42625

National Library of Canada
Canadian Theses Division
Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada
Division des thèses canadiennes

PERMISSION TO MICROFILM — AUTORISATION DE MICROFILMER

• Please print or type — Écrire en lettres moulées ou dactylographier

Full Name of Author — Nom complet de l'auteur

Louis Joel Zivot

Date of Birth — Date de naissance

MAY 4 1953

Country of Birth — Lieu de naissance

Canada

Permanent Address — Résidence fixe

14312 90A AVE
Edmonton, Alberta

Title of Thesis — Titre de la thèse

Management Issues Pertaining to the use of Northern National Parks: A CASE STUDY OF THE NORTHERN YUKON

University — Université

University of Alberta

Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée

Master of Science

Year this degree conferred — Année d'obtention de ce grade

1979

Name of Supervisor — Nom du directeur de thèse

Dr. J. W. Thorsell

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

Date

Oct 19/79

Signature

National Library of Canada

Cataloguing Branch
Canadian Theses Division

Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada

Direction du catalogage
Division des thèses canadiennes

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us a poor photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de mauvaise qualité.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

NL-339 (3/77)

THE UNIVERSITY OF ALBERTA

MANAGEMENT ISSUES PERTAINING TO THE USE OF NORTHERN NATIONAL PARKS: A CASE STUDY OF THE NORTHERN YUKON

by

Louis J. Zivot

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

DEPARTMENT OF FOREST SCIENCE

EDMONTON, ALBERTA

Fall 1979

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled MANAGEMENT ISSUES PERTAINING TO THE USE OF NORTHERN NATIONAL PARKS: A CASE STUDY OF THE NORTHERN YUKON submitted by Louis J. Zivot in partial fulfilment of the requirements for the degree of MASTER OF SCIENCE.

J Thorsell
.....

Supervisor

Doug Fuller
.....

Peter Murphy
.....

C W Hunt
.....

Date 16 OCTOBER 1979
.....

Dedication

To my mother for her unfailing moral and financial support

Abstract

The purpose of this study is to examine the management issues that might arise through the use of a proposed national park in the Northern Yukon by three user groups: native people, researchers, and wilderness recreationists. Assuming the principles of biocentric management (restricting or prohibiting human use when it appears to be damaging the biological resources), the thesis considers the potential effects of the various uses on the environment and on each other to reveal possible conflicts. Secondary considerations include: (1) the proposed park's ability to support the native people's continued use of the renewable resources, to protect their cultures, and to provide them with planning and management opportunities; (2) the expectations of wilderness recreationists and their reactions to different management proposals; (3) research needs, and constraints that might be required to protect research resources and prevent conflicts with other user groups.

The available literature and information from resource experts is used to identify the biological resources and their sensitivities to disturbance. A major concern of all user groups is the Porcupine Caribou herd which spends much of its life cycle within the bounds of the proposed park. There is a need for use controls during caribou migration, calving, and wintering periods. The protection of other wildlife species may also require controls on time, area, intensity, and type of use.

Land claims documents, ethnographic literature, and harvest information, are used to examine the native-land relationship: what lands are used, when, for what purposes? At present, native use is confined to a small resource hinterland around the village. The ease of access to resources, modern weapons, and a different perception of conservation could lead (as it has led in the past) to the depletion of renewable resources. Local renewable resources are still the major source of food and income for many native people. However, there appears to be a decreasing ability to harvest them, due to loss of skills, and a general lack of interest in subsistence activities, particularly among the young people. A burgeoning population, the erosion of the cultural underpinnings of subsistence, the inability of the population to provide food, the lack of wage employment, and political developments associated with land claims may result in new patterns of resource use and new considerations for park managers.

Research will be required to ensure effective management of the Northern Yukon. Research has the potential for disturbing the environment, and can have social impact on other user groups. There is a need for educating researchers as to their impacts and to define more rigorously methods of research.

A survey of recreationists was conducted in 1976 by Renewable Resources Consulting in the adjacent Alaska Arctic

National Wildlife Range(ANWR). The questionnaires were analysed as part of this study. The user of the ANWR appears to fit the description of the "purist" as defined by research done in southern wilderness areas. The arctic recreationist appears to regard the arctic as the last frontier. He expects to be among the first persons to explore the area; finding any evidence of man disrupts the experience. Most wilderness users perceive the area as crowded if they see even one other party, whereas in southern areas meeting 4 to 5 parties a day is often acceptable. Access to northern parks is principally by aircraft which can be very disruptive of the wilderness experience. People do not want to see aircraft frequently in the wilderness; once a week may be permissible.

Freedom is an important element of the wilderness experience and most users surveyed were highly opposed to restrictions on the timing and location of their trip.

The major conclusion from the survey is that the area has a very low social carrying capacity, one that is in all liklihood lower than the ecological carrying capacity. Therefore if the area is managed to protect the experience it will also serve to protect the environment. Lastly the thesis discusses a number of ways, using both direct and indirect management methods, in which this can be achieved.

Acknowledgements

I wish to thank my supervisor, Dr. J.W. Thorsell for his assistance throughout the course of this study.

I also wish to thank Professor P.J. Murphy, Dr. W.A. Fuller, and Professor Connie Hunt for their editorial comments and helpful discussion. I am also grateful to Gordon Harvey and Ross Hodgetts for the time they spent reviewing the manuscript.

The staffs of the Boreal Institute and the Yukon Archives have assisted me greatly in finding research materials.

Thanks are also due to Renewable Resources Consulting for permitting me to analyse their questionnaire.

I would especially like to acknowledge the Canadian Arctic Resources Committee for providing the opportunity and funds with which to do this research.

Table of Contents

List of Tables

List of Figures

1. INTRODUCTION AND OBJECTIVES

1.1 Introduction

> The term "wilderness area" must mean more than land not yet required for other purposes, as so often applies today(Marsh 1969).

In the past decade a number of significant steps have been taken to create a system of conservation lands in Northern Canada. Three national parks reserves have been created, 71 International Biological Program sites proposed, 24 potential wild rivers inventoried, and two territorial park systems initiated(Thorsell and Zivot 1979).

An additional step was taken in January, 1978 by the Minister responsible for National Parks, the Honourable J. Hugh Faulkner. Mr. Faulkner announced his Department's intention to study the feasibility of five national wilderness parks and a national landmark(Pingos of Tuktoyaktuk) in the Territories(Parks Canada 1978a). These areas are located at Bathhurst Inlet, at Wager Bay, on Banks Island, on Ellesmere Island, and in the Northern Yukon. The total area under consideration is 90,000km². This would represent a considerable increase to the 125,000km² already in Canada's national park system. If all five wilderness parks are established as they are now proposed, over two thirds of Canada's acreage in the national park system will exist north of 60°.

This thesis will concern itself with the most advanced of the five proposals, the Northern Yukon. On July 6, 1978

Mr. Faulkner used the Territorial Lands Act to withdraw from further disposition all Yukon land north of the Porcupine and Bell Rivers(38,000km², Figure 1) in part for the creation of Canada's first "National Wilderness Park"(Parks Canada 1978b). [1]

The general purpose of this study is to examine the user groups of the Northern Yukon within the context of a land-use model that emphasises biocentricity. This model is presented in Figure 2. The biocentric approach as appropriate to National Parks emphasizes, "the natural integrity of wilderness ecosystems, at the expense of recreational and other human use, if the two conflict"(Hendee and Stankey 1973). The fundamental guidelines are thus that wilderness parks, by definition, have a low carrying capacity and that public use must comply in nature and location, to critical periods of biological cycles.

> Not all national parks are the same. In remote or northern areas potential national parks may be identified which are the homeland of people who have traditionally depended on the land and its resources for their survival. Their culture reflects this fundamental relationship. In certain cases, lands which have been traditionally used by native people

---

[1] In May 1979 Parks Canada issued a new policy statement(Parks Canada 1979). This recent document no longer recongnizes National Wilderness Parks as a distinct entity. Instead the northern areas identified by Parks Canada will be incorporated into the present system of national parks. They will, however, include only zone 1 --Special Preservation, and zone 2 --Wilderness. Parks Canada still recognizes the needs of native subsistence and recognizes the unique relationship of the native and the renewable resources. As such the user groups of these areas remain as identified in this thesis. Concomitantly, so do the management issues.

Figure 1

The Northern Yukon

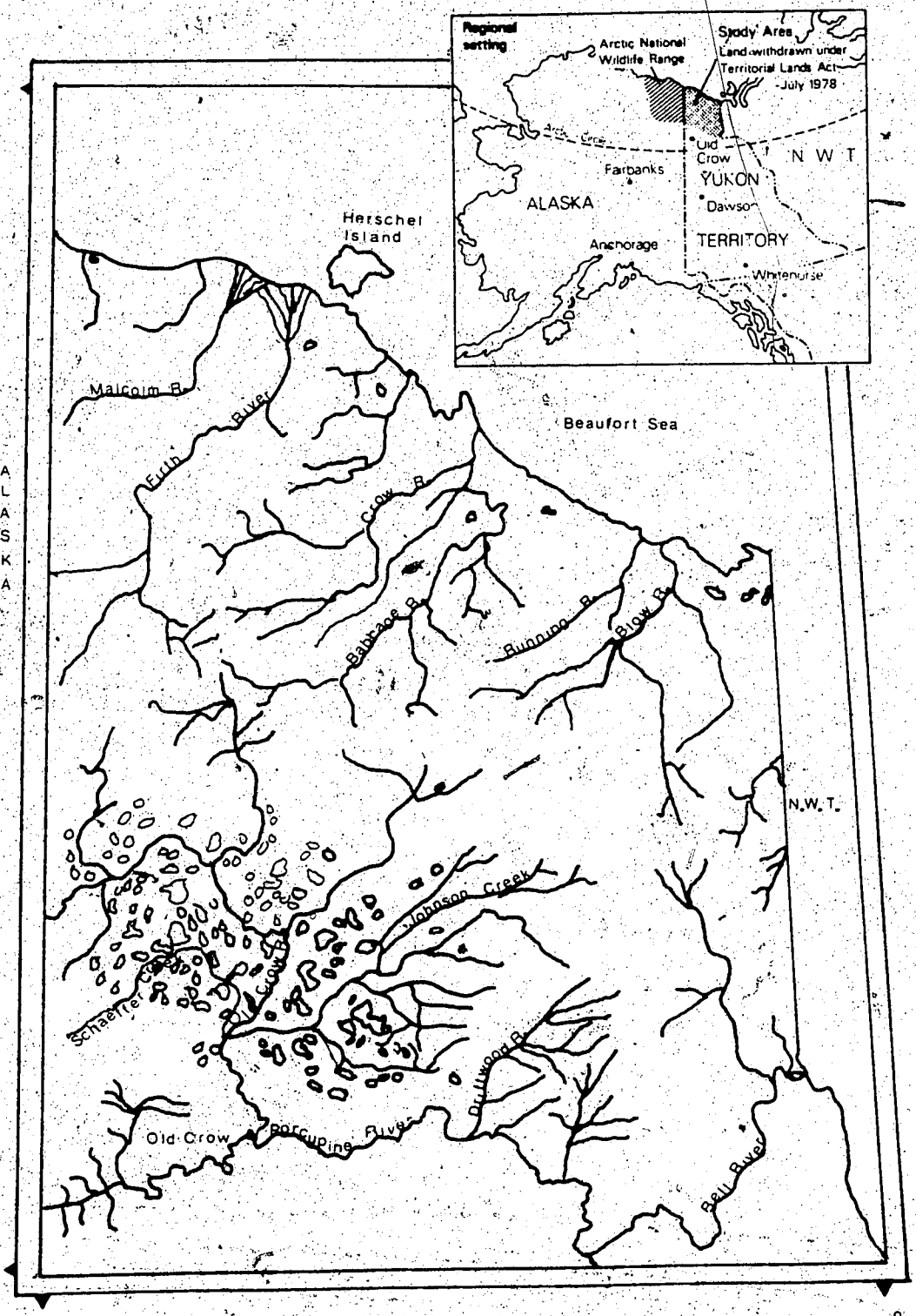
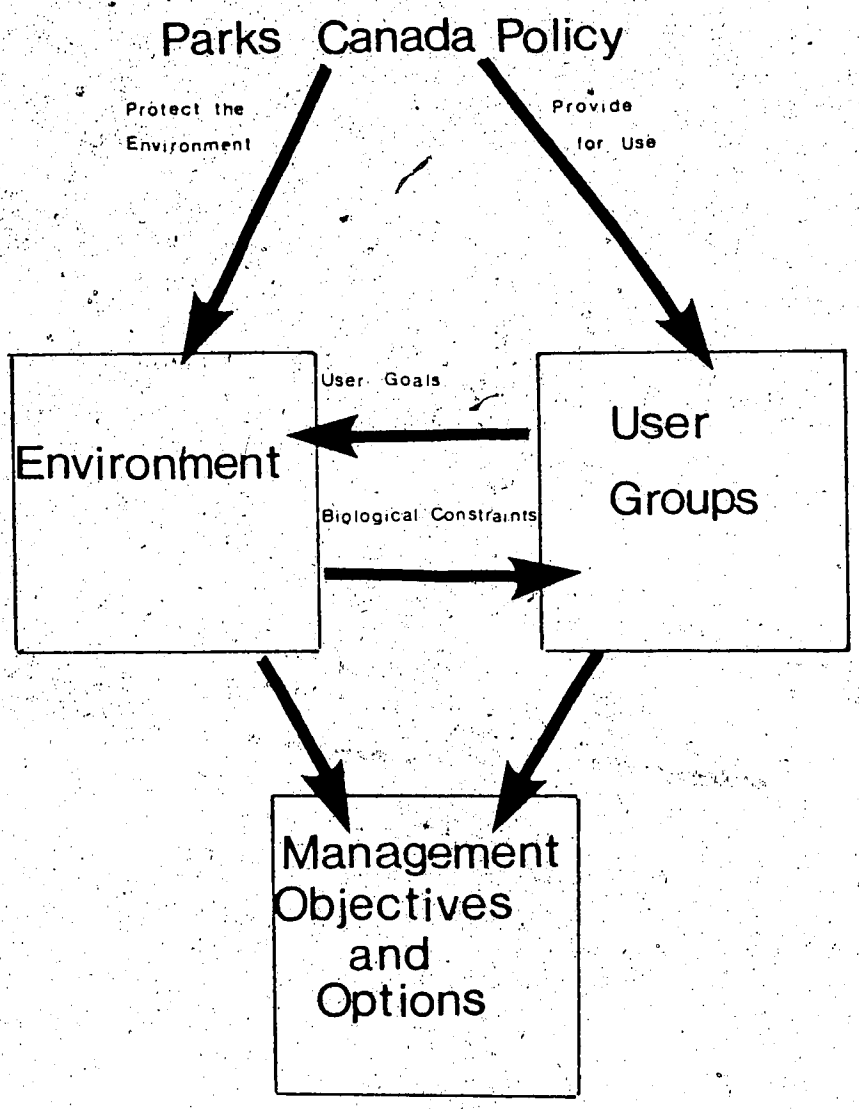


