were immune to this temptation. Recent radio commercials promoting Nahanni River tours emphasizing "rock hounding" as an activity is a development which should be checked.

Ecto-parasites were collected from a few specimens and these await further identification. Tapeworms from Dolly Varden have been submitted for identification. A colonial hymenoptera (*Bicyrtes*) was observed at the landing site at Virginia Falls (identification by University of

Alberta Entomology Department). Their life history is fascinating, and could be used in interpretive work. About 3 species of hymenoptera were observed "milking" aphids on *Salix glauca* bushes near the Oxbow Lake area at Virginia Falls.

Two species of mollusca (*Helisoma* spp.) were collected. Invertebrates in the park provide challenging avenues for future interpretive work.

Sparrows (*Fringillidae*) were observed forming flocks in the third week of July. Blackbird movements (mostly rusty blackbirds) were noted on 31 July. Bird movements (pre-migration flights?) were from west to east.

A correlation of weather patterns and use of Rabbitkettle Lake by arctic bird migrants probably would result in some interesting findings for interpretive purposes.

Fred Marsh (pers. comm.) made some interesting observations on spiders from the family Linyphiidae. Tent-like webs could often be seen in early morning outings at various locations. These belong to the following species:

Microlinyphia pnsilla (Sundevall, 1829)

Neviene radiata (Walckenaer, 1841)

Fontinella pyramitela (Walckenaer)

These spiders are widespread Nearctic and/or Holarctic species and could well be used for interpretive purposes, if further information on their life histories could be obtained from the literature.

- Figure 43. Spawning "hole" of arctic grayling at the mouth of an unnamed creek flowing into Oxbow Lake. (Photo L.N. Carbyn)
- Figure 44. Dolly Varden¹ caught in Oxbow Lake. Ageing was carried out by reading a scale. The fish was about 19-21 years old. (Photo D. Patriquin)
- Figure 45. A representative collection of the small mammals collected at the Nahanni Hotsprings and Virginia Falls sites. (Photo D. Patriquin)
- Figure 46. Fossil beds are common along rock outcrops. Souvenir hunters will collect these and special attention should be drawn to the illegality of such activities. (Photo J. Nolan)

¹Identification tentative.



Fig. 43



Fig. 44

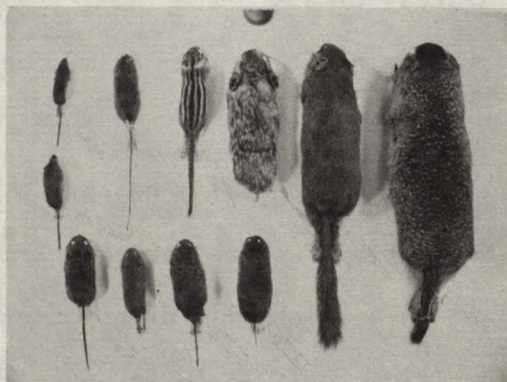


Fig. 45



Fig. 46

IV. RECOMMENDATIONS

A. General

1. Development of campgrounds and subsequent human use will have some impact on the vertebrate populations of the park. Because of the diversity and abundance of most vertebrates, such impacts generally are negligible when viewed within the total context of the park. The latter is applicable only if the facilities are located in the most common plant communities and bear problems are given special considerations.
2. Arising out of the above, it becomes important that detailed quantitative and qualitative descriptions of the vegetation and soils proceed before final selections of camp sites and day use areas are made.
3. Further selection criteria for campground development and day use areas should be based on:
 - (a) soils (drainage, permafrost)
 - (b) interpretive potentials in areas close to the facilities
 - (c) vegetation (secondarily to recommendation 1. - i.e. general attractiveness, cover)
 - (d) access to main features (i.e. Virginia Falls; hot springs)
 - (e) unless cautioned by health officials, there seems no reason to base campground selection on availability of a non-river source of water. Such a decision would allow for more flexible resource based selection of sites.
4. In keeping with parks' policy, the interpretive potential of areas surrounding the facilities should be given highest priority.

5. Our studies indicated that areas 11 and 12 at Virginia Falls and areas 4 and 5 at Nahanni Hotsprings, should be rated as areas with high interpretive potentials. Other areas adjacent to the above have also been mentioned e.g. licks at the hotsprings and birds of prey in the alpine areas of Mt. Sunblood. In addition the geomorphology around Rabbitkettle Lake and Rabbitkettle Hotsprings are obvious features of significance.
6. Studies by scientists in other fields e.g. entomologists, botanists, paleontologists, geologists, undoubtedly would identify other areas with interpretive potentials. Such studies should be encouraged whenever funds become available.
7. Until the interpretive service facilities become established, seasonal wardens could be effectively stationed at strategic locations along the river. In addition to public safety, resource protection and dissemination of information, such wardens could continue the process of data collection initiated in this study. This requires hiring persons with strong interests and backgrounds in natural history.
8. Methods be devised that point out to visitors the illegality of collecting artifacts, such as antlers and fossils. Fossil beds close to campgrounds are particularly vulnerable. Radio advertising featuring "rock hounding" in the Nahanni should be censured as it promotes an illegal activity.
9. Aircraft landing on lakes should be regulated.

B. Specific

1. Small campground and day use areas be established in area 6 at Nahanni Hotsprings. The grave of a human in the area should be noted and hence respected.

2. Black bears are naturally attracted to areas 1, 3A and 2 of the Nahanni Hotsprings area. We therefore recommend against the placing of campgrounds there, although this does not eliminate potential bear problems. Bears are attracted by odours. Once accustomed to garbage the only solution is destruction of the bear.
3. Small campgrounds be established within suitable areas in region 2 of the Virginia Falls area (existing campground used by outfitters and CWS crew). Campgrounds in these areas could be linked to a hiking trail to Marengo Falls and along Marengo Creek.
4. The above sites should only be selected pending the results of general recommendations 1 and 3.
5. An interpretive oriented facility be established that allows guided self-guided, or exploratory tours of areas 11, 12 and 13 at the Virginia Falls. This campground (possible near the water resources cabin) could also serve canoeists and therefore would take pressure off the falls oriented facilities.
6. The area around the rim of the falls is dangerous; careless use by visitors will undoubtedly result in the loss of human life.
7. Although at present there is no evidence of a conflict between nesting successes of birds of prey and jet boat traffic along the river, this aspect should not be dismissed lightly in future planning considerations. More data will be required for basing decisions.
8. Garbage disposal at campgrounds should be carefully controlled to avoid bear problems. Areas 8 and 11 (Virginia Falls) area 3A (Nahanni Hotsprings) and all of Rabbitkettle Lake areas are prime black bear habitats.
9. Caribou winter range around Virginia Falls would probably not be significantly affected by limited campground development. More data is required on the movements of this species and such information could be collected by the warden service.

10. Special efforts be made to protect the Nahanni Hotsprings area (areas 4 and 5) as here the avifaunal small mammal and vegetational diversities are unique.
11. Deadmen Valley contains a number of attractive natural features which have interpretive potential and also are vulnerable to human activities. Future integrated studies are recommended for this area.
12. Flat/Nahanni junction appears to be less vulnerable to human impairment and should receive lower priority than Deadmen Valley for future impact studies.
13. No development be contemplated for Flood Creek area as there have been frequent reports of grizzlies from that region.
14. The old outfitter's portage be used in preference to the newly established west end one into Rabbitkettle Lake. This reduces potential impact on summer moose range and the ungulate lick site.
15. A short hiking trail could be built to "Emerald Lake" along the east end of Rabbitkettle Lake and towards Rabbitkettle Hotsprings. This would serve both as a hiking trail towards the hotsprings area and could be used for interpretation (see Marsh and Scotter [76] for specifics).
16. Rabbitkettle Lake and environs are suitable spring and fall grizzly range, hence recommendations regarding garbage disposal are particularly important here.
17. Whenever feasible, aircraft traffic be encouraged on the river in preference to lakes. Potential disturbances to the bald eagle nest and ungulate lick site be monitored along the river on either side of Rabbitkettle Lake.
18. Aircraft landing and take-off on Rabbitkettle Lake be restricted to between 1000 - 1800 hrs, and reduced or eliminated if feasible.



V. REFERENCES CITED

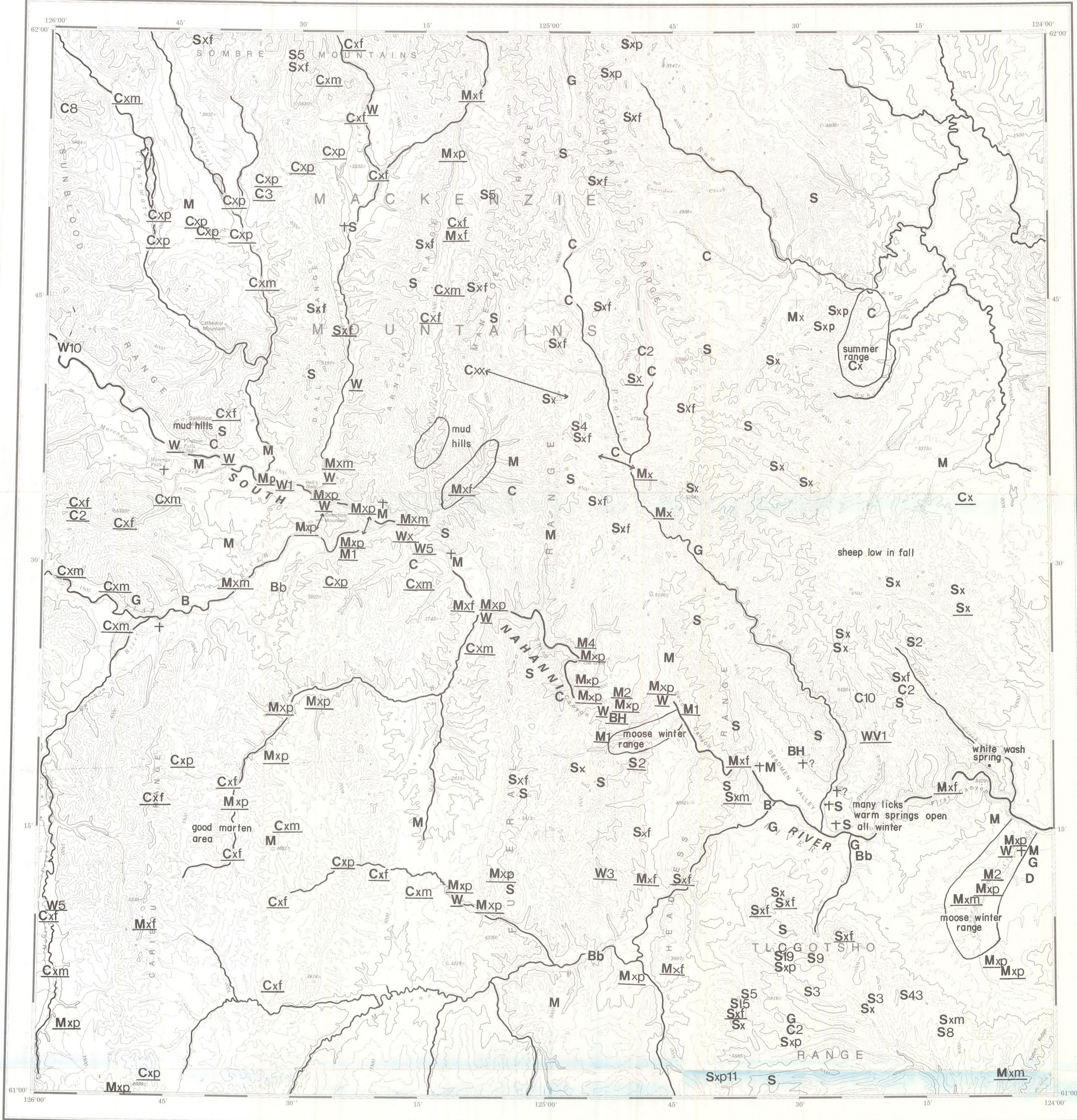
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APPENDIX A

(ALUR MAP IN ENVELOPE)





LEGEND

M Moose

C Woodland caribou

S Sheep

W Wolf

G Grizzly bear

D Mule deer

B Beaver

BH Beaver lodge

Bb Black bear

WV Wolverine

x tracks

xf few tracks

xm moderate tracks

xp plentiful tracks

+ mineral lick

6 number of animals seen

xx trails

+? possible mineral lick

C Summer (Caribou)

C Winter

Example:
Sxp11 indicates 11 sheep seen in winter and tracks plentiful.

Third edition map, derived from large scale mapping.
Produced 1970, by the SURVEYS AND MAPPING BRANCH,
DEPARTMENT OF ENERGY, MINES AND RESOURCES.
Printed 1972.

Magnetic declination 1972 varies from 32°56' easterly at
centre of west edge to 33°01' easterly at centre of east
edge. Mean annual change 5.2' westerly.

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VIRGINIA FALLS
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES

Miles 5 0 10 15 20 25 30 Miles
Kilometres 5 0 10 15 20 25 30 Kilomètres

CONTOUR INTERVAL 500 FEET
Elevations in feet above Mean Sea Level
North American Datum 1927
Transverse Mercator Projection

Copies may be obtained from the Map Distribution Office,
Department of Energy, Mines and Resources, Ottawa.

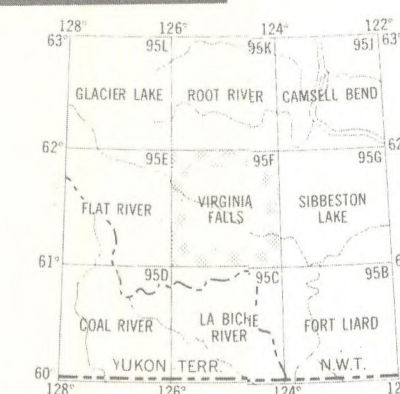
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Troisième édition tirée de cartographie à grande échelle.
Établie en 1970, par la DIRECTION DES LEVÉS ET DE LA CARTOGRAPHIE,
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES.
Imprimée en 1972.

La déclinaison magnétique pour 1972 varie de 32°56' Est
au centre de la limite Ouest à 33°01' Est au centre de la
limite Est. Variation moyenne annuelle 5,2' Ouest.

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POUR UNE LISTE COMPLÈTE DES SIGNES, VOIR AU VERSO.



Index to adjoining maps of National Topographic System
Tableau d'assemblage du Système national de référence cartographique

APPENDIX B

Appendix B. - Scientific Names of Plants quoted in the text.

White spruce	<i>Picea glauca</i>
Highbush cranberry	<i>Viburnum edule</i>
Twinflowers	<i>Linnaea borealis</i>
Bunchberry	<i>Cornus canadensis</i>
Trembling aspen	<i>Populus tremuloides</i>
Balsam poplar	<i>Populus balsamifera</i>
Birch	<i>Betula</i> spp.
Red osier dogwood	<i>Cornus stolonifera</i>
Labrador tea	<i>Ledum groenlandicum</i>
Buffalo-berry ¹	<i>Shepherdia canadensis</i>
Shrubby cinquefoil	<i>Potentilla fruticosa</i>
Juniper	<i>Juniperus</i> spp.
Fireweed	<i>Epilobium angustifolium</i>
Alder	<i>Alnus</i> spp.
Rose	<i>Rosa acicularis</i>
Saskatoon berry	<i>Amelanchier alnifolia</i>
Chokecherry	<i>Prunus virginiana</i>
Larch	<i>Larix laricina</i>
Water lily	<i>Nuphar variegatum</i>
Blueberry	<i>Vaccinium uliginosum</i>
Bog rosemary	<i>Andromeda polifolia</i>
Cranberry	<i>Vaccinium vitis-idaea</i>
Crowberry	<i>Empetrum nigrum</i>
Lodgepole pine	<i>Pinus contorta</i>

¹ also referred to as Soapberry.

Appendix B - (continued)

Raspberries	<i>Rubus</i> spp.
Western Canada violet	<i>Viola rugulosa</i>
Kentucky bluegrass	<i>Poa pratensis</i>
Alfalfa	<i>Medicago sativa</i>
Yellow sweet clover	<i>Melilotus officinalis</i>
Alsike clover	<i>Trifolium hybridum</i>
Dandelion	<i>Taraxacum officinale</i>
Bearberry	<i>Arctostaphylos rubra</i>
	<i>A. uva-ursi</i>
Willows	<i>Salix glauca</i>
	<i>S. arbusculiodes</i>
	<i>S. myrtillofolia</i>
Alder	<i>Alnus crispa</i>
	<i>A. incana</i>

APPENDIX C


ROM
Mammalogy Department

Royal Ontario Museum
100 Queen's Park
Toronto, Ontario, Canada
M5S 2C6

Telephone 928-3681
Cables: ROMA-Toronto

November 15, 1974

TEL 4174 6422

Wm 200 Bats

Dr. L. Carbyn
Department of the Environment
Canadian Wildlife Service
Room 1110
10025 Jasper Ave.
Edmonton, Alberta T5J 1S6

Dear Lu:

We received your bat specimen and as you might know it is
a Myotis keenii, somewhat out of range for this species.

Dr. Peterson is on sabbatical so I have been screening his
mail. Many thanks for sending it - a nice addition to the
collection.


Yours sincerely,



JLE/nsg

J.L. Eger

P.S. I have not been able to locate Kraus Hot Springs. Is
it the same place as Hot Springs Valley? Would appreciate
some additional information. Thanks.

ATTENTION OF	✓	NOTE & INITIAL	REPLY
REG. DIR.			
MGR. AD. SERV.			
WOOD			
CARBYN	✓		
SOOTER			
STEFER			
MYERS			
LEAH			

APPENDIX D



National Museums
Canada

Musées nationaux
Canada

Museum of
Natural Sciences

Musée des Sciences
naturelles

Canadian Wildlife Service
Western Region

Your file: WLN 300

JAN - 2 1975

File: WLN 300

December 30, 1974.

Mr. Ludwig Carbyn,
Biologist,
Canadian Wildlife Service,
1110 - 10025 Jasper Avenue,
Edmonton, Alberta. T5J 1S6

Dear Mr. Carbyn:

Due to circumstances beyond my control my correspondence has been running late. I hope that my delayed answer to your query of November 22 will not inconvenience you.

In answer to your specific inquiry, I do not have an actual breeding record of the Golden-crowned Sparrow within the Northwest Territories.

I should like very much to have the details of your breeding record for our files at your convenience.

Sincerely yours,

W. Earl Godfrey,
Chief,
Vertebrate Zoology Division.

WEG/jb

SEARCHED	INDEXED
SERIALIZED	FILED
JAN 2 1975	
WLN 300	

APPENDIX E

Appendix E - Results of Bear Scat Analysis for 1974 samples.