Figure 2
Biocentric Planning Approach



> are the subject of unresolved native land claims. If such areas are to be protected within the national parks system, they must be planned and managed in a way which reflects these special circumstances.
>
> ...An apropriate balance must be maintained between the rights of the public to understand and enjoy Canada's natural heritage, the rights of local people to continue certain traditional uses and the requirement to protect the wilderness of the area. (Parks Canada 1979)

Parks Canada's draft policy (1978c) originally outlined the purposes and uses of National Wilderness Parks: native use, low density recreation, and park-related research. [2] The relationships of these user groups with each other and the environment will depend upon the degree of commonality in their objectives, the intensity of use, and the degree to which park policy considers and directs the users. The draft policy (1978c) included the following statements on park use.

> Protection
>
> Appropriate legislation would be required for national wilderness parks to ensure exclusion of all activities inconsistent with the preservation of the wilderness character of the landscape and its natural and cultural values.
>
> Public Use, Understanding and Enjoyment
>
> Local people would be guaranteed the right to continue traditional subsistence resource uses within parts of national wilderness parks where they have traditionally done so on a subsistence basis, subject to the requirement to protect the ecosystems and to maintain viable populations of wildlife species.

---

[2] An important user of Northern National Parks, not discussed in this thesis, will be the non-using public. Their use will consist of the vicarious visit to these northern parks through films, books and the stories of those who have been there. The knowledge that these areas exist and that they protect Canada's northern ecosystems will be sufficient to solicit the concerns and backing of the general public.

National wilderness parks would be planned and managed to provide a wilderness experience for park visitors.

Visitor activities would be permitted which are compatible with a park's natural and cultural resources and require no man-made facilities or motorized transportation.

Research

Parks Canada will conduct and encourage research for the identification, protection, understanding, and use of Canada's heritage resources.

With the specific uses for northern parks defined it becomes necessary to examine the possible impacts of these uses on the biological resources.

Each of the aforementioned uses depends on the quality of the biological environment; goals must be formulated to ensure the perpetual quality of the biological resources and consequently the derived opportunities.

Park planning, as with all land-use decision making must consider the ecological component of the land base, the ethnological characteristics of the land users, and the economic benefits and costs derived from the use of that land (Firey 1960).

1. Ecological Component

Are the proposed set of land uses compatible with the ecological processes in that area? Or, can the biological resources sustain the consequences of use? If yes, how much use?

To answer these questions it will be necessary to identify the scope and nature of the permitted uses. In the case of natives, this will prove a difficult task,

as past, present, and future patterns of use are different. Land claims, and their consequences may present new resource patterns that will make new demands on the land base. It will thus be necessary to examine past and present land-use patterns and their effects on the environment if we hope to make some statement about the future.

For recreationists, the permitted uses can be more rigorously defined. It will be necessary to identify areas and times that will be attractive to recreationists and conducive to the permitted activities. This information must then be placed into the context of potential impacts on the biota and on other users.

The examination of park use by researchers will be a secondary topic of this study. The types of research carried out in arctic parks will be determined in part by the gaps in the present resource information. Identifying these gaps will reveal the nature of the required research and the potential uses of and impacts on the land base. Many research projects have already been carried out in the area and several more are currently underway(see Hanna and Thorsell 1979). An examination of the effect of researchers on the environment and other users may indicate the type of management required to minimize impacts, and protect the very resources they are studying.

2. Ethnological Component

What resource-use patterns characterize the people or culture utilizing the land? What is the set of culturally acceptable uses for the land base?

It is essential to understand the user and his patterns of resource use. Culture determines how the people use and value the resources(Firey 1960). Management alternatives are often inappropriate with the user's cultural expectations.

Native cultures of the past are fairly well defined, those of the present are in a state of flux. A number of exogenous variables that are having an impact on native cultures and may result in new patterns of resource use must be considered.

In the context of this thesis recreationists and researchers will be considered to have their own culture, that is their own concepts of appropriate land use. These may be referred to as the "wilderness recreationist culture" and the "researcher culture". The task will be first to determine if there is an identifiable "culture" shared by northern wilderness users, then to attempt to define the set of activities that is culturally acceptable. For example, would the construction of an interpretive centre in a wilderness park be compatible with the recreationists conception of wilderness?

3. Economic Component

What are the benefits and costs to the user groups as a result of a planning decision?

The economic component in this instance can be considered of lesser importance for recreationists and researchers, except in terms of the economic costs incurred in the pursuit of their activity, and the imputed value of the experience and opportunities. For the native, however, the park must be considered in terms of the benefits and costs they incur as a result of a land-use decision. This involves examining the degree of economic reliance upon those lands chosen as national parks.

This thesis will examine land use within the bounds of the above three components: ecological, ethnographic, and economic. Information on these components has come largely through the review of available literature. A major function of this research is to interpret the ecological, ethnographic, and economic literature and adapt it to a park planning context.

A field trip to the study area was made during June and July 1978. The main purposes of this trip were to view first hand the terrain of the Northern Yukon so as to gain some insight into its limitations for recreational use, and to visit two northern communities Inuvik, and Whitehorse(headquarters for the Committee for the Original Peoples Entitlement(COPE) and the Council for Yukon Indians(CYI) respectively) to consult

with native groups, civil servants employed by the territorial and federal governments, and other resource people.

1.2 Methodology and Objectives

1.2.1 Statement of Objectives

The overall objective is to demonstrate the need for a planning process that places a higher priority on the safekeeping of the resources than on providing opportunities for use. The following objectives will be specifically addressed through the Northern Yukon case.

1. Identify the biological resources and their limitations for sustaining use.
2. Assess the relationship of the native user to the land: past, present, and future.
3. Examine the recreationist's concept of the appropriate use of an arctic wilderness park.
4. Assess future research needs, and the researcher's association with the resources.
5. Identify management issues and options from the perspective of the three user groups, and suggest means for the integration of their uses of Arctic National Parks.

1.2.2 Objective I

Identify the biological resources and their limitations for sustaining use.

The purpose of this section was to use the available resource infomation to describe and locate the biological resources of the Northern Yukon. The biophysical attributes

of the Northern Yukon have been examined rather extensively by pipeline studies, the International Biological Program, Environment Canada, Territorial Parks, Canadian and Territorial Wildlife Services, and many other agencies(see Hanna and Thorsell 1979).

This section also concerns itself with the sensitivity of the resources to human uses and to identifying where and when possible impacts might occur. This has involved examining the status of the wildlife populations, and the extent to which these resources are used or will be used by the various user groups.

Interpretation of the resource data was aided by consulting resource experts in a variety of fields. Researchers were contacted in person in Inuvik, Whitehorse, Edmonton, Calgary, and Vancouver. Many others were contacted by telephone and letter(Appendix I). All major government departments(Federal and Territorial) were visited and most provided some relevant information. Constant contact was maintained with resource people in the Northwest Territories through their information officer in Edmonton.

1.2.3 Objective II

Assess the relationship of the native user to the land; past, present and future

This section of the research synthesizes the available information on native land use in the Northern Yukon. The focus is on the native people who use the area of the Northern Yukon north of the Porcupine and Bell Rivers: the

Inuvialuit and Indian people of the Lower Mackenzie Valley villages of Inuvik, Aklavik, Fort McPherson, and Arctic Red River, the Indian people of Old Crow, Yukon, and the Inuit people of Kaktovik, Alaska.

The native people of this region have been subjected to numerous questionnaires and hearings. The obtrusiveness of the data-gathering techniques and the dispersed nature of this population restricted direct contact with individuals. However, thanks to the Mackenzie Valley pipeline proposal, associated commissions, and native land claims, information pertinent to the questions can be gleaned from secondary sources.

There has as yet been little research on native subsistence lifestyles in Canada, and much of the information used was collected through correspondence with researchers in Alaska who have done extensive work on the subject. The Anthropology Section of the Co-operative Parks Unit at the University of Alaska has provided numerous research materials. Various studies done in Canada, ethnographic, historic, economic, and social also provided information. Land Claims documents for COPE and draft documents by CYI were subjected to content analysis to obtain an idea of native goals for development and over-all land use.

Interviews were conducted with representatives of the Native Organizations. Sam Raddi president of COPE was consulted in Inuvik, and Joe Jack, then representing CYI,

was interviewed in Whitehorse. Other representatives of COPE and CYI were interviewed in Edmonton on two separate occasions during promotional campaigns for native land claims.

Letters were sent to all native groups in Canada and Alaska that live adjacent to northern national parks. (Appendix II). Letters were also sent to representatives of the native organizations. Unfortunately the response to these letters was nil.

The assembled information was used to determine the extent of present day land use in the Northern Yukon. It included a survey of those land areas that are used by native people, the periods of use, and the frequency. The research has also attempted to outline the specific uses that occur in each area (eg. what animals are harvested, and where). To understand fully the native's dependence on subsistence it was also necessary to examine native use in economic terms. This was accomplished by calculating the imputed values of local renewable resources.

Information was also gathered concerning the native's relationship with the resources. This involved an assessment of the impact of native use on the biological resources. Included in the assessment was information on the numbers and species harvested, harvesting trends, and harvesting methods. This examination can help determine the potential for reducing resource stocks, and help suggest means and controls to protect the resources.