No.	Date	Locality	Information
1	July 21	Base of Sunblood Mountain on the west side (Virginia Falls)	55% <i>Vaccinium uliginosum</i> 35% Unidentified vegetation 10% <i>Vaccinium vitis-idaea</i> trace <i>Ericaceous</i> leaves
2	July 25	Across from camp (Virginia Falls)	35% Unidentified vegetation 20% <i>Vaccinium vitis-idaea</i> 20% <i>Gramineae</i> 15% <i>Vaccinium uliginosum</i> 10% Lichens
3	July 27	Upland black spruce behind camp (Virginia Falls) area 2	98% Unidentified vegetation 2% Wood chips and twigs trace ants trace lichens trace <i>Vaccinium uliginosum</i> 1 small mammal bone
4	July 20	100 yards south of camp (Virginia Falls) area 2	50% <i>Picea</i> seeds and cones 30% Unidentified vegetation 20% <i>Picea</i> needles trace short white-hair-like structures
5	July 7	Fan at Deadmen's Valley	30% White animal hair (possible Dall sheep) 25% <i>Vaccinium vitis-idaea</i> fruit 25% <i>V. vitis-idaea</i> leaves 20% Unidentified vegetation
6	July 25	North side of river across from camp (Virginia Falls)	70% <i>Vaccinium vitis-idaea</i> 15% <i>Arctostaphylos uva-ursi</i> 10% Unidentified vegetation 5% <i>Ericaceous</i> leaves
7	July 25	By large slump on south side of river 2 miles upstream from camp (Virginia Falls)	50% Unidentified vegetation 40% <i>Vaccinium vitis-idaea</i> seeds 10% <i>V. vitis-idaea</i> leaves trace ants, <i>V. uliginosum</i> , and <i>Picea</i> needles
8	July 31	Black spruce-feathermoss Some white spruce-feathermoss (Virginia Falls)	60% Ants 30% Unidentified vegetation 10% Wood chips and twigs

No.	Date.	Locality	Information
9	August 3	West bog on north side of river (Virginia Falls)	80% Ants. 15% Unidentified vegetation 5% Wood chips and twigs trace <i>Ericaceous</i> leaves
10	July 3	North side of river. Black spruce-feathermoss (Virginia Falls)	44% Unidentified vegetation 40% <i>Vaccinium uliginosum</i> seeds 5% Wood chips 1% Ants trace wasps
11	No date	Ridge above and north of Marengo Creek (Virginia Falls)	91% Unidentified vegetation 8% <i>Vaccinium vitis-idaea</i> 1% Lichens trace ants trace twigs
12	August 2	Oxbow Lake (Virginia Falls) (Possible Grizzly)	45% Unidentified vegetation 40% <i>Vaccinium uliginosum</i> 15% Animal hair trace grass and moss
13	No Date	Across river from camp between large knoll and <i>Pinus contorta</i> stand (Virginia Falls)	60% <i>Vaccinium vitis-idaea</i> seeds 39% Unidentified vegetation 1% <i>Ericaceous</i> leaves trace ants, <i>Vaccinium vitis-idaea</i> , grass
14	August 2	Behind knoll. Black spruce-white spruce (Virginia Falls)	98% Unidentified vegetation 1% <i>Gramineae</i> 1% <i>Vaccinium vitis-idaea</i> seeds trace unidentified seeds
15	July 31	Lodgepole pine area (Virginia Falls)	83% Unidentified vegetation 15% <i>Vaccinium vitis-idaea</i> 2% <i>Ericaceous</i> leaves trace <i>Gramineae</i> , ants, <i>Carex</i> .



APPENDIX F

Appendix F - Descriptions of grizzly habitat for Nahanni Hotsprings, Virginia Falls, Junction of the Flat/Nahanni rivers and Rabbitkettle area.

Nahanni Hotsprings Grizzly Bear Habitat Designations

1. Rough precipitous areas with open vegetation. Stunted spruce, willow clumps and shrub areas seem to prevail, particularly along lower elevations i.e. creek bottoms. Dry wash i.e. boulder strewn outwashes, are common.
- 2b "Foothill" type terrain, mostly forested. Principle forest cover being coniferous.
- 3c Flat to rolling topography; areas with poor drainages common.
- 3d Rolling topography with coniferous and mixed cover.
- 3e Level terrain, frequent aquatic interspersions e.g. lakes, marshes.
- 1f The Tlogotsho and Liard ranges and the Yohin Ridge area, contain what are judged to be the best grizzly bear habitats in the hotsprings area. The areas exhibit interspersions of alpine, subalpine areas, slides, creeks and a diversity in plant cover.
- 2g River and floodplain area. Vegetation considered "lush" when compared to other areas. There is considerable habitat diversity within this region. Generally it would seem to be an area better suited as black bear habitat than grizzly habitat.
- 2h Rugged and precipitous terrain along the canyons of the south Nahanni River. No specific sightings were made of grizzly bears in this region but it has been given a "2" rating because of its proximity to an extensive class 1 area.

- 2i. Similar to 2h in topography but because of the associated river bars and flats, this area has been separated out from the neighboring region.
- 2j. Alluvial fan area; and a field check indicated abundant evidence of prime berry habitats. Black bear sign was common.

Virginia Falls - Flat River Grizzly Bear Habitat Designations

- 1a. Undulating to mountainous region; mostly forested. Occasional open areas are found along south-facing slopes and stream outwashes. Sub-alpine areas are interspersed along the higher elevations.
- 1b. Nahanni River valley below Virginia Falls. Alluvial areas are interspersed with an otherwise solid forest cover.
- 1c. Mountainous terrain. Because of the diversity of terrain and elevations, this area was judged to be good potential grizzly bear habitat.
- 2d. Forest cover along the river margin. Coniferous forest cover is broken up by muskeg and numerous thermokarst ponds. This region is probably seasonally important to grizzly bears, particularly as it pertains to berry production from year to year.

Rabbitkettle Lake Grizzly Bear Habitat designations

- 1a. Rugged rocky terrain and peaks exceed 9,000 ft in some areas. Alpine and subalpine areas within basins probably are prime mid-summer habitats.
- 1b. Lower elevations. Sections with burned over areas providing suitable areas with soapberry bushes.

- 2c Similar to 1b, however areas with mature spruce forests judged to have less potential food (berry crops). Some sections along the river banks probably are attractive spring grizzly bear habitats (*Hedysarum* spp. growth), therefore used for a short time.
- 1d Area much like 1a but less precipitous. Grizzly habitat seems much like 1a.

APPENDIX G

APPENDIX G. Annotated list of birds for Nahanni National Park seen during the summers of 1974 and 1975.

Notes and dates are restricted to the more unusual sightings, sightings of possible interpretive value and sightings that could have a bearing on human impact related problems.

Because of our field schedule it is important to note that little time was spent in alpine regions. The observations in that area are sketchy.

Common Loon - *Gavia immer*

A pair of loons was seen on 18 June 1975 at Rabbitkettle Lake. Both or at least one of these birds was seen on the lake every day up to 13 July 1975. What appeared to be courtship display was observed on 23 June 1975 (one bird head bobbing, rising out of water, flapping wings and exposing chest area). No nest or evidence of nesting on the lake was found. There is some evidence that they may have been nesting across the Nahanni River (north) because, whenever the birds flew into or away from the lake it would always be in that direction.

Yellow-billed Loon - *Gavia adamsii*

Yellow-billed loons were seen only on two occasions. On 13 July 1975, two adults were seen on the southeast end of Rabbitkettle Lake and again on 14 July, five adults were seen on the same lake. It is significant to note here that on both of these days the weather was stormy.

* Breeding record

Arctic Loon - *Gavia arctica*

In 1974, only one bird was seen at Virginia Falls on 7 August. At least five arctic loons were present in the Rabbitkettle Lake area throughout the study period in 1975. On 19 June five birds were seen on the lake. On 20 June, two individuals were seen on a pond near the lake, and a second one close by. These ponds are east of Rabbitkettle Lake, and all three (presumably the same birds) remained in the vicinity throughout the summer. Several ponds to the south of Rabbitkettle Lake had two resident birds all summer; one arctic loon was seen on a lake southeast of Rabbitkettle Lake.

Red-throated Loon - *Gavia stellata*

Only one red-throated loon was seen during the summer of 1974 on Oxbow Lake near Virginia Falls. In 1975, a single bird was first seen on Rabbitkettle Lake on 22 June and subsequently, presumably the same bird, was observed daily to mid-July. This bird was the least wary of all the loons and usually fed close to shore. Perhaps this is an indication that the red-throated loons feed more commonly on leeches which may exist to a greater extent in shallower waters. Other species of loons were seen more often feeding in deeper water.

Red-necked Grebe - *Podiceps grisegena*

Two pairs of red-necked grebes were resident on Rabbitkettle Lake in 1975. On 19 June both nests were found. One nest was on the east side (labelled #1) and the other on the west side (#2). Nest #1 contained three eggs and nest #2 had six eggs. Both nests were in about 5 feet of water and approximately 60 feet from the shore. The nests were composed of rushes and other aquatic plants and were floating amongst the emergent rushes. On 24 June one egg hatched from nest #1 and by 26 June the other two had also hatched. All three young were observed riding on the female bird's back on the 26 June. Nest #2 was abandoned and a renesting attempt failed.

Horned Grebe* - *Podiceps auritus*

The horned grebes were first seen on 22 June 1975 south of Rabbitkettle Lake. Four adults were seen on this occasion. On 28 June, four adults were again seen on the same small ponds and one nest containing two eggs was found. The nest was a typical grebe nest of a floating island of rushes and other aquatic vegetation in about 4 feet of water surrounded by emergent vegetation. Both pairs were again observed on 9 July 1975 but no young had hatched yet.

Swans

On 27 June 1974, two pair of swans (possibly trumpeter swans - *Olor buccinator*) were seen on a small lake east of Glacier Lake by tourists (Jewett, pers. com.). A single bird flying east over Nahanni Hotsprings, then south along Clausen Creek was observed on 13 June 1975. Wardens have frequently sighted swans, often with young, on Yohin Lake (Frey, pers. comm.)

Canada Goose - *Branta canadensis*

A single bird was seen on 10 July 1975 at Rabbitkettle Lake (Marsh, pers. comm.). Three birds were seen flying west near Rabbitkettle Lake on 15 August 1975.

White-fronted Goose - *Anser albifrons*

A flock of about 50 was seen at Virginia Falls on 19 August 1975.

Mallard* - *Anas platyrhynchos*

One bird was seen at Virginia Falls on 7 August 1974. On 20 June, two males were observed flying over Rabbitkettle Lake and again on 21 June

another male was seen at the same location. On 28 June a female with six downy young were seen on a small pond south of Rabbitkettle Lake.

Gadwall - *Anas strepera*

A duck that was seen on Oxbow Lake on 8 August, was tentatively identified as a gadwall.

Pintail - *Anas acuta*

A single male pintail was seen, flying east on 16 June 1975 at Kraus Hotsprings. On 21 June, three males were seen flying southeast over Rabbitkettle Lake.

Green-winged Teal* - *Anas carolinensis*

This species was frequently observed at Nahanni Hotsprings in 1974. Again on 3 August this species was seen at Virginia Falls. In 1975, a female with eight downy young were observed on a pond south of Rabbitkettle Lake on 19 June.

Shoveler - *Spatula clypeata*

A single bird was seen flying west at Nahanni Hotsprings on June 27 June.

Ring-necked Duck - *Aythya collaris*

Six male ring-necked ducks were seen on 28 June 1975 on a pond south of Rabbitkettle Lake. Because of a close view there is no question of the identification.

Lesser Scaup* - *Aythya affinis*

On 7 August 1974, two broods of lesser scaup were observed on a small lake at Virginia Falls. A male was seen near Rabbitkettle Lake on

20 June 1975. In the same season, a female was flushed from a nest containing seven eggs near the above lake on 26 June. Two males and a female were seen at Rabbitkettle Lake on 28 June and 9 July.

There was some confusion at first whether, in fact, the above observations in 1975 were of greater scaup (*A. Marila*) or lesser scaup (*A. affinis*), however on subsequent sightings the identification was confirmed.

Common Goldeneye - *Bucephala clangula*

A duck, believed to be a common goldeneye, was seen at Nahanni Hotsprings on 24 June 1974.

Barrow's Goldeneye - *Bucephala islandica*

During the 1975 season, it was first seen at Nahanni Hotsprings on 13 June when two females were flushed from the hotspring stream. Two males and one female were seen at Rabbitkettle Lake on 18 June and a female was seen on 22 June east of the lake. On 26 June, two males were seen feeding on the same lake among a flock of swift and white-winged scoters. A brood of eight young goldeneye were seen on 12 July north of Rabbitkettle Lake. The young were quite large and well feathered but unable to fly.

Bufflehead - *Bucephala albeola*

This species was seen at Virginia Falls on 19 July, 29 July and 7 August 1974. A single female was seen near Rabbitkettle Lake on 23 and 24 June 1975. On 28 June, at the same location, six males and four females were seen. On 30 June, on a pond south of Rabbitkettle Lake and next to Rabbitkettle River, one female and seven ducklings were seen. This pond offered suitable nesting habitat.

Oldsquaw - *Clangula hyemalis*

A lone female oldsquaw was seen swimming in the middle of Rabbitkettle Lake on 18 June. On 22 June (a stormy rainy day) one male oldsquaw was seen among a flock of approximately 80 surf and white-winged scoters. A single female was seen again on 22 June in Pond #6 along with a female Barrow's goldeneye, two male lesser scaup and one female white-winged scoter. This single female oldsquaw remained in the Rabbitkettle Lake area up to 7 July.

White-winged Scoter - *Melanitta deglandi*

A single female white-winged scoter was seen on 18 June 1975 at Rabbitkettle Lake. This same bird probably remained in the area until 7 July, and was seen on many different occasions. On 21 June a mixed flock of white-winged and surf scoters landed on the lake at 23:30 hrs; this was just before a storm on 22 June and the flock of scoter remained on the lake until the weather cleared. The flock consisted of, at least, 80 birds of which at least ten were white-winged scoters. There was much active courtship display (head bobbing, neck stretching, also chasing one another.) On 6 July, four individuals (3♂, 1♀) were seen on Rabbitkettle Lake; and again on 13 July, when another storm struck the area, a mixed flock (200±) white-winged and surf scoters were seen on the lake. These large flocks are mainly composed of surf scoters. The flocks seemed to arrive from the east and flew off to the west.

Surf Scoter - *Melanitta perspicillata*

As mentioned above, large flocks of surf and white-winged scoters were seen on Rabbitkettle Lake during June and July, 1975. These sightings

were related to the rain storms in the area. Eleven surf scoters were observed on Rabbitkettle Lake on 26 June, one female Oldsquaw was among the flock. On 30 June, a flock of 42 surf scoters was observed on Rabbitkettle Lake. On 13 July a large flock (200±) settled on the lake. This was a mixed flock of white and surf scoters (approx. 80% surf scoters).

Common Merganser - *Mergus Merganser*

A female common merganser was seen on the main river at Nahanni Hotsprings on 28 June 1974.

Goshawk* - *Accipiter gentilis*

Goshawks were seen at Nahanni Hotsprings on 21 June 1974, 13 June 1975 and in the alpine region on Mt. Sunblood 20 July, 27 July and 7 August 1974. The 7 August sighting was of an immature.

Sharp-shinned Hawk* - *Accipiter striatus*

A sharp-shinned hawk was seen at Oxbow Lake, near Virginia Falls on 2 August 1974. Another one was seen at Nahanni Hotsprings on 12 June 1975. A pair, with young, remained around the Rabbitkettle Hotsprings area from 2 to 7 August. Their nest was close to the old "dome" in a tall spruce tree, and the young fledged on 6 August.

Red-tailed Hawk* - *Buteo jamaicensis*

Red-tailed hawks were seen on 18 June, 24 June and 22 August in the Nahanni Hotsprings area. A nest near the Clausen Creek game licks was found on 12 June 1975. A pair of red-tailed hawks were seen at the confluence of Nahanni River and Clausen Creek on 15 June. A single bird circled Rabbitkettle Lake on 26 June 1975.

Golden Eagle - *Aquila chrysaetos*

An adult bird was seen hunting on Mt. Sunblood, 21 July 1974.

Bald Eagle* - *Haliaeetus leucocephalus*

On 19 June, at Rabbitkettle Lake, an immature bird was seen perched in a spruce tree on the southwest shore of the lake. On 21 June, at Rabbitkettle Lake, one adult bald eagle was seen flying low along the south shore. On 5 July one adult and one immature bald eagle was seen on Rabbitkettle Lake. The immature was perched on the same spruce as on 19 June and the adult was flying low along the south shore. The adult was observed catching a large fish (probably a sucker) in the shallow water. Upon catching the fish the adult eagle flapped ashore, secured the fish in its talons and flew off to the west (upriver).

A bald eagle nest was found along the north bank of the South Nahanni River, approximately 5 kilometers west of Rabbitkettle Lake. One dead immature bird, partly decomposed was found along the south side of the lake; cause of death unknown.

Osprey - *Pandion haliaetus*

An Osprey was seen on 27 June at Rabbitkettle Lake. The bird was probably catching fish at the time and almost flew into the path of a Cessna aircraft leaving the lake.

Peregrine Falcon - *Falco peregrinus*

On 15 June 1974 a bird, almost certainly of this species, was seen in the first canyon immediately west of Nahanni Hotsprings. On 21 June 1975, a "crow" sized falcon was seen at Rabbitkettle Lake and was tentatively identified as a peregrine falcon.

Merlin* - *Falco columbarius*

An eyrie most likely was found on 7 July 1974, in the first canyon, high on an east cliff in Deadmen Valley. An adult merlin circled and behaved in a predictable manner, as if defending a nest. Two birds, tentatively identified as merlins, were seen near Rabbitkettle Lake on 19 June 1975.

Kestrel* - *Falco sparverius*

Seen daily around Nahanni Hotsprings in 1974. Field notes for 1975 yield some interesting observations:

"On 10 June at Nahanni Hotsprings, one male and one female Kestrel were seen. At first it was thought that there was only one pair of kestrels nesting in the clearing by the cabin, however, further observations caused much confusion. There were definitely two females because on the 14 June both of them were seen within 5 minutes in two different locations. Furthermore, both females were seen to enter into different nest holes in dead poplar trees. On 13 June it was observed that a male kestrel passed some prey to a female kestrel (executed in the air). The female alighted on an aspen branch and consumed the prey. After 5 minutes she flew down to a large aspen stump, and crawled up the side of the tree and into a hole in the tree about 25 feet above ground, and 10 minutes later she entered a hole in another aspen 150 feet closer to the river."

On 20 June a male kestrel was seen at Rabbitkettle Lake. On 21 June, a nest was found on a hill about 1 km south of Rabbitkettle Lake; both male and female birds were seen, and the female flushed from the nest.

There were at least two pairs of kestrels in the immediate vicinity of Rabbitkettle Lake, one pair to the south and one to the west.

Blue Grouse - *Dendragapus obscurus*

One bird was seen in an open lodgepole pine forest stand approximately 4,500 feet elevation on the south side of Mt. Sunblood.

Spruce Grouse* - *Canachites canadensis*

These grouse were frequently sighted in all the regions that were investigated.

Ruffed Grouse - *Bonasa umbellus*

This species was occasionally heard drumming at Nahanni Hotsprings and Rabbitkettle Lake.