National parks present new opportunities for native people. The research examines the ways and means of involving natives in park management and associated activities. Finally this section uses the accumulated information to predict possible futures of the subsistence lifestyle and native use of park lands.

1.2.4 Objective III

Examine the recreationist's concept of the appropriate use of an arctic wilderness park.

This section examines arctic recreationists. Ideally, recreationists in the Northern Yukon would make up this population, but there is as yet no definable recreation user population for the area. It is assumed that wilderness quality (e.g. scenic beauty, remoteness, and absence of man's influence) determines the type of recreationist, the purist seeking out the least altered environments. This assumption has allowed for the substitution of an adjacent, physiographically similar area in Alaska from which inferences have been made about potential users of the Canadian side in the Yukon. The population consists of recreationists who in 1975 and 1976 used the Alaskan Arctic National Wildlife Range (ANWR). This population was sampled by questionnaire, but the results were not analysed. For operational reasons, the present study was limited to 1976 users.

The wilderness user survey was conducted in the Arctic National Wildlife Range by Renewable Resources Consulting

Services. Postcard survey posters were distributed to 20 locations, including air taxi services, sporting goods stores, and other centres of supply and information on the Arctic National Wildlife Range. These locations were in Kaktovik, Arctic Village, Fairbanks, Fort Yukon, Anchorage and Juneau. A mailing list aquired from the postcard survey, U.S. Fish and Wildlife Service files, air taxi services, and miscellaneous sources was compiled by early December and early January(1975-1976). Confirmed users represent approximately 50% of all users of the ANWR(Ritchie and Childers 1977).

The purpose of this portion of the study was to examine the expectations of arctic wilderness recreationists and to determine their reactions to specific management options. These data were analysed using the cross tablulations program from the Statistical Package for the Social Sciences(SPSS).The Chi-square test for independence was used as a test statistic. All analysis was done using the Amdahl 470v/6 computer at the University of Alberta.

1.2.5 Objective IV

Assess future research needs, and the researcher's association with the resources.

The information provided in the previous sections has illuminated several areas that will require significant study. It has also provided a look at specific methods of research employed in the north.

The study population includes all researchers and resource personnel who have worked or are working in the Northern Yukon or are involved with related resource fields. This population is very dispersed and difficult to define. Because of limitations of time and resources not all members of this population were included. An effort was made to consult persons in a variety of resource fields.

The impacts of researchers were revealed through content analysis of community hearings documents, the questionnaire analysis and the literature produced by northern researchers.

1.2.6 Objective V

> Identify management issues and options from the perspective of the three user groups and suggest means for the integration of their uses of national wilderness parks

Discussion of the uses of the Northern Yukon will reveal how the three user groups might interact, and where and when they might interact. Following from this, methods to integrate the various uses will be discussed. The result will be to produce a spectrum of management options that provide for use within the biological constraints.

2. ECOLOGICAL COMPONENT

The following discussion of the ecological component is based on the interpretation of biophysical information. The purpose of this section is to examine the resources of the Northern Yukon and their sensitivities to disturbance. This examination will reveal possible management guidelines that could prevent or minimize disturbances to the environment

2.1 ECOREGIONS AND VEGETATION

In 1978 the Department of the Environment(DOE) completed a biophysical inventory of the Northern Yukon(Wiken et al. 1978). The area was divided into four ecoregions and 33 ecodistricts(Figure 3).

> Ecoregions represent a recognized common identity from a regional perspective. In comparison, their subunits--the ecodistricts and ecosections-- are more inclusive and less variable with respect to biological and physical land characteristics(Wiken et al. 1978).

2.1.1 Ecoregion 1. North Coastal Plain

The coastal plain is the most northerly of the four ecoregions. It is approximately 25km in width, and slopes from 305m in the northern mountains to sea level. Most of the plain is relatively flat, lakes are common, and the large deltas of the Firth and Malcolm Rivers merge in its western portion.

This area was glaciated by Laurentide ice to about the Firth River, and into the foothills to approximately 300m . The ice filled many of the foothill river valleys

Ecoregions and Ecodistricts of the Northern Yukon

Ecoregion 1. Northern Coastal Plain
1. Herschel Island
2. Komakuk Plains
3. King Plains
4. Shoalwater Bay
8. Babbage Plains
9. Running River

Ecoregion 2. Northern Mountains Ecoregion
5. Mt. Conybeare
6. Buckland Basin
7. Malcolm River
10. British Mountains
12. Joe Creek
13. Upper Trail River
25. Riggs Mountain
26. Timber Creek
27. Whitefold Hills
16. East Barn Range
17. West Barn Range
15. Blackfold Hills
18. Cottonwood Creek
14. Mount Sedgewick
11. Tulugaq Pediments
19. Blow Pass
20. Purkis Creek
21. Richardson Folds
24. Bonnet Lake
22. White Mountains
23. Bell River

Ecoregion 3. Old Crow Basin

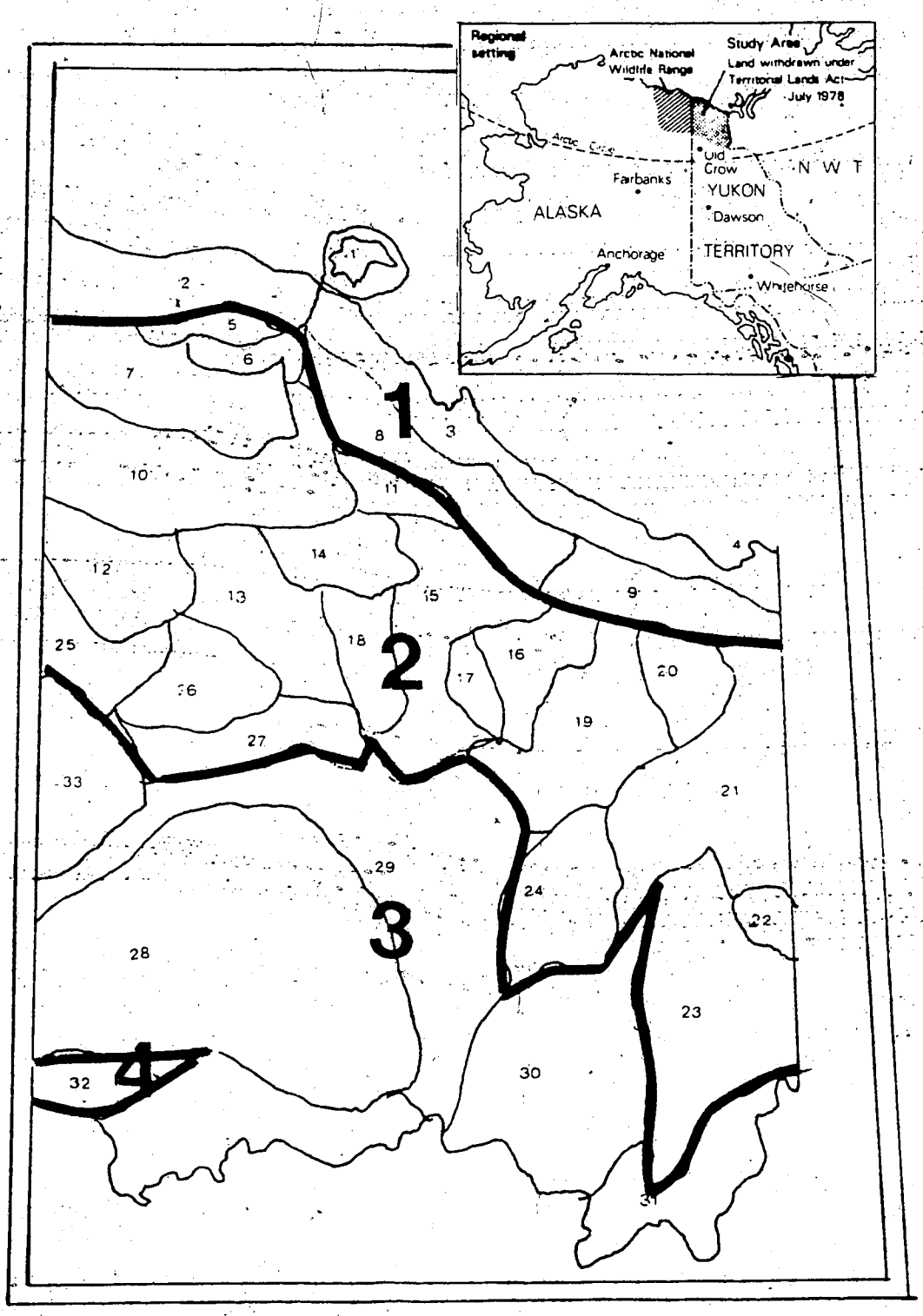
33. Thomas Creek
28. Old Crow Flats
29. Old Crow Pediments
30. Driftwood River
31. Waters River

Ecoregion 4. North Olgivie Mountains

32. Old Crow Range

Figure 3

Ecoregions and Ecodistricts of the Northern Yukon



Source: Wiken et al. 1978

including Rapid Creek, and the Blow and Babbage Rivers (Hettinger et al. 1974).

The climate of the coastal plain is influenced by the adjacent Beaufort Sea and by pack ice, which are responsible for both low summer and winter temperatures. The low temperatures prevent high levels of precipitation in all seasons. Winds from the sea and onshore frequently generate fogs and frosts during the summer months. The overall severity of the climate and shortness of summer are reflected in the soils and vegetation of this ecoregion (Wiken et al. 1978).

The DOE biophysical survey (Wiken et al. 1978) has delineated several ecodistricts within the coastal plain ecoregion. Along the coast stretch the Komakuk Plains, an unglaciated area, today under the influence of the fluvial forces of the northern mountain rivers, and the King Plains, part of the glaciated lowlands of the Yukon coastal plain (Figure 3). There are a number of terrain types in this ecoregion: alluvial fan deposits, outwash plains, glacially formed sediments, and rounded mantled slopes (Hettinger et al. 1974). Soils are poorly drained and frozen; the active layer is very shallow.

Spetzman's (1959) description of the Alaskan North Slope vegetation included six major plant communities; niggerhead meadows, wet sedge meadows, dry upland meadows, flood plain and cut-bank vegetation, outcrop and talus vegetation, and the aquatic vegetation of lakes. Spetzman identified 439

plant species in this area. In general the vegetation of the coastal plain is arctic tundra(Wiken et al. 1978). Trees are absent and though there are numerous community types the vegetation consists largely of tussock tundra dominated by Cottongrass(Eriophorum spp.) physiognomically, but by mosses on a percent cover basis. Other important plants include the dwarf shrubs and sedges(Hettinger et al. 1974).

The coastal plain with its numerous lakes, fens, and polygon systems presents a formidible barrier for recreational activities. The coastal plain is too wet for easy travel. The poorly drained organic soils, the shallow active layer, and the underlying permafrost features make this area and its associated plant communities very sensitive to disturbance(Hettinger pers. comm. 1979). The removal of vegetation, a possible consequence of hiking, would cause the soil in the denuded areas to warm, and the permafrost to melt. The result would be the eventual erosion of the arctic soil.

2.1.2 Ecoregion 2. Northern Mountains

The Northern Mountain ecoregion consists of several mountain ranges, all of particular interest as being the only extensive non-glaciated mountain systems in Canada(Barr 1972). In the northwest the British Mountains, an extension of the Alaskan Brooks range, rise to elevations nearing 1850m. Developed on sedimentary rocks, largely Mississipian limestones in the south and Hadrynian and Palaeozoics in the

north, this entire range escaped Quaternary glaciation. Fluvial processes have been the major shaping influence on the landscape. The Firth and Malcolm Rivers drain the British Mountains. The Babbage River also drains these northern mountains, and separates the British Mountains from the Barnes Range. The Blow River similarly divides the Barnes from the Richardson Mountains. The Richardson Mountains form a narrow belt on the Yukon-Northwest Territories border. They also escaped glaciation during the Pleistocene and are similarly under the shaping influences of fluvial forces. Peaks in this range reach 1500m and are formed primarily of sedimentary rocks of Mesozoic age. Rat Pass(MacDougall Pass) the lowest point on the continental divide, separates the Richardson Mountains into a northern and southern section.