Rock Ptarmigan* - *Lagopus mutus*

The identification of this species may be confused with that of willow ptarmigan. Birds that were tentatively identified as rock ptarmigan were seen on the Tlogotsho Plateau on 10 July. On Mt. Sunblood these birds were seen on every visit to the alpine area.

White-tailed Ptarmigan - *Lagopus leucurus*

Small flocks of white-tailed ptarmigan were seen on the Tlogotsho Plateau on 10 July 1974.

Sora Rail - *Porzana carolina*

On 22 June, one adult sora rail was seen at the pond south of Rabbitkettle Lake. This was probably the same bird that was seen on 28 June. The pond is typical of this area with growths of sedges and rushes in shallow

water. On both occasions, the rail was seen feeding on the mudflats among emergent vegetation.

Common Snipe* - *Capella gallinago*

The snipe was a fairly common summer resident in the park. Its winnowing could frequently be heard in most areas. On 13 June, a nest with four eggs was found near the Clausen Creek lick. Another nest with four eggs was found on 24 June north of the Rabbitkettle Lake.

Spotted Sandpiper* - *Actitis macularia*

Spotted sandpipers were common summer residents in the park. They could be seen every day along the main river or tributaries. At Nahanni Hotsprings, one nest was found (12 June 1975) where the creek, draining the hotsprings, enters the Nahanni. The nest contained four eggs. Another nest was found at the main hot pool, also containing four eggs.

Solitary Sandpiper - *Tringa solitaria*

In 1974, this species was seen on three different occasions around Virginia Falls. Solitary sandpipers were uncommon summer residents at Rabbitkettle Lake. It was seen twice on 23 June and 24 June, both times near a spruce bog north of the lake. Only one bird was seen on each occasion.

Lesser Yellowlegs* - *Totanus flavipes*

The lesser yellowlegs was a very common summer resident in the Rabbitkettle Lake area but was seen infrequently in the eastern portion of the park. On 22 June, six adults were seen and one dead chick was found in the burn area south of the lake. On 23 June 1975, one nest containing

four eggs was found on the north side of the lake. These eggs had a small hole pecked in them and were about to hatch. By 13 July almost all territorial aggression of the adult birds in the Rabbitkettle Lake area had ceased and on that day a flock of eight birds was seen circling the lake and landing on the east shore.

Pectoral Sandpiper - *Erolia melanotos*

Three birds of this species were seen at the Clausen Creek licks on 22 August 1974.

Least Sandpiper - *Erolia minutilla*

A "peep" seen feeding on the dome of the more recent Rabbitkettle Hotsprings was identified as a Least Sandpiper on 2 August 1975.

Western Sandpiper - *Ereunetes mauri*

Birds tentatively identified as western sandpipers were seen at Nahanni Hotsprings 20 August and at Clausen Creek lick on 22 August 1974.

Northern Phalarope - *Lobipes lobatus*

These phalaropes were seen once. A flock were feeding on Rabbitkettle Lake on 30 July 1975.

Herring Gull - *Larus argentatus*

In 1974 this species was seen on 3 August 1974 at Virginia Falls. Similarly the herring gull was seen only once in 1975 on 14 July at Rabbitkettle Lakes. Two adults were seen that day along with a large flock of mew gulls.

Mew Gull* - *Larus canus*

Mew gulls were frequently seen at Virginia Falls in 1974. These gulls were common summer residents at Rabbitkettle Lake in 1975. Six adult mew gulls were seen on 17 June at Rabbitkettle Lake. Usually no more than six adults were seen around the lake at any one time, except on 13 July when 20 adults were on the lake. The 13 July observation was on a stormy day. Immatures were noted in August.

Bonaparte's Gull* - *Larus philadelphia*

These gulls were a common bird at Rabbitkettle Lake, although they seemed to prefer the smaller ponds in the area. On 20 June a nest was examined in a spruce tree. Six adults were exhibiting fairly aggressive territorial behavior, however the nest was not active. Again on 30 June on a small lake south of Rabbitkettle Lake near the Rabbitkettle River, another nest in a small spruce tree was found which was guarded by two adult Bonaparte gulls. No young or eggs were present.

Arctic Tern* - *Sterna paradisaea*

Arctic terns, a common summer resident of the Rabbitkettle Lake area, were often seen around Virginia Falls in 1974. A total of eight individuals were seen at one time on the lake. On 20 June, one nest was found on the top of a ridge near Rabbitkettle Lake. The nest contained two eggs which was guarded by the adults until 8 July when the nest was found destroyed. Arctic terns were seen fishing in Rabbitkettle Lake every day.

Great Horned Owl - *Bubo virginianus*

A great horned owl was heard hooting at Clausen Creek lick on 12 June 1975. On 11 July, at Rabbitkettle Lake, two great horned owls were heard calling back and forth across the lake.

Common Nighthawk* - *Chordeiles minor*

Nighthawks are very common summer residents along the Nahanni River and can be seen daily. On 22 June 1975 one nest containing two eggs was found in the open burn area about 2 km south of Rabbitkettle Lake. Another nest with two young birds was found on 9 July about 1 km south of Rabbitkettle Lake. In 1975, it was noted that the activity of the night-hawks decreased markedly after 24 June, i.e. they were still seen actively feeding at night but the "booming" was not as frequent as earlier on in the season.

Belted Kingfisher - *Megasceryle alcyon*

This species was frequently observed along the main river and tributaries in all the areas visited. At one location on Rabbitkettle River, a probable kingfisher nest was found. Several other suspected nest sites were seen at various locations along the main river.

Flicker (yellow-shafted)* - *Colaptes auratus*

A fairly common summer resident of both the upper and lower Nahanni River areas. One nest was found at Nahanni Hotsprings along the trail to Clausen Creek which is closest to the river. Two nests were found at Rabbitkettle Lake, one near the shore on the northwest end of the lake, in a tall dead spruce, and the second south of the lake in a burned-over area.

Yellow-bellied Sapsucker* - *Sphyrapicus varius*

An uncommon summer resident, the yellow-bellied sapsucker is perhaps more limited to the aspen woods than the other woodpeckers. One was seen on 16 August 1974 (adult with young) and on 11 June 1975 at Nahanni Hotsprings. This species was seen twice at Rabbitkettle Lake (23 June and 25 June 1975) both times on the north side of the lake.

Hairy Woodpecker* - *Dendrocopos villosus*

Hairy Woodpeckers were seen 17 June, 18 June and 20 June 1974 at Nahanni Hotsprings. One pair was seen daily at Nahanni Hotsprings in June 1975. A nest was found along the trail leading upriver from the cabin. When our field crew arrived on 10 June this nest contained fairly well-developed young which were pushing their heads out of the nest hole to be fed. On 30 June 1975 one female and four immature birds were seen in the burn area 1 mile south of Rabbitkettle Lake.

Downy Woodpecker - *Dendrocopos pubescens*

Only one Downy Woodpecker was seen during the duration of the field work. This was a bird sighted at Nahanni Hotsprings on 23 June 1974.

Northern Three-toed Woodpecker* - *Picoides tridactylus*

This is the most truly boreal member of the woodpeckers. In 1974, one was seen at Nahanni Hotsprings on 25 June and at Virginia Falls on 3 August. In 1975, one pair was resident in the mature spruce forest at Nahanni Hotsprings. On 13 June two adult birds were observed to exhibit what appeared to be courtship display. On 9 July 1975 at Rabbitkettle Lake one female and four immature northern three-toed woodpeckers were seen about 2 km south of the lake.

Eastern Kingbird - *Tyrannus tyrannus*

An uncommon summer resident. A single individual was seen on 14 June 1975 at Nahanni Hotsprings. This bird was seen only once. The eastern kingbird was seen on three occasions at Rabbitkettle Lake (20 June, 26 June, 30 June). Twice at a pond and on 30 June near Rabbitkettle River.

Eastern Phoebe - *Sayornis phoebe*

Seen once on 27 June 1974 at Nahanni Hotsprings.

Say's Phoebe - *Sayornis saya*

The Say's phoebe was seen only once. On 7 July 1975, one adult phoebe was seen catching insects from a rocky perch at treeline (elevation about 5,500 ft). This was about 6 km southwest of Rabbitkettle Lake.

Traill's Flycatcher - *Empidonax traillii*

The identification of this species was achieved with recorded song. It was frequently seen in the deciduous vegetation around Nahanni Hotsprings. The same species was seen only once (20 June 1975) at Rabbitkettle Lake.

Least Flycatcher - *Empidonax minimus*

The familiar "che-bek" is the most abundant of the flycatchers at Nahanni Hotsprings. While sitting quietly on the morning of 11 June 1975, eight different individuals were counted either by sight or voice. This empidonax prefers the aspens, and saskatoon - chokecherry habitats.

Western Flycatcher - *Empidonax difficilis*

One sighting made on 16 August 1974 near Nahanni Hotsprings may have been of this species. This is well out of the expected range of the species, however, the possibility cannot be ruled out that the bird under lengthy observation was a western flycatcher.

Western Wood Pewee - *Contopus sordidulus*

In 1974, a bird positively identified as this species was seen near Virginia Falls on 7 August. This species was frequently around Nahanni Hotsprings and less commonly at Rabbitkettle Lake.

Olive-sided Flycatcher - *Nuttallornis borealis*

Seen at Virginia Falls on 10 August 1974.

Violet-green Swallow - *Tachycineta thalassina*

Migrating flocks of violet-green swallows were seen at Kraus Hotsprings on 11 June and 13 June; a total of 12 individuals was seen on these two days. On 15 June, four violet-green swallows were observed hawking about the cliffs downstream and across the river from Nahanni Hotsprings. These swallows often perched on the cliff face and may have been nesting. Violet-green swallows were seen at the same location 2 July 1974. Two were seen at Rabbitkettle Lake on 21 June 1975.

Tree Swallow* - *Iridoprocne bicolor*

A pair of tree swallows were nesting in a bird house at Nahanni Hotsprings' cabin. On 10 June 1975, six eggs were in the nest. This pair of swallows were very territorial and would drive away other swallows, especially the violet-greens that came into the vicinity.

Bank Swallow* - *Riparia riparia*

While going down river to Nahanni Butte from Nahanni Hotsprings a nesting colony of at least 10 bank swallows was seen in a high bank about 1.6 kilometers down river from Yohin Ridge. Whenever it rained at Rabbitkettle Lake, bank swallows could always be seen (hawking for insects above the water; this was so on 21 June, 22 June and 17 July. They may easily have been nesting about 3 km upriver where there are some steep banks. Similarly, a large colony (as evidenced by holes in the river bank) was seen downriver from Rabbitkettle Lake.

Cliff Swallow* - *Petrochelidon phrrhonota*

This species was seen in both years. One nesting colony of cliff swallows was found on the cliffs just down and across the river from Nahanni Hotsprings. This colony may offer possibilities for interpretive use as there is a floodplain directly across the river from the cliffs which gives one an excellent vantage point for viewing the swallows at the nest. The floodplain is easily accessible from the cabin. On 13 June these swallows were seen building nests (approximately 12 birds were observed in this activity). Cliff swallows, as with the other swallows, were seen on Rabbitkettle Lake mainly during or after a rain storm.

Gray Jay* - *Perisoreus canadensis*

Very common bird and seen almost daily. Juvenile birds were frequently seen in early summer. The young were feeding on their own although on occasion the adults would feed them. Both adults and immature were also seen daily at Rabbitkettle Lake.

Common Raven* - *Corvus corax*

Along with the gray jay the raven is another common permanent resident of the boreal forest. Ravens were seen almost daily at Nahanni Hotsprings both in 1976 and 1975. A nest was known to be on the cliffs just upriver from the Nahanni Hotsprings cabin. An adult raven was seen on 25 June at Rabbitkettle Lake with a fish (appeared to be a small sucker) in its bill. The ravens were often seen along the lake shore.

Boreal Chickadee* - *Parus hudsonicus*

Boreal chickadees were frequently observed throughout the park. On 24 June, on a stand of mature spruce along the river at Rabbitkettle Lake, two adults were seen feeding three immature birds.

Black-capped Chickadee - *Parus atricapillus*

The only sighting of this species was of one bird seen on 14 August, 1974 at Nahanni Hotsprings. It appeared to be migrating.

Red-breasted Nuthatch - *Sitta canadensis*

At least one pair of red-breasted nuthatches were resident on the mature spruce stand just downriver from the cabin at Nahanni Hotsprings. Adult birds were seen on the 12 and 14 June in the spruce forest there.

Robin* - *Turdus migratorius*

Robins were seen every day in many locations. On 21 June, one nest containing four eggs was found in a burn area near Rabbitkettle Lake. On 24 June 1975, two adults and two immature robins were seen just north of Rabbitkettle Lake.

Varied Thrush* - *Ixoreus naevius*

Varied thrushes were fairly common residents of the mature spruce forest and were frequently sighted in 1974 and 1975. Male birds were heard singing in the early morning nearly every day in June. On 24 June 1975, two adults and four young were seen in spruce woods along Nahanni River at Rabbitkettle Lake. On 25 June, one adult and two immatures were seen in the same area.

Hermit Thrush* - *Hylocichla guttata*

Hermit thrushes were not seen at Nahanni Hotsprings but were common summer residents at Rabbitkettle Lake. On 22 June, a nest containing four eggs was found. Hermit thrushes could be heard singing daily in the burn areas around Rabbitkettle Lake.

Swainson's Thrush* - *Hylocichla ustulata*

These thrushes were common summer residents at both Nahanni Hotsprings and Rabbitkettle Lake. Frequent sightings of adults were made in 1974. On 13 June 1975, a nest with five eggs was found at Nahanni Hotsprings. On the 25 June, a nest with four eggs was found at Rabbitkettle Lake. On the 29 June, another nest with eggs was found near Rabbitkettle Lake; the nest had four eggs and was on a high ridge in a small birch tree about 3 metres tall. All these nests were in trees and about 2 m from the ground. Swainson's thrushes seem to prefer the river edge or the open spruce forests, compared to the hermit thrushes which were seen mainly in the burned-over areas around Rabbitkettle Lake.

Gray-cheeked Thrush - *Hylocichla minima*

Identification of this species was not positive, however, one bird almost certainly a gray-cheeked thrush was seen at George's riffles on 21 August 1974.

Townsend's Solitaire* - *Myadestes townsendi*

This species was seen frequently around treeline on Mt. Sunblood during 1974. Young birds were heard calling in that region in August. Only one sighting (7 July) was made at Rabbitkettle Lake.

Ruby-crowned Kinglet - *Regulus calendula*

This species is another boreal element of the avifauna that is found most often in a mature spruce forest. It was seen at Nahanni Hotsprings on 21 June 1974 and 10 and 12 June 1975.

Water Pipit - *Anthus spinoletta*

A species found in the alpine areas of the park. It was seen on the Tlogotsho Plateau on 10 July and on Mt. Sunblood 28 July and 7 August 1974. Flocks were seen at Nahanni Hotsprings that season when it had snowed above timberline on 20 August.

Bohemian Waxwing* - *Bombycilla garrulus*

Bohemian waxwings are very common summer residents in the park. Birds could be seen perched and catching insects every day along the shore of Rabbitkettle Lake. On 28 June 1975, two adult birds were seen, one with nesting material in its bill. On 1 July 1975, a nest with three eggs was found about 3 km west of Rabbitkettle Lake. The nest was about 3 m off the ground and in the forks of a small spruce tree.

Northern Shrike - *Lanius excubitor*

Only one northern shrike was seen in 1975. On 28 and 29 June, one male bird was seen and heard singing from the top of a ridge south of Rabbitkettle Lake.

Starling - *Sturnus vulgaris*

One bird of this species was seen at Nahanni Hotsprings on 17 June 1974. This, according to Godfrey's maps (Godfrey 1966), is a considerable range extension. Hoeffs (1973) reported this species from the Kluane Lake area.

Red-eyed Vireo - *Vireo olivaceus*

Red-eyed vireos were seen only at the Nahanni Hotsprings on 23 and 25 June 1974.

Warbling Vireo* - *Vireo gilvus*

The warbling vireo was a very common summer resident at Nahanni Hotsprings. On 14 June 1975, two nests were found; one was about 10 m high in an aspen and the second about 3 m high in a saskatoon shrubbery.

Black-and-white Warbler - *Mniotilta varia*

A black-and-white warbler, probably on migration, was seen only once. This bird was observed at Nahanni Hotsprings on 14 August 1974.

Tennessee Warbler* - *Vermivora peregrina*

Probably the most common warbler in the Nahanni area. Its endless song is heard at all times of day whenever one is in a deciduous or mixed forest habitat. Seen daily at Nahanni Hotsprings and frequently at other

locations. On 14 June 1975, a nest was found at Nahanni Hotsprings. The nest was on the ground in a mixed aspen birch forest. It contained five eggs, and was slightly hidden beneath a moss covered log.

Orange-crowned Warbler - *Vermivora celata*

An orange-crowned warbler was seen at Nahanni Hotsprings on 26 June 1974. A second bird was seen at Rabbitkettle Lake on 12 July 1975.

Yellow Warbler - *Dendroica petechia*

A fairly common warbler at Nahanni Hotsprings. Males were seen defending their territories in the deciduous shrubs. One sighting, 23 July 1974, at Virginia Falls and two sightings (25 June and 28 June) are the only other records for this species.

Magnolia Warbler - *Dendroica magnolia*

Less common than the Yellow-rumped warbler, this species was often seen around the Nahanni Hotsprings area. This is the only area where the species was encountered.

Yellow-rumped Warbler - *Dendroica coronata*

Both races, myrtle and audubon's were seen at Nahanni Hotsprings. Myrtle warblers were more common. This species was often seen in other areas, particularly concentrated during the pre-migration (mid-August) period.

Bay-breasted Warbler - *Dendroica castanea*

An uncommon summer resident, the bay-breasted warbler was seen on 25 and 26 June 1974 and 14 June 1975 at Nahanni Hotsprings along Clausen Creek. This warbler tends to stay on the higher branches in mixed coniferous forest and its weak song can easily be overlooked.

Palm Warbler - *Dendroica palmarum*

This species was seen only twice at Rabbitkettle Lake. Observation dates are 20 June and 9 July 1975

Ovenbird - *Seiurus aurocapillus*

More often seen than heard this secretive ground warbler is a fairly common resident of the deciduous aspen/birch forests at Nahanni Hotsprings. Its taunting "teacher teacher" call is heard whenever one walks through such habitat.

Northern Waterthrush - *Seiurus noveboracensis*

The other ground inhabiting warbler of the *Seiurus* genus, the waterthrush, is not nearly as common as the ovenbird. Seen on 12 June and 14 June 1975 at Nahanni Hotsprings. This warbler tends to inhabit the thick tangled willow aspen areas along the snye around Nahanni Hotsprings.

Mourning Warbler - *Oporornis philadelphia*

The only member of the *Oporornis* complex seen in the Nahanni area. Seen at Nahanni Hotsprings on 29 June 1974, 11 June, 13 June and 15 June 1975.

Yellowthroat - *Geothlypis trichas*

A skulking inhabitant of the wetland areas where willow and alder are abundant. This warbler was a common resident at both Nahanni Hotsprings and Rabbitkettle Lake.