The climate of the Northern Mountains is continental, with warmer summers and colder winters than the coastal plain. Weather in the mountainous regions is unpredictable. There are often prolonged periods of heavy rain in the summer, and considerable snowfall in winter.

The vegetation in the Northern Mountains is influenced by both latitude and altitude, which results in a unique mixing of arctic and alpine habitats. White Spruce(Picea glauca (Moench) Voss) reaches its northernmost extension along the Firth River(Drew and Shanks 1965). The region was delineated into 21 ecodistricts and numerous plant communities have been described(Wiken et al. 1978, Hettinger

et al. 1974). The Richardson and British Mountains are predominantly arctic/alpine tundra. The tree line lies generally at 460m to 615m on the west side of the Richardsons and the south side of the British Mountains. Plant communities of Mountain Avens(Dryas integrifolia M. Vahl), Lapland Cassiope(Cassiope tetragona (L.) D. Don) and lichens are prevalent in these mountains(Hettinger et al. 1974). At lower elevations tussocks and hummocks predominate(mainly cottongrass, carex, many heath species, and low shrubs). Along protected rivers and streams white spruce, willow, and to a lesser extent balsam poplar(Populus balsamifera L.) are found(Wiken et al. 1978). Open spruceland interspersed with shrub-heath species such as Vaccinium uliginosum L., Rhododendron lapponicum (L.) Wahlenb., and Potentilla fruticosa L. occur in the valley bottoms. Beneath this is a fairly continuous mat of Dryas and lichens. Moister sites in the valley bottoms are occupied by sedge meadows, with scattered black spruce(Picea mariana (Mill.) BSP.). String bogs occur in some locales(Barr 1972).

The Northern Mountains are spectacularly scenic, and will no doubt attract wilderness recreationists. Some of the soils and plant communities could sustain recreational use. Along the rivers, the gravels and coarsely-textured, well-drained sandy soils could withstand some trampling. The relatively hardy Dryas flats communities in these regions would sustain little damage as a result of hiking and

camping(Hettinger, pers. comm. 1979). The best areas for hiking, in terms of easy walking and minimal damage, are the already denuded game trails that follow the rivers, and the open willow communities that vegetate the gravels of the river's edge. Many of the ridges that flank the major river systems are composed of frost-shattered bedrock and other coarse materials. These areas could sustain some level of use as well. Trisetum spicatum (L.)Richt.-grass communities are also fairly resistant to trampling. Away from the rivers are the tussock and hummock Eriophorum communities. Walking is difficult over these areas and often the tops of tussocks are knocked off. More sensitive are the mosses and lichens that live between the tussocks. Many of the surrounding hills are characterized by solifluction terraces or lobes. Constructed largely of silty soils, these areas and the associated plant communities are extremely susceptible to disturbance, which could cause further slipping and erosion.

The physical conditions of the Northern Mountain ecoregion suggest that most travel will occur along the river systems. Camping adjacent to these areas could mean a proliferation of fire rings. Most vegetation types, including the Eriophorum communities respond favorably to fire, in that they are actually rejuvenated after a burn(Wein and Bliss 1973). New growth replaces the damage within two growth seasons. Lichen communities on the other hand are slow to recover and fires should not be set in them. Fires should also be kept out of areas of dwarf

birch-heath communities as they are easily ignited.

It may be necessary to educate the wilderness recreationist, so he can identify areas of high and low impact susceptibility.

2.1.3 Ecoregion 3. Old Crow Basin

The Old Crow Basin was also unglaciated. This ecoregion comprises the area between the Northern Mountains and the North Ogilvie Mountains Ecoregion.

> In preglacial times the Old Crow basin and surroundings drained southeastwards. During the Quaternary period continental glaciers moving from the Mackenzie lowlands into the Richardsons blocked the former outlet of the Old Crow region. Initially a number of pro-glacial lakes were formed the main one occupying what is now the Old Crow flats. Eventually these lakes found a new collective outlet to the west whose erosion has since created an entrenched outlet and established the present Porcupine River (Wiken et al. 1978).

The central portion of the ecoregion is the Old Crow Flats. Lying at an elevation of 300m the area consists of approximately 5180km^2 of angular lakes and ponds.

The Old Crow Basin is encircled by mountains that act as a barrier to moist air and thus affect the climate of the area. The British Mountains in the north and the Old Crow Range and Ogilvies in the south prevent the intrusion of cold arctic air in summer, and warm southern influences in winter. The summers therefore are warm and relatively dry, and the winters long and severe (Wiken et al. 1978).

Due to poor drainage, the bulk of the flats is not forested; over large areas sedge meadows with string bogs

predominate. Trees tend to be restricted to river banks and are predominantly spruce, tamarack (Larix laricina (DuRoi) K. Koch), birch (Betula sp.) and poplar (Barr 1972). Hettinger et al. (1974) describe two basic vegetation associations for the Old Crow Flats. Open evergreen microphyllous dwarf scrub, occur in relatively well-drained peat areas, they consist of labrador tea, dwarf birch, and a closed ground cover of moss and lichens. Seasonal orthophyll meadows occur on poorly-drained sites and support sedge meadow communities with a closed, dense, ground cover of mosses. Many of these communities occur on infilled lakes or wet areas surrounding and connecting existing lakes.

The Old Crow Basin is predominantly lakes and wetlands and as such will not be very attractive or conducive to recreation. The poorly-drained organic soils would be susceptible to damage, causing erosion. Erosion in this area could prove detrimental to the water systems and reduce waterfowl production.

2.1.4 Ecoregion 4. North Ogilvie Mountains

The Northern Ogilvie Mountains occupy only a small segment of that area north of the Porcupine River. This section of the Ogilvies is referred to as the Old Crow Range. It lies within the un-glaciated region of the Northern Yukon and consists largely of subdued granitic formations (Wiken et al. 1978).

The climate of this area is similar to those alpine

regions of the Northern Mountain ecoregion.

Vegetation is largely arctic tundra-boreal forest transition. Low shrubs, heath species, and cottongrass tussocks grade into open stands of white spruce taiga.

2.2 WILDLIFE

2.2.1 Porcupine Caribou Herd

The Porcupine Caribou Herd is the fourth largest herd in North America. The 110,000 animals that make up the herd represent roughly 10% of the total North American Barren Ground Caribou population(Calef 1974). One of two international herds(the other being the Forty-Mile Herd) the Porcupine herd ranges over an area of 250,000 km^2(Figure 4) from the Ogilvie Mountains in the central Yukon, north to the Arctic coast, west into Northeastern Alaska and east as far as the western foothills of the Richardson Mountains in the Northwest Territories(Alaska Highway Pipeline Panel 1978). This range is the least disturbed of any caribou range in North America(Calef 1974).

The Barren Ground Caribou[3] is a migratory species whose life cycle may be studied in seven phases. Some of the Porcupine Herd stay in the proposed park area throughout their life cycle, however most of the herd spend at least some periods in other areas of the Northern Yukon, the Northwest Territories, or Alaska. Each of the life cycle

---

[3]See Appendix III for a list of wildlife species and their scientific names

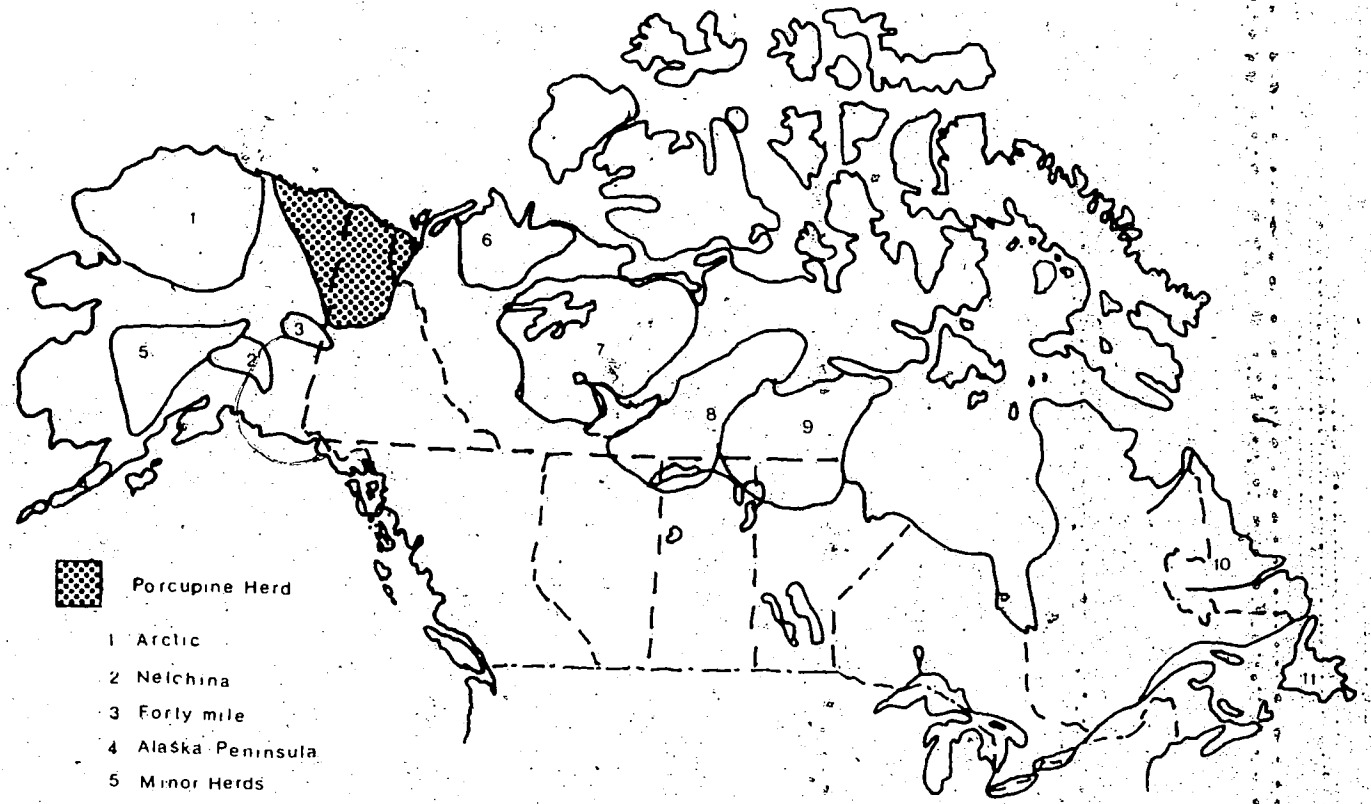
phases is spatially distinct and each suggests its own set of management implications, which are discussed below.

The commencement of the spring migration is possibly triggered by snow conditions. The caribou may begin migrating northward any time after mid-February, and continue to move northwest until mid June (Surrendi and DeBock 1976). The herd follows two major routes (Figure 5). Those animals that winter south of the Porcupine River move north, crossing the Porcupine at several traditional crossings. The caribou move through the Old Crow Flats to the Firth River Valley which they follow to their calving grounds on the coastal plain. The portion of the herd that winters near the Northwest Territories border moves north along the Richardson Mountains via Rat Pass, into the Barnes Range and finally through the British Mountains, where they join the Old Crow group on the coastal plain. Smaller sub-groups wintering in the Richardson Mountains or on the coastal plain also move towards the northwest corner of the Yukon.

During the spring migration pregnant cows have high nutritional requirements and are easily stressed. Disturbances that induce stress could lead to calf mortality and therefore affect the annual population increment (Jakimchuk et al. 1974). It is necessary to keep disruptive activities away from the migrating herds.

Calving begins in late May and continues through mid-June. The event takes place in traditional areas of the

Figure 4
Distribution of North American Caribou Herds



Source: Calef 1974

foothills and coastal plain of the Yukon and Alaska. In some years most of the herd calves in Alaska, other years, in Canada. The location of calving is thought to be where parturient cows are during spring migration at the time of parturition(Banfield 1954). The calving location would therefore depend on the time of departure and the rate of movement during the spring migration.

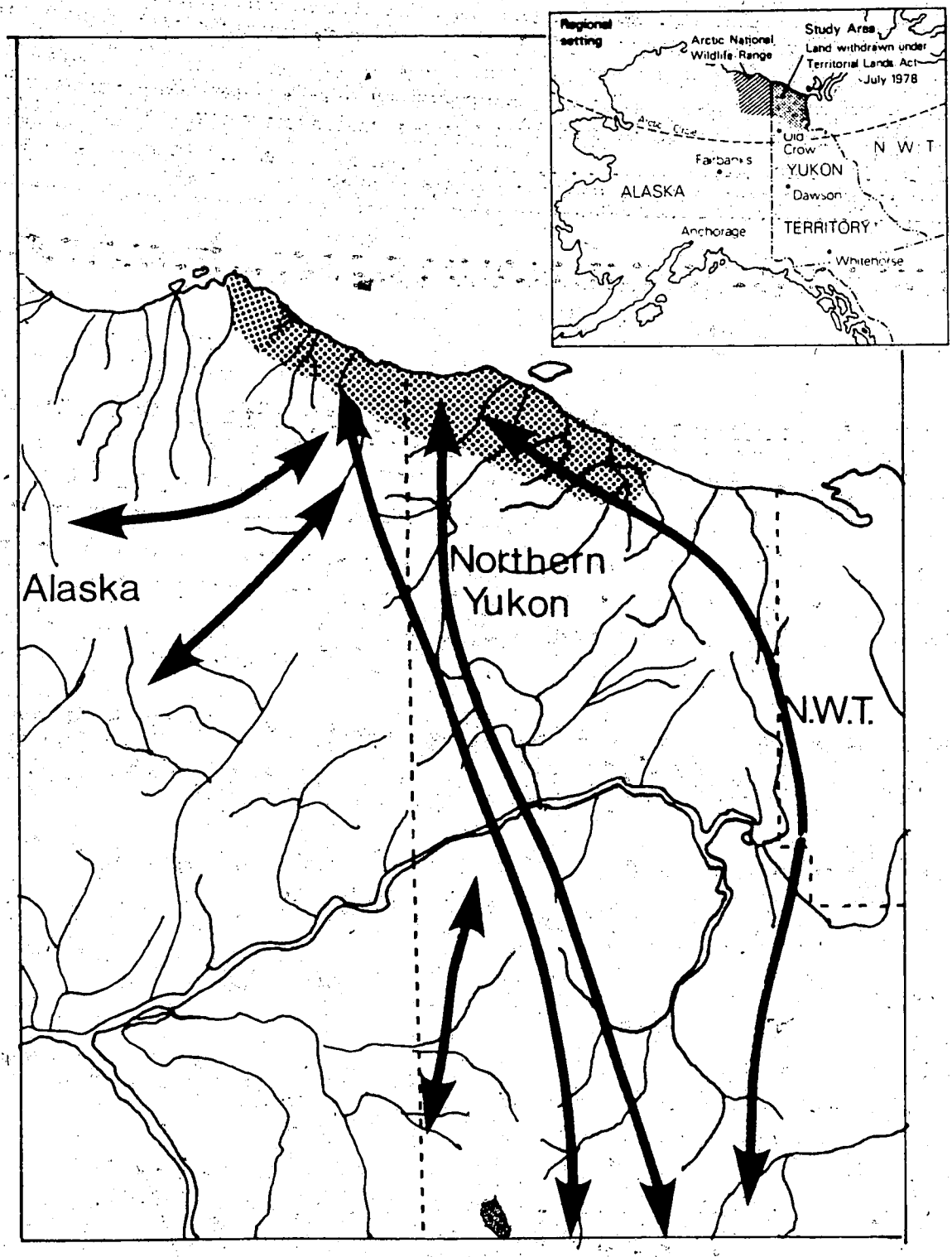
As the caribou congregate on the coast and the group size increases, they become more sensitive to disturbance(Surrendi and DeBock 1976). During the calving period(usually June 1-15) disturbance to the herd, particularly by aircraft, should be avoided(Calef 1974), and all use of the calving areas should be prohibited. Aircraft should be subject to altitudinal restrictions(600m as suggested in the ANWR Public Use Management Plan, United States Fish and Wildlife Service 1978) or diverted from the area.

In late June through mid-July the caribou congregate in large post-calving herds, which gradually move towards the east, and later disperse(Calef and Lortie 1973, Jakimchuk et al. 1974). Because the caribou remain in large aggregations they continue to be sensitive to aircraft disturbance. Calves are present in the herds, and may become separated from their mothers. This increases their susceptibility to starvation and predation.

The post-calving event, in terms of numbers is very spectacular and will be an attraction for visitors to the

Figure 5

General Migration Routes of the Porcupine Caribou Herd



Northern Yukon. Caribou can tolerate human presence if they do not come to associate man with harm (Calef 1974). This suggests that the construction of a make-shift blind at a non-disruptive vantage point could permit a small number of visitors to view this spectacle. Three suggested viewing locations are shown in Figure 6.

During late June mosquitos and warble flies harass the large herds of caribou. In response the herds move towards the coast or the tops of ridges where breezes suppress the insect hordes.

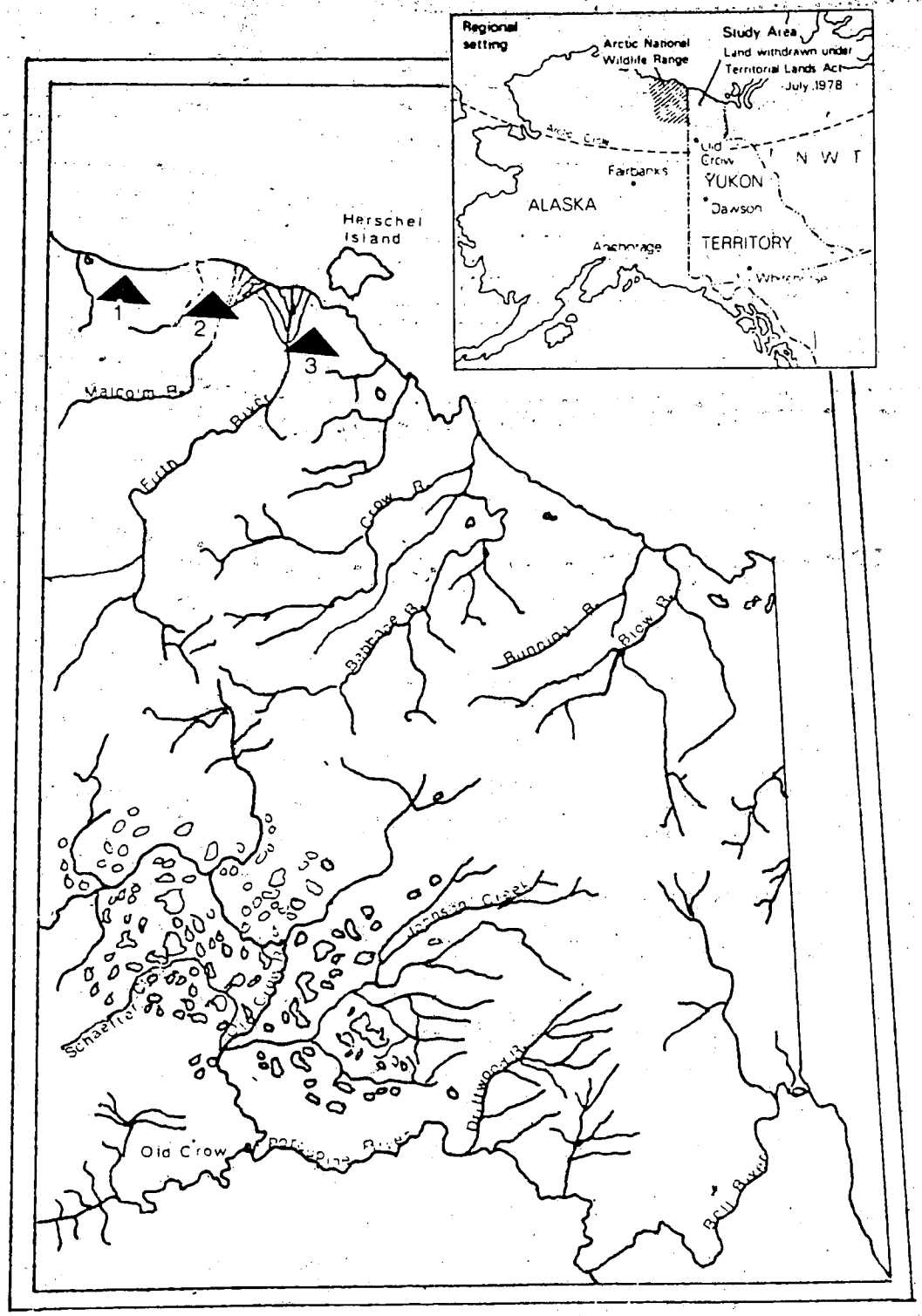
Insects place a great deal of stress on the caribou, and all other disturbances become secondary at this time. So preoccupied, the caribou are easily observed. In fact, biologists have walked with the herd during this period with no apparent disruption to the animals (Lortie pers. comm. to J.W. Thorsell 1978).

In early September, possibly in response to the first snow fall, the caribou begin their autumn migration. They return to the wintering areas, following the same major routes they used during the spring migration.

Caribou are thought to be less sensitive to disturbance at this time than during the other phases of their life-cycle. Harassment, however, could influence the cow-calf bond, that might result in the abandonment and eventual loss of some calves. Major disturbances, more likely to be encountered outside the park (e.g. Dempster Highway), could cause a shifting of migration routes and

Figure 6

Potential Locations for Viewing Caribou



1 Backhouse River

2 Mt. Conybeare

3 Engigstciak

even cause the abandonment of certain ranges (Calef 1974). Other disturbances occur in the fall when native hunters from Old Crow, Fort McPherson, Arctic Red River, Aklavik, Inuvik, and Arctic Village harvest most of their annual supply of caribou (see section 3.1).

The caribou breed in October, during the autumn migration. The location of the rut depends upon the time of departure from the coastal area and the rate of movement during migration. The rut occurs some years within the proposed park other years outside.

Caribou are sensitive to disturbance during the rut, and the public should be kept from them (Surrendi and DeBock 1976). Harassment during this period could interfere with normal reproductive behavior and affect the success of the rut. Native harvesting is usually less intense at this time as rutting animals are not highly regarded for their meat, and most have moved beyond the hunting range of the villages. The arctic climate will limit the amount of public use at this time, in any case, and direct harassment will be minimal.

Most of the Porcupine Herd winter in the Yukon's Ogilvie Mountains, south of the wilderness park. Small groups winter in Alaska and fewer winter in the Northwest Territories (Roseneau and Curatolo 1975); some also winter along the northern coast within the boundaries of the withdrawn lands (Roseneau et al. 1974). In general winter habitat in the Yukon consists of undisturbed forests of

black-spruce caribou-lichen associations. Snow depth may be a critical factor in the choice of wintering areas. Areas of little snow accumulation provide easy access to the underlying vegetation(Jakimchuk et al. 1974).

The caribou are dispersed during the winter months, the degree of dispersal seems related to snow depth, the herds being more compact in heavy snow(Calef 1974). During this period the animals must conserve energy; excessive exertion will cause them to abort or even die of exhaustion (Telfer pers. comm 1979, Geist 1975). Pursuing caribou with snowmachines is especially deleterious as it rapidly places the animal in a negative energy situation. Native people have become dependent on the snowmachine for their subsistence activities but there must be some assurance that snowmachines provide only a means of access and egress, and are not used to pursue game.

There are a number of natural controls that limit the caribou population. Besides man, wolves are the most significant predator on the Porcupine Herd. Most of the predation(up to 85%) is on calves(Calef 1979), Jakimchuk(1974) found 131 wolf kills during his survey of the Northern Yukon. Caribou appear to be most susceptible to predation during migrations and the calving period.

Calef and Lortie(1973) and Davis and Roseneau(1978) report that grizzly bear are a significant predator on the herd. Golden eagles may also be responsible for some calf predation during the calving period(Calef and Lortie 1973,

Roseneau and Curatolo 1975). Predators may remove enough of the population so as to limit the safe level of human harvest. Predation pressure should be monitored to help in the establishment of game quotas.

Many caribou are also lost at dangerous river crossings, where they are crushed by ice or drowned. Inclement weather during calving may also contribute to mortality. Together, natural mortality and hunting account for 10,000 animals annually or 10% of the estimated population. Jakimchuk(1974) states that at this level "it is within the capacity of the herd to replace the amount of loss by the annual production of calves". Northern development, or an increase in harvests could have a negative effect on this balance. Changes in native use and the effects of new developments must be weighed as to their effects on caribou populations.

2.2.2 Moose

In the Northern Yukon, moose occur primarily in the Old Crow Basin Ecoregion. In winter they are restricted to those drainages south of 69°45 that can provide adequate cover and browse, mainly willow, (Roseneau and Stern 1972). The major moose wintering areas were located south of the Porcupine River in 1972 when heavy snow deterred animals from wintering on the Old Crow Flats (Ruttan 1974c). During summer, food is more readily available and moose disperse as far north as the Arctic Coast. Ruttan(1974c) found that in

summer moose concentrated in the Old Crow Flats and the Arctic coastal area between the Babbage and Malcolm Rivers. Three moose were observed in the Riggs Mountain and Joe Creek ecodistricts during a 1978 field study (Thorsell and Zivot 1978). Moose are solitary animals and are not as prone to disturbance as the more gregarious species.

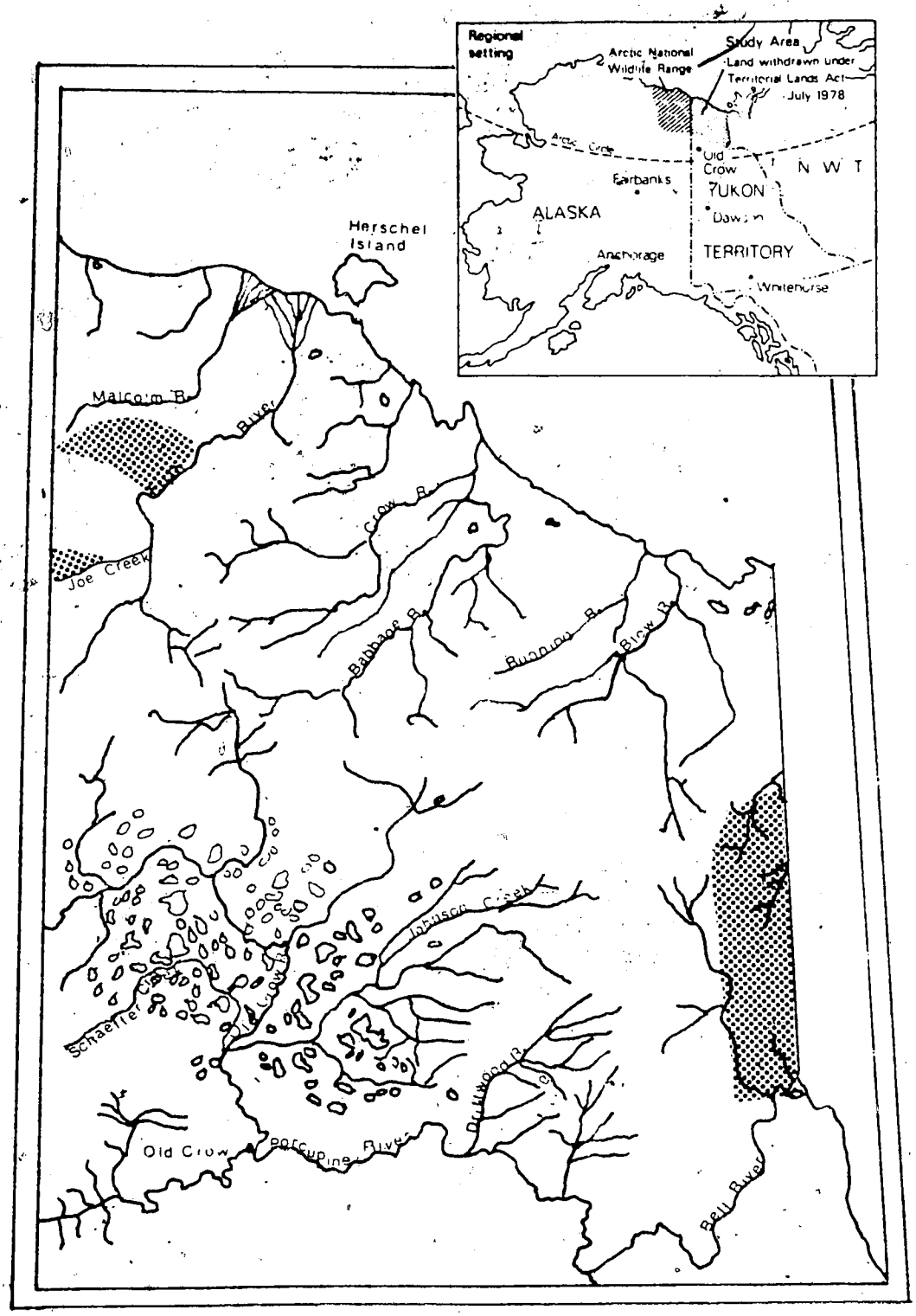
2.2.3 Dall Sheep

Dall Sheep reach their northernmost limit in the Northern Yukon. There are three recognized populations within the area of the proposed park (Figure 7). In the British Mountains, Hoefs (1974) recognizes two populations: Joe Creek and Sheep Mountain (Creek). During a 1974 survey 18 sheep, mostly nursery sheep and young, were located in the Joe Creek area; later 53 animals were spotted. Hoefs suggests that the rams spend most of their time in Alaska and that the two segments of the population mix only during the fall rut. The other British Mountain population lives along the Firth River between Sheep Creek and Mountain Creek. A total of 75 sheep have been observed (Hoefs 1974).

There are four recognized sheep populations in the Richardson Mountains: Canyon Creek, Mount Cronin, Mount Mullen, and Mount Goodenough (Hoefs 1978). Only the latter inhabits the region north of the Porcupine River. This population, estimated at 300, has come under considerable harvest pressure from the native people of Aklavik and Fort MacPherson. Simmons (1973) concluded that this harvest is in

Figure 7

Distribution of Dall Sheep in the Northern Yukon



Sources: Hoefs 1974, 1978

excess of the sustainable yield and predicted a population decline if control measures were not taken. Sheep are most vulnerable at lambing time during early May to mid June (Geist 1975, Wiken et al. 1978). Salt licks are important to sheep and are frequented during the post-lambing period. Sheep are particularly sensitive to noise disturbance and aircraft should be directed away from critical sheep habitat. Both the British Mountain and Richardson Mountain populations inhabit areas adjacent to either an international border or a territorial border. Hunting of sheep is legal both in the Arctic National Wildlife Range and in the Northwest Territories. This could present poaching problems for the Northern Yukon.

2.2.4 Bears

2.2.4.1 Polar Bear

"The polar bear of the Beaufort Sea, although not an endangered species, is a species sensitive to environmental alterations" (Moore and Quimby 1974). Polar bears are not common in northern Yukon, possibly because of native hunting pressure, resulting from the price of polar bear hides (Stirling pers. comm. 1979). They spend most of their life out on the pack ice, where they prey on ringed and bearded seal. Occasionally they are seen along the coast in winter or in the fall feeding on carrion that has washed up on the shore. There is some winter denning along the Beaufort Sea coast, but the area is not a core polar bear

denning area. The only dens recorded recently in the Northern Yukon have been on Herschel Island, which provides access to large seal populations(Wiken et al. 1978).

2.2.4.2 Grizzly Bear

"Although population status is not known, the largest contiguous and pristine grizzly bear population is probably that which ranges throughout the Northern Yukon Territory and Northeastern Alaska"(Ruttan 1974). In surveys carried out by Ruttan(1974) during the period March to October, a total of 203 grizzly bears were observed at 139 different locations in the Northern Yukon and adjacent Alaska. Curatolo and Moore(1974) calculated bear densities at 1/148km^2 in the adjacent Brooks Range. They estimate that males have an average home range of 702km^2, females 318km^2. Population studies have revealed that the present age structure consists largely of older individuals; males averaged 13 years, females 11 years. Grizzlies in this area do not breed until they are 8 years old, and only rear an average of 1.8 young. The bears emerge with cubs in early May and tend to pass the spring in the river valleys, In summer they move into mountain habitats(Curatolo and Moore 1974). Grizzly bears are primarily vegetarians, eating such plants as lingonberry(Vaccinium vitis-idaea L.), blueberry (Vaccinium uliginosum L.), astragulus roots, sedges, and equisetum. The bears also kill rodents, are thought to be a major predator of caribou(Davis and Roseneau 1978), and are

known to visit salmon and char spawning areas(Ruttan 1974, Roseneau and Stern 1972). The movements of bears are largely food oriented. This results in their congregating in specific areas, such as caribou calving grounds in June, and river valley bottoms in September. Bears breed in May through mid-June, and are not often seen during this period. Bears move to river valleys again in the fall to eat ripe berries. Denning generally begins in October or November; and lasts until late April.

2.2.4.3 Black Bear

Black bears also inhabit the proposed park. They are only common in the boreal forest-arctic tundra ecotone, primarily in the Old Crow Basin Ecoregion(Wiken et al. 1978).

2.2.5 Muskox

Muskoxen were extirpated from the western arctic mainland by whalers during the early part of the century. In 1969, fifty-one animals were re-introduced at Barter Island, Alaska and in 1970 thirteen more were released at Kavik Camp, Alaska. A 1973 survey located 37 individuals(Roseneau and Warbelow 1974). The animals seem to prefer the north slope of Alaska and Yukon. The 1973 survey found 6 animals in the Northern Yukon, one as far south as the Old Crow flats. In 1976 another survey accounted for 70 animals(Curatolo 1976). The population now appears to be

stable.

Natives have shown some animosity towards the muskox, as they believe it competes with caribou for forage, but studies have shown that the two animals select different plant species, and do not compete for resources (Kennedy pers. comm. 1979, Hickey pers. comm. 1978).

2.2.6 Furbearers

"Furbearers" include all those animals that are trapped or hunted primarily for their pelt. They are important in many terrestrial and aquatic ecosystems, both as predators and prey, and are an important source of income for the native people of the Northern Yukon (Berger 1977, Archibald 1978).

2.2.7 Wolves

Wolves occur throughout northern Yukon, from Old Crow to the arctic coast (Jakimchuk 1974), although they prefer to den inland away from the coast. The population has been estimated at between 300 and 400 in the area from the Peel River to the Beaufort Sea (Doll et al. 1974). Wolves are the major predator of the Porcupine Caribou herd. They kill many caribou on the calving grounds, during migrations, and in the heavy snows of winter. Wolves hunt the river valleys in summer, where they find small mammals, caribou and moose (Ruttan and Wooley 1974).

2.2.7.1 Arctic Fox

From an economic standpoint arctic fox are very important fur bearers in the arctic. In northern Yukon they breed primarily on the coastal plain. They prefer to locate dens on elevated areas such as the tops of eskers, where snow cover is shallow(Macpherson 1969). Alluvial fans also provide adequate denning habitat(Ruttan 1974a). Arctic Fox populations depend upon the availability of appropriate denning sites. Also of primary importance is the availability of food. Arctic Fox rely on cyclic lemming populations, and like many arctic predators their numbers vary with prey availability(Ruttan 1974a). Colored Fox also occur in northern Yukon and may out-compete the arctic fox in certain areas. They are not as highly valued for their fur as the white arctic fox.

2.2.7.2 Muskrat

Muskrats are economically the most important mammals in northern Yukon, specifically in the Old Crow flats. They occupy all lakes in numbers ranging from a few to many hundreds(Ruttan 1974b). Ruttan(1974b) estimated muskrat density in the flats at .82 rats/acre. Though harvest records show an average muskrat harvest of about 28,955(Ruttan 1974b, Bryant 1957), the take appears to have declined recently(12,728 in 1976/77, Archibald and Olson 1978). Nonetheless "rats" are always an important source of revenue for the villagers of Old Crow.

2.2.7.3 Wolverine, Mink, Marten, and Beaver

Wolverine, mink, marten and beaver also occur in the flats but, they are of secondary importance to muskrat. Mink are particularly abundant along the south portion and west central portion of the flats, as well as in the vicinity of the region's larger streams(Ruttan and Wooley 1974). Wolverine, according to Van Zyll DeJong(1975) occur throughout the Northern Yukon, and like other upland fur bearers(lynx, fox, wolf, ermine, marten) their numbers vary annually. Archibald and Olson(1978) reported that the annual wolverine harvest in the Yukon of 250-350 represents a maximum sustainable harvest. Although only 12 were harvested in Old Crow in 1976/77 there is no estimate of the regional wolverine population. Marten find excellent habitat along the Porcupine River between the Driftwood River and its tributaries, primarily Rat Indian and Berry Creeks(Ruttan and Wooley 1974). Beaver are found throughout the flats and along Potato, Sunrise, and Schaeffer Creeks in the west half of the flats(Ruttan and Wooley 1974). Only 4 were harvested at Old Crow in 1976/77(Archibald and Olson 1978).

2.2.8 Birds

The Northern Yukon provides important breeding, molting, feeding and staging areas for numerous bird species. There are two areas of major significance: the Old Crow Flats and the coast-line of the Malcolm, Firth, and Babbage Deltas(Schweinsburg 1974).

The Old Crow Flats are second only to the Mackenzie delta as an important area for waterfowl production in northwestern Canada. They support a breeding population of 75,000-170,000 ducks; are one of the most important breeding areas for Canvasbacks; a major molting area for scoters; and " the only known nesting grounds for the rare and endangered Tule Whitefronted Goose"(Jacobson 1974). Whistling Swans, Canada Geese, gulls, terns, large numbers of loons, and other water-associated birds nest on the flats(Mossop and Hayes 1977). During dry years on the praries, the northern nesting areas provide habitat for thousands more birds.

At least 110 bird species were identified in the Old Crow region during the pipeline environmental impact assessments. Thousands of shorebirds and passerines nest there and the region is an important nesting area for raptors: gyrfalcons, golden eagles, and the endangered Peregrine Falcon. A subpopulation of the eastern anatum race of Peregrine (Falco peregrinus anatum) nests in the vicinity of the Porcupine and Old Crow Rivers. They have been declining in recent years due, it is thought, to high levels of organochloride pesticides that have accumulated in the birds' tissues(Mossop and Hayes 1977). In a 1977 survey of Peregrines in the Old Crow region only 8 sites were observed to have fledged young, a reduction from previous years (Mossop and Hayes 1977). The decline may also be a result of human disturbance as these birds and all raptors are very sensitive to disturbance, particularly during the nesting

and incubation periods. Travel on the Old Crow River by natives and researchers during the June incubation period is thought to have a negative impact on the successful rearing of young. There have also been a number of suspected poaching incidents, and close monitoring of aeries is needed. It will be necessary to coordinate the activities of recreationists and researchers with raptor breeding periods.

The North Slope is also important for breeding, staging, feeding and molting. Schweinsburg(1974) and Koski(1975) reported large concentrations of waterfowl and shorebirds on the North Slope and in the Mackenzie Delta during late August. Gollup and Richardson(1974) identified important breeding, and molting areas along the coast in the vicinity of the river deltas, Phillips Bay, and around Herschel Island. Snow Geese in numbers approaching 400,000 gather on the North Slope prior to migration to feed on sedges and berries until inclement weather forces them to leave(Koski 1975, Barry pers. comm. 1979). The numerous small lakes on the North Slope also provide productive habitat for waterfowl and shorebirds. The deeper lakes are important to diving ducks, and other species nest around lakes with good vegetative cover(Gollop and Davis 1974). Of the 110 reported species, passerines are the most important group with 32 species. The North Slope and the river valleys of the northern drainages also provide excellent habitat for raptors. Peregrine Falcons, Gyrfalcons, Roughlegged Hawks, Snowy Owls and Marsh Hawks all breed in this

area(Schweinsburg 1974, Tull 1979 pers.comm.). The tundra subspecies of Peregrine (Falco peregrinus tundrius) inhabits the North Slope, although its populations have been declining in the past years. In 1977 Mossop and Hayes(1977) observed only three pair of Peregrines, of which only two produced young. Gyrfalcons are year round residents of the North Slope and the mountainous regions(Platt and Tull 1977). Mossop and Hayes(1977) located 21 active aeries in their 1977 survey. Gyrfalcon numbers seem to vary with the availability of prey items such as ptarmigan and arctic ground squirrels.

The Northern Yukon is of major significance to the avifauna of North America, as it provides all habitat requirements for numerous species. Arctic bird life is important to northern natives, not only for its food value, but for the part it plays in native cultures. This is reflected in religions and legends and in the fact that both Inuvialuit and Kutchin peoples have developed distinguishing names for the majority of arctic birds(Irving 1958)

The birds that nest, feed, and molt on the many lakes of the Old Crow flats and in the deltas and bays of the North Slope may be subject to disturbances from aircraft that use these areas as landing sites. Access for float planes should be restricted to a few specific lakes so as to minimize disruptions. Harassment of predatory birds may cause adults to abandon nest sites and eggs, thus affecting populations. Restrictions on aircraft, wilderness

travellers, and researchers during sensitive periods will help reduce potential impacts. Certain species of raptors command high prices in foreign markets, and there is always the danger of poaching, especially in areas where there is little enforcement. By restricting access points and requiring wilderness use permits, a closer watch can be kept for poachers.

2.2.9 Fisheries

Fish habitat must serve four basic functions. It must provide areas for overwintering, spawning, feeding, and the rearing of young. These requirements may be located within a relatively small area or spread out over great distances, requiring fish to make seasonal migrations.

There are 24 species of freshwater and anadromous fish found in the Northern Yukon drainages, that is the coastal or Beaufort Sea drainage, and the interior Porcupine drainage (Steigenberger et al. 1975), and many other species that occur in the coastal waters of the Beaufort Sea.

During the winter most of the North Slope streams are frozen. The only areas of open water are occasional deep pools and perennial groundwater springs. According to Craig and McCart (1974) most springs are found near headwaters of a few major mountain streams and all are known to be important wintering sites for arctic char. Major springs on Fish Creek, Firth and Babbage Rivers, Joe and Canoe Creeks provide overwintering habitat for char and arctic

grayling(Craig and McCart 1974). These springs can often be identified by the large areas of aufeis that form downstream during the winter and often remain throughout the summer(Craig and McCart 1974).

In the Porcupine drainage many creeks and rivers have no flow during the winter months, and fish must migrate into other waters to find suitable overwintering areas. The Old Crow River was observed to have no flowing water while the Porcupine River provides several overwintering sites, many near the mouth of the Driftwood River(Craig and McCart 1974).

In summer the estuaries of the North Slope are very productive and fish seem to concentrate there for feeding and rearing young. The coastal areas of the Beaufort Sea are also important feeding areas, and serve as migratory routes for fish of the Mackenzie River. The interior drainages are very active in spring and summer as fish move up the small streams and creeks and spawn. Arctic Char, which occur in the North Slope drainages, are an important food item for native people. The Firth River supports what is probably the largest population of anadromous char west of the Mackenzie River in Canada(Glova and McCart 1974). Other North Slope drainages also provide good habitat for char.

The North Slope river systems are made up of a coastal-estuary component and an interior component. The coastal-estuary component includes areas of the Beaufort Sea that serve as migration routes and feeding areas for the

anadromous and coastal species such as arctic char and arctic cisco, which are important links in the coastal food chains that include ringed seals, sea birds, and beluga whales. Anadromous species are also part of the trophic structure of inland waters. Arctic waters have lower species diversity and lower levels of growth and production than warmer southern waters. Any disruption to fish populations could affect the entire food web.

The rivers and streams of the Porcupine drainage eventually flow into the Pacific Ocean. Several anadromous salmonids migrate into the Porcupine River during the summer. Many are harvested at Old Crow. The Old Crow Flats contains many lakes that have productive fisheries, important in maintaining the ecological balance in the flats. Thousands of waterfowl nest in the flats, and many, like the Arctic Loon are piscivorous.

For the people of the Northern Yukon fish are second in importance only to caribou as a food for both human and canine consumption. The predecessors of the people of Old Crow used fish traps and spears to harvest the July migrations of chum salmon; today the fish are harvested with gill nets. In previous years the people fished open water areas in the head waters of the Firth River and Fish Hole Creek, a tributary of the Babbage River. Balikci (1963) reported that seven men in two days netted over 1000 char at the fish hole.

The fisheries of the North Slope drainages are

traditional fishing areas of the Mackenzie Inuit, though today use of the area is relatively low. Arctic char are caught for human consumption, and arctic cisco , least cisco, broad whitefish, and inconnu for dog food(Delury et al. 1975). During the peak of whaling, when 3000 people lived on Herschel Island, pressure on these fisheries was greater than at present.

Arctic char, arctic grayling and the salmons are highly prized by recreational fishermen. A number of Northern Yukon rivers could support a small sport fishery(Friesen 1975). This subject would have to be discussed in light of native subsistence requirements, the impact on the fisheries resource, and the nature of the wilderness park. The sport fishery could mean extra revenues for native guides.

In certain areas of the Northern Yukon there are refugial or isolated fish populations. These populations represent unique gene pools and are susceptible to overharvesting. Fishing should only be permitted on a subsistence basis, that is, fish may only be caught and consumed within the park.

Table 2.2.1 Summary of critical periods for wildlife

Species	Sensitive Periods	Season
Caribou	late winter	late April to May
	fly season	July 1-26
	calving	June 1-25
	rut	October
Sheep	lambing	May to mid June
Polar bear		Fall-winter
Grizzly bear	emerge with cubs	Early May-June
Raptors	nesting	April to Aug. 31
Snow Geese	staging-moulting	Late August
Other Waterfowl	nesting-moulting	Spring-Summer
Fish	migration	Spring

3. USER GROUPS OF THE NORTHERN YUKON

3.1 NATIVE USE

> While in the past conservation has largely been a function of the isolation of the area, the future must depend upon the good offices of man, and an adequate conservation plan for the Northern Yukon (Northern Yukon Task Force 1978).

The Northern Yukon has been used by both Inuit and Indian peoples. The present Inuvialuit are descendents of the Mackenzie Inuit, many of whom migrated to the Mackenzie Delta from Northeast Alaska. These people now reside primarily in the villages of Inuvik, Aklavik, and Tuktoyaktuk. Traditionally, many depended on the resources of the Beaufort Sea and the drainages of the North Slope, occasionally using caribou and other terrestrial resources.

The Indian people belong to an Athapascan group known as the Kutchin or Loucheux. These people lived in the boreal forest-arctic tundra ecotone, depending primarily on caribou, moose, and the abundant fish of the Porcupine drainage. Today they live in the Yukon village of Old Crow and the Northwest Territories settlements of Fort McPherson, Arctic Red River, and Aklavik.

It is important to gain an understanding of native culture and historic land-use patterns to help determine the range of culturally acceptable practices, and to weigh the socio-economic costs of any development. As well, the native resource complex has undergone massive change in the last century, and it is especially important to gain insight into

the new relationship with the land as the area is now under consideration for a national park.

Native people have endorsed the idea of national wilderness parks because they offer protection for the renewable resources (COPE 1978a). These people have a long history of living with the land and remain to some extent dependent on traditional lands for their livelihood. They therefore have their own specific ideas of what benefits are to be derived from these lands now and in the future. The implementation of a national park must also provide for the perpetuity of native use. This will involve:

1. providing a continued flow of economic benefits from the wildlife resources.
2. providing for the protection and enhancement of native cultures.
3. providing opportunities for renewable resource development.
4. providing natives with opportunities in the planning and management of national wilderness park lands and their resources.
5. providing natives with opportunities offered by tourism.

It will be necessary for park managers to assess these native-use objectives within the context of general park policy and to impose constraints when other park values become threatened. The following discussion will attempt to assess the present and future native demands, and the ability of the park situation to accommodate native

interests. It is first necessary to examine the scope of present native use of the Northern Yukon.

3.1.1 Native Use of the Northern Yukon

The pattern of native land use in the Northern Yukon is dynamic. Major changes in use have taken place throughout the history of its occupation. Before the fur trade the people were semi-nomadic, migrating to traditional resource areas with the seasons. A group of coastal Mackenzie Inuit known as the "Kigirktarugmiut" (taken from the name of the main village of Herschel Island; McGhee 1976) inhabited the Northern Yukon coast, where they hunted seals and whales in the Beaufort Sea, and fished the rivers of the North Slope. Before the whaling period, which saw most of these people move to Herschel Island, the Kigirktarugmiut occupied various coastal villages located at good sealing or fishing localities such as Escape Reef, Shingle Point, Sabine Point, King Point, Ray Point, Stokes Point, Herschel Island Harbour, and Herschel Island sandspit.

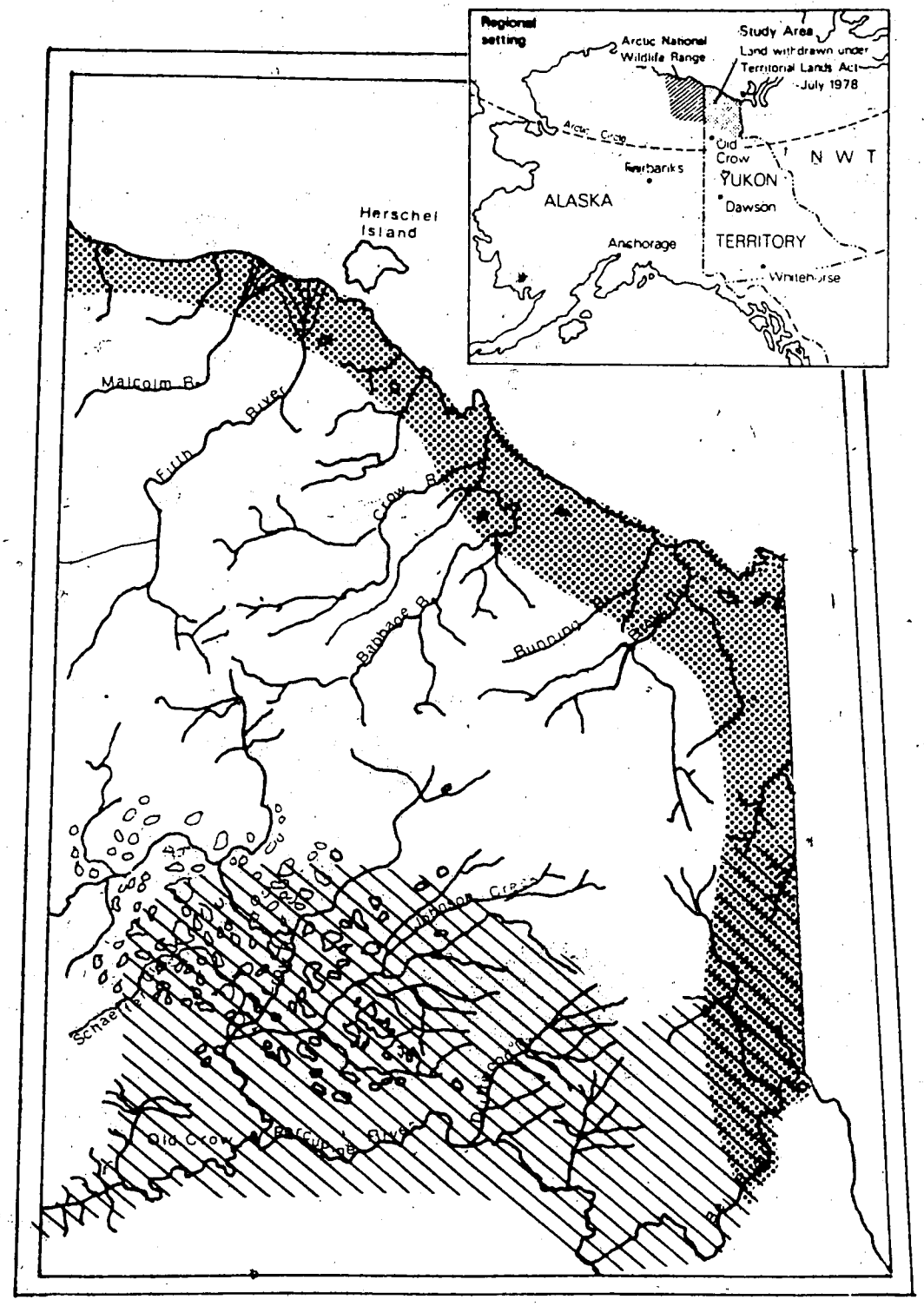
The Kutchin built caribou surrounds in the central Northern Yukon to entrap migrating caribou and built fish traps in the many rivers and streams of the Porcupine drainage. With the fur trade and establishment of forts and trading posts, the natives established more permanent residences and shifted their resource patterns to ones that provided access to fur bearers.

> The seasonality and location of all Kutchin activities were permanently changed after white contact. The people abandoned their traditional caribou surrounds in favour of the major autumn hunt at river crossings(McSkimming 1975).

The pursuit of abundant supplies of fish was responsible for the deepest penetrations into the Northern Yukon. Specific areas such as the fishing holes on the Firth River and Fish Hole Creek were used by both Inuvialuit and Indians(Steigenberger et al. 1975).The Firth River Valley was also used as a transportation route to Herschel Island and the coast, where the Indians traded with the Inuvialuit(Franklin 1828).

Today, use of these areas is reduced(see Figure 8). There are only a few Inuit from the Mackenzie Delta and Northeast Alaska who still use the northern coast for hunting, whaling, and trapping. Natives from Aklavik and Inuvik fish at Demarcation, Phillips and Shoalwater Bays, and harvest a few beluga whales around Shingle Point(Bissett 1974). Seals are still taken at Herschel Island(Sam Raddi pers. comm. 1978), and a few families from Aklavik trap arctic fox along the coast from Komakuk Beach to about the Longstick River(Ruttan and Wooley 1974). Some caribou are killed along the coast by people from Inuvik, Aklavik, Kaktovik, and even Tuktoyaktuk(Wentworth 1978, Freeman 1976), and a few people still hunt caribou in the Malcolm and Firth River areas(Usher 1976b). Although much of the North Slope was used in the past, present-day use is restricted primarily to the coast(Figure 8).

Figure 8
Present-Day Native Land-Use



Old Crow

Ft. McPherson, Arctic Red River, Aklavik

Inuvik, Aklavik

Sources: Bissett 1974, Steigenberger et al. 1975, Usher 1975, McSkimming 1975, Surrendi and DeBock 1976

The eastern boundary of the withdrawn land, formed by the Richardson Mountains, is still used by the people of Inuvik, Aklavik, Fort McPherson, and Arctic Red River. Natives from Aklavik and a few from Fort McPherson hunt Dall Sheep in the area north of Summit Lake(Simmons 1973). People from these villages also fish and trap in the Rat River-Bell River area. Coloured Fox are trapped in the Big Fish River area (Usher 1976b),and lynx, often abundant in the Richardsons, are trapped by people from Fort McPherson(Bissett 1974). A major portion of the Porcupine Caribou Herd migrates through the Richardson Mountains. The people from the Mackenzie valley villages harvest them during the spring and fall migrations northwest and south of Aklavik(Usher 1976b). Some of the caribou taken are sold in the Northwest Territories(Bissett 1974 , Northern Yukon Task Force 1978). Organized caribou hunts out of Fort McPherson and Aklavik are responsible for some of the harvest in the Northern Yukon. Organized hunts from these villages in 1972, for example, took 460 caribou(Bissett 1974).

Archaeological evidence reveals that the ancestors of the people of Old Crow formerly used an extensive area of the Northern Yukon(Morlan 1973, Morlan 1977). The Firth River was originally named the Mountain Indian River by Franklin because of the presence of the Kutchin on the Beaufort Sea coast(Franklin 1828). Historically, the Vunta Kutchin extensively used the Old Crow flats and other similar basins: Bluefish, Bell, and Porcupine. Within the

withdrawn lands, the core use areas were the Old Crow Flats and the streams of the Porcupine and Old Crow drainages. Today

> The people no longer exploit the entire Porcupine drainage area but have focussed their attention to the land that is within easy commuting distance of Old Crow. Hunting and trapping are still carried on, but on a small spatial scale (McSkimming 1975).

The "rat camps" and a few fish camps in the flats are still used, as are many areas of the Porcupine and Old Crow drainages, specifically Schaeffer Creek and the Driftwood River (McSkimming 1975).

In examining the range of historical land use one observes that a large part of the Northern Yukon was scarcely, if ever, used. When one considers that the total population of the area probably never exceeded 500 (200-300 Inuit (McGhee 1976), 200 Kutchin, it is difficult to conceive that any area received intensive use. Present-day use is more restricted, leaving even more of the Northern Yukon "unused". It was shown by McSkimming (1975) that native people are most sensitive to other land uses (eg. pipelines) close to their villages and core use areas. In light of present use, natives might find it easier to accept activities such as recreation or research in the large expanse away from their villages or core areas.

Having examined the areas used by these people, we must examine more thoroughly the importance of the products of the land.

3.1.2 Economic Value

The economy of the north is mixed, since the degree of reliance on the land and renewable resources varies from person to person. What is referred to as "subsistence" is actually a continuum that includes both the fully employed native who hunts on the weekends and the villager who spends most of the year on the land, taking occasional work to pay the expenses of modern subsistence. In a survey of native households in Northeast Alaska, Kruse(1979) found that most natives prefer to spend time in both subsistence and employment activities(Tables 3.1.1 and 3.1.2). Young native respondents were less likely to prefer spending much of their time in subsistence activities(only those older than 40 preferred subsistence, Table 3.1.1; older than 50, 3.1.2). In Old Crow casual employment generates most of the cash income; traditional pursuits significantly supplement total income and well-being(McSkimming 1975).

It is difficult to assess the true value of subsistence. However, using replacement costs as a means of estimation gives a general idea of the economic value of subsistence activities. There have been many attempts made to assess the worth of a land- based economy, but all run into difficulties presented by (a) inaccuracy of the harvest data, (b) considerations of the costs incurred in acquiring the products, (c) differences in food value between "country" and "store" food,and (d) cultural preferences for specific items. Using the same estimators as Berger(1977),

Table 3.1.1 Time preference for subsistence vs. wage employment
Yukon-Porcupine native respondents

TIME PREFERENCE FOR SUBSISTENCE vs. WAGE EMPLOY.	%ALL NATIVE RESPONDENTS	AGE %UNDER 30	%30-39	%40-49	%50+	RESIDENCE FORT YUKON	OTHER VILLAGES
mostly subsistence	13	4	6	14	26	11	16
mostly wages	14	22	15	7	19	12	16
both	73	74	79	79	55	77	68
number of respondents	115	22	35	28	36	50	65

reproduced from Kruse 1979

Table 3.1.2 Time preference for subsistence vs. wage employment for North Slope native respondents

TIME PREFERENCE FOR SUBSISTENCE vs. WAGE EMPLOY.	%ALL NATIVE RESPONDENTS	AGE %UNDER 30	%30-39	%40-49	%50+	RESIDENCE BARROW	OTHER VILLAGES
mostly subsistence	15	8	6	13	43	16	13
mostly wages	22	17	17	29	20	26	17
both	63	75	73	63	37	52	70
number of respondents	288	90	66	40	42	122	166

reproduced from Kruse 1979

the gross imputed values of country food resources can be computed for Old Crow and the Mackenzie Delta Communities (Inuvik, Aklavik, Fort McPherson Arctic Red River). A summary is presented in Tables 3.1.3 and 3.1.4. For Old Crow the total per capita value of country food was estimated at $2,297.81 ($9,188.00/family of 4). This amount represents a larger part of the economy than the revenues generated by wage employment (Table 3.1.5).

Subsistence activities supply an average of 307kg of country food for every resident of the village. This compares with Arctic Village, a nearby Athapascan settlement on the edge of the Alaskan Arctic National Wildlife Range, which obtains 295kg of meat per capita from the land (Wentworth 1973).

For the Mackenzie