Wilson's Warbler - *Wilsonia pusilla*

This warbler was seen only twice, 14 August and 21 August 1974; probably on a premigratory flight, at Nahanni Hotsprings.

Red-winged Blackbird* - *Agelaius phoeniceus*

A common resident around Rabbitkettle Lake. A nest was found on 30 June 1975, however without eggs. The adult did defend the nest so undoubtedly they were late nesters. This species was seen once, 25 June 1974, at Virginia Falls.

Rusty Blackbird - *Euphagus carolinus*

This species was seen twice during the period of investigations. Observation dates were 3 August 1974 at Virginia Falls and 28 June 1975 at Rabbitkettle Lake.

Brown-headed Cowbird - *Molothrus ater*

Cowbirds were seen twice, 18 June and 7 July 1975 at Rabbitkettle Lake. Both birds observed were males.

Western Tanager - *Piranga ludoviciana*

The bird was seen only at Nahanni Hotsprings. Dates of observation were 4 July 1974, 12 June, 13 June and 14 June 1975. A pair could well have been nesting in the area.

Pine Grosbeak - *Pinicola enucleator*

A rare summer resident in Nahanni National Park. On 29 June 1975, one female was seen near Rabbitkettle Lake.

Gray-crowned Rosy Finch - *Leucosticte tephrocotis*

Common in the Tlogotsho Plateau. These birds were seen on 10 July 1974 in the alpine area.

Common Redpoll - *Acanthis flammea*

An uncommon summer resident the redpoll was seen only on two occasions, on 21 June and 28 June 1975. On both occasions both a male and a female bird were seen, but they seemed to be transient. The sightings were made in the burn areas to the southwest of Rabbitkettle Lake.

Pine Siskin - *Spinus pinus*

Seen occasionally within the park in small flocks, usually in tree tops. These birds were noted at Rabbitkettle Hotsprings on 17 June 1974 and 12 June, 13 June, 15 June, 1975 in the same area.

White-winged Crossbill - *Loxia leucoptera*

An uncommon summer resident, the White-winged crossbill was seen on three separate occasions. On 29 June, 1 July and 6 July, there were large flocks of 20 or more birds. Adults, females, and males, and immature, were seen feeding on spruce cones and willow catkins at the west end of Rabbitkettle Lake. Flocks often identified as "fringillids" but not as to species could well have been white-winged crossbills.

Savannah Sparrow* - *Passerculus sandwichensis*

A rather rare sparrow in the Nahanni, the savannah was seen in only one location at Rabbitkettle Lake. On 27 June 1975, a nest of the savannah sparrow was found in an open grassland area. The nest contained four newly hatched young. Both adults were seen at close range and identification was positive. The nest was typical of the open field ground nesting sparrows being tucked in a hollow in the open sedges and grasses.

Vesper Sparrow - *Pooecetes gramineus*

A bird which almost certainly was this species (awaits confirmation) was seen on 7 July 1974 on the floodplain at Prairie Creek. If this is confirmed it would be a considerable range extension (Godfrey, 1966)

Slate-colored Junco* - *Junco hyemalis*

A common summer resident of the park. On 13 June 1975, a nest with four young was found at Nahanni Hotsprings. At Rabbitkettle Lake a nest was found in a clump of sedges which contained three young.

Tree Sparrow - *Spizella arborea*

This species probably is very common in the subalpine area. Because most of the field work was, by necessity, carried out at lower elevations it was encountered only once, the date being 27 July 1974 on Mt. Sunblood. Tree sparrows were common in the scrub birch zone and behaved as if they were nesting in that region.

Chipping Sparrow* - *Spizella passerina*

Chipping sparrows were also common summer residents throughout the park. On 21 June 1975, a bird was seen carrying food to a nest the precise location of which could not be determined. On 24 June 1975, at the southwest end of Rabbitkettle Lake, a nest containing four eggs was found. The nest was in a small spruce area.

White-crowned Sparrow* - *Zonotrichia leucophrys*

An uncommon summer resident at Nahanni Hotsprings area. White-crowned sparrows were seen once in 1974 on 7 July 1974 and on 14 June 1975 at this location. The species was more abundant at Rabbitkettle Lake and

was a very common summer resident there. Individuals were seen every day in every habitat type but mainly in the burn areas. A nest with four young was found on the 19 June 1975. On 20 June, another nest with two young and two eggs was found under a willow clump near one of the ponds to the south of Rabbitkettle Lake. Three other nests were found along the shore of Rabbitkettle Lake. These were found on 26 June with two eggs, on 2 July with three eggs and on 4 July with four young.

Golden-crowned Sparrow* - *Zonotrichia atricapilla*

A golden-crowned sparrow was seen feeding two young on 10 July 1974 along the treeline on Mt. Sunblood. This is a new breeding record for the Northwest Territories.

White-throated Sparrow - *Zonotrichia albicollis*

The species was seen at Nahanni Hotsprings on 25 June, 26 June, and 2 July 1974. The species was also recorded for Prairie Creek on 7 July.

Lincoln's Sparrow - *Melospiza lincolni*

This sparrow is a common summer resident in the park. It was seen at Virginia Falls on 26 July 1974. Furthermore, it was seen at Nahanni Hotsprings 13 June and 15 June. On 24 June 1975, a nest with four eggs was found on the south side of Rabbitkettle Lake. Another nest was found on an island in the Nahanni River near Rabbitkettle Lake.

Song Sparrow - *Melospiza melodia*

A bird which almost certainly was this species was seen at Virginia Falls on 31 July 1974.



APPENDIX H

Appendix H. Summary of visitor survey results (for discussion of the problems see end of part II).

Part I. Visitor background and use survey. The questionnaire was set up and analysed by Parks Canada - Socio-Economic Division, Ottawa; data was collected by Wardens (east end of the park i.e. Virginia Falls to Nahanni Butte) and CWS (Rabbitkettle Lake to Virginia Falls) in 1975

Nahanni National Park 1975 Park Use Survey - Interview Information

<u>Charter Point</u>		<u>Number of Parties/Persons</u>	
		<u>M</u>	<u>F</u>
Fort Simpson	12	24	9
Other	5	14	11
Watson Lake	3	11	9
Fort Nelson	1	2	0
Hay River	1	2	0
Yellowknife	0	0	0
	22	53	29
<u>Park Entrance Point</u>		<u>M</u>	<u>F</u>
Nahanni Butte	10	21	11
Rabbitkettle Lake	7	16	5
McMillan Lake	2	6	5
Other	2	6	0
Glacier Lake	1	4	8
Hole-in-the-Wall Lake	0	0	0
Seaplane Lake	0	0	0
	22	53	29

Appendix H, Part I (Continued)

<u>Reason for Park Trip</u>	<u>Number of Parties/Persons</u>		
		<u>M</u>	<u>F</u>
Pleasure	7	14	11
Wilderness Experience & Challenge	6	16	14
River Challenge	4	12	4
Paid Researcher	3	7	0
Photography	1	2	0
Other	1	2	0
Fishing Naturalist	0	0	0
Geologist	0	0	0
	22	53	29

<u>Reason for Total Trip</u>		<u>M</u>	<u>F</u>
Direct Pleasure	12	31	22
Direct Business	4	9	0
Nahanni as grand tour of NWT	3	3	1
Grand Tour of Western Canada	2	9	6
Grand Tour of National Parks	1	1	0
Business and Pleasure	0	0	0
Side Trip from Business	0	0	0
	22	53	29

Appendix H, Part I (Continued)

<u>Side Trips</u>			
<u>Number of Parties/Persons</u>			
		<u>M</u>	<u>F</u>
By Foot	15	39	26
None	7	14	3
By Canoe	0	0	0
	22	53	29
<u>View on Density</u>			
		<u>M</u>	<u>F</u>
Only one party per day	11	31	10
Three parties per day	4	7	6
Ten parties per day	4	9	8
Five parties per day	3	6	5
No, does not matter	0	0	0
	22	53	29
<u>Experience</u>			
		<u>M</u>	<u>F</u>
All reasonably experienced	13	31	15
Some but not all experienced	5	11	10
All highly experienced	4	11	4
	22	53	29

Appendix H, Part I (Continued)

Charter Point by Types of Craft

Craft	Charter Point				
	Fort Simpson	Watson Lake	Fort Nelson	Hay River	Other
canoe	9	4	0	0	5
rubber raft	1	2	0	0	0
motorized raft	1	0	0	0	0
motorized boat	1	0	0	0	3
unknown (i.e. not specified)	4	0	1	1	0

Type of Craft	Number of Crafts	Number of Persons	
		M	F
canoe	18	26	10
motorized boat	4	9	10
rubber raft	3	6	8
motorized raft	1	1	0
motorized canoe	0	0	0
kayak	0	0	0
other	0	0	0
craft type not specified	6	11	1
	32	53	29

Appendix H, Part I (Continued)

Park Entrance Point by Type of Craft

craft	<u>Park Entrance Point</u>				
	McMillan Lake	Rabbitkettle Lake	Glacier Lake	Nahanni Butte	Other
canoe	5	10	0	1	2
rubber raft	0	1	2	0	0
motorized raft	0	0	0	1	0
motorized boat	0	0	0	4	0
not specified (unknown)	0	0	0	5	1

EquipmentNumber of Parties/People

		<u>M</u>	<u>F</u>
Medium	9	22	19
Light	7	18	8
Heavy	<u>6</u>	<u>13</u>	<u>2</u>
	22	53	29

Knowledge on Park

<u>Knowledge on Park</u>		<u>M</u>	<u>F</u>
Friends	7	25	10
Other	7	13	5
Influence by Patterson's book	6	10	5
T.V., radio, books, magazines	2	5	9
Influence by NFB film	0	0	0
	<u>22</u>	<u>53</u>	<u>29</u>

Appendix H, Part I (Continued)

Type of Craft noted at Observation Points

Craft	Observation Point				Observation Point not specified
	Rabbitkettle Hotsprings	Virginia Falls	Nahanni Butte	Nahanni Hotsprings	
Canoe	17	1	0	0	
rubber raft	2	0	1	0	
motorized raft	1	0	0	0	
motorized boat	1	0	2	1	
Type of craft not specified					6

Note: Types of craft not observed #2 & #3: observation point not used #2.

Origin of VisitorsNumber of Parties/People

		Number of Parties/People	
		M	F
Ontario	6	18	18
British Columbia	5	12	2
Alberta	5	7	6
N.W.T.	4	9	1
Quebec	1	5	4
New York State	1	2	0
	22	53	29

Appendix H, Part I (Continued)

Reason for visit by types of craft

craft	pleasure	paid researcher	<u>Reason for Visit</u>			
			wilderness experience and challenge	river challenge	photography	other
canoe	1	1	9	7	0	0
rubber raft	0	1	2	0	0	0
motorized raft	0	1	0	0	0	0
motorized boat	3	0	0	0	1	0
unknown (ie. not specified)	3	1	0	1	0	1

Length of Stay by Type of Craft

craft	<u>Length of Stay</u>			
	up to 1 week 3 - 6 days	up to 2 weeks 8 - 14 days	up to 3 weeks 17 - 21 days	4 weeks & longer 28 & up
canoe	5	7	4	2
rubber raft	0	2	0	1
motorized raft	0	0	0	1
motorized boat	2	2	0	0
craft not specified	1	4	0	1

Appendix H, Part 1 (Continued)

Amount of Equipment by Length of Visit

Length of Visit	<u>Amount of Equipment</u>		
	Heavy	Medium	Light
up to 1 week			
3 - 6 days	1	2	2
up to 2 weeks			
8 - 14 days	2	5	3
up to 3 weeks			
17 - 21 days	0	1	2
4 weeks and longer			
28 days +	3	1	0

Number of persons observed

Male	53
Female	29
Total	82

Duration of stay

		<u>Number of Parties/Number of Persons</u>	
		M	F
up to 2 weeks	8-14 days	10	27
up to 1 week	3-6 days	5	12
4 weeks and longer	(28 days and up)	4	8
up to 3 weeks	15-21 days	3	6
		22	53
			29

Appendix H, Part II: Resources section (questionnaire set up by CWS;
data collected by Wardens and CWS and analysed by
CWS.)

- A. Have you seen any wildlife along the river? What kind? Where?
 - B. Would you like to see resource interpretation programs?
What kind?
 - C. Do you belong to any outdoor, parks or nature organizations?
 - D. Would you like to see organized canoe oriented campsites along the
route or camp anywhere, recognizing the problems that it creates with
a large number of visitors coming to the park?
 - E. Do you prefer to have descriptive signs along the river for travel
and/or interpretation?
 - F. What is your attitude towards motorized craft on the river?
(exclusive of official craft)
 - G. What is your attitude toward aircraft over the park?
 - H. Did you see any nighthawks on your trip?
-

Appendix H, Part II (Continued)

Question A

<u>Serial No.</u>	<u>Animals</u>	<u>Where</u>
001	Bat	Cave entrance Grotte Valerie
002	Moose, Goat	-
006	3 Dall Sheep	Tlogotsho
007	Cow Moose and calf	Broken Skull Creek
011	2 cow Moose variety of birds (listed below) Bald eagles, Robins, Ravens, U.I. Ducks; Pintail, Mallard, Lesser Scaup, W.W. Crossbills, Nighthawks, Kestrels, W. Crowned Sparrows, Kingfisher, Spotted Sandpipers, Tree Swallows, Cliff Swallows, Spruce Grouse, Gray Jays; Chickadees, Mew Gull, Bonaparte's Gulls; Migratory shore birds, semi-palmeted Plover. (This group was with Federation of Ontario on a trip with Naturalist Guides - interviewed at the start of their trip.)	West boundary along river
012	Common Loon, Horned Grebes Red-throated Loons	Rabbitkettle Lake
013	Bear Wolves (family group - 3 animals)	Rabbitkettle Lake Virginia Falls
204	Cow and calf moose, Bald Eagle	Along the river
601	Cow Moose; 3 Dall Sheep	Along the river
602	Dall Sheep (6)	Along the river
603	21 Dall Sheep; 1 Bald Eagle 1 Golden Eagle; 4 Moose	Along the river
604	1 Black Bear	Along the river.

The above is a sample only as many visitors, particularly travelling on motorized craft up to Virginia Falls did not respond to these specific questions as Part I was emphasized. This is largely due to the way interviewers handled the interview (see discussion).

Appendix H, Part II (Continued)

Question B

No resource interpretation	-	5 ¹
Yes - no elaboration	-	7
Yes - resource person (naturalist)	-	4
- checklist for birds and plants	-	1
- pamphlets	-	3

Question C

Not members in club	-	11
Yes - members in 1, 2 or 3 clubs	-	9
Clubs - Canadian Nature Federation	-	5
- Federation of Ontario Naturalists	-	2
- Forest Management Institute	-	1
- Boone and Crockett Club	-	1

Question D

Organized i.e. controlled canoeists		
campsites desirable		
- now	-	8
- in future, as pressure increases	-	5
- camp anywhere	-	7

¹ All numbers refer to parties i.e. responses as reflected by the party spokes-person.

Appendix H, Part II (Continued)

Question E

Yes - have signs	-	1
Yes - only a few signs (rapids etc.)	-	1
No signs	-	7

Question F

Yes - in favour of motorized craft	-	8
No - keep motorized craft off the river	-	12

Question G

Aircraft should be allowed for controlled access only	-	14
Aircraft alright (no harm)	-	6

Question H

Yes, saw nighthawks	-	9
No - what is a nighthawk?	-	3
Question not asked	-	8

DISCUSSION

This questionnaire (Parts I and II) gives useful insight into the backgrounds and desires of the visitors.

The original intention was to have a very rigid sampling procedure; that is one which could be replicated in the future. This meant (1) to have an observer established at the river bank at all times (2) have all observers stationed at one location. Because of other duties the above was not possible, and the sampling effort was less rigid.

Appendix H. Part II. (Continued)

Visitor attitudes can predictably change a lot from the time they set out on their trip to the time that they had completed the journey. For example, the need for interpretive literature on specific resources may be less desired initially when the visitors set out on their journey, but becomes more important as questions come to mind while they experience the park. Similarly, attitudes towards established campsites versus camping anywhere, can change.

This questionnaire includes responses from visitors at various stages of their trip. The analyses does not take that fact into consideration. Various interviewers placed different emphasis on the more subjective portion, i.e. Part II than others. Hence not all questions were covered equally thoroughly.

Appendix H. Part III

Human activity as recorded by C.W.S. field party in Nahanni National Park during the summer 1974.

Kraus' hotsprings

- June 20 - 2 canoeists from Tungsten
- June 22 - 1 scow with 3 students going upstream
- June 27 - 4 speleologists on rubber raft from Rabbitkettle
- June 29 - 2 jetboats (15 people) from Nahanni Butte
- July 3 - 2 jetboats returned from the falls
- July 4 - 1 jetboat from Nahanni Butte
- July 5 - 1 scow with tourists from Nahanni Butte
- July 6 - 1 airplane with Readers Digest reporters
- July 6 - 4 speleologists on jetboat from Nahanni Butte
- July 6 - 1 scow from Virginia Falls
- July 8 - 1 scow from Nahanni Butte
- July 8 - Canoeists lining upriver
- July 9 - Forestry helicopter with personnel
- July 9 - Parks scow
- July 12 - Water Resources helicopter in from Simpson
- July 14 - Highways helicopter
- July 14 - 7 canoeists - 2 canoes
- July 18 - 6 tourists by airplane
- July 18 - 3 kayakers
- 4 canoeists

Appendix H. Part 111 (Continued)

Many individuals seen at Virginia Falls 20 July ~ 10 August, were again met subsequently at Kraus' hotsprings. These are not listed below.

August 16 - 2 individuals travelling in a motorized Zodiac

August 18 - 8 from Rabbitkettle. Six floated downriver in a Zodiac,
2 in a canoe

August 19 - 4 people going upriver from Nahanni Butte in a scow

Virginia Falls

July 20 - 4 canoeists from Rabbitkettle

July 22 - 1 jetboat (4 tourists)

July 22 - Forestry plane in twice

July 22 - 3 students on scow

July 26 - 2 rubber rafts (10 people) from Rabbitkettle

July 29 - 2 canoeists from "Moose ponds"

July 30 - 4 canoeists, point of departure unknown

August 1 - 2 canoeists, point of departure unknown

August 1 - 2 kayakers, point of departure unknown

August 4 - Canada Council plane - photographers

August 5 - 4 canoeists from Glacier Lake

August 7 - 4 canoeists, point of departure unknown

August 8 - 8 canoeists began trip from "Moose ponds"

August 9 - 9 canoeists began trip from "Moose ponds"

August 9 - 2 canoeists began trip from Rabbitkettle

Appendix H. Part III (Continued)

August 9 - 4 canoeists began trip from "Moose ponds"

August 10 - 8 people on 2 rubber rafts from Rabbitkettle

This list does not include Parks or CWS aircraft flights into and out of the Hotsprings and Virginia Falls areas. It also does not include the numerous flights (helicopter and fixed wing aircraft) heard overhead (averaged about 3 - 4 per day).

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C32
1976

Description of the wildlife
component for impact
assessment at three
potential campsite
locations in Nahanni

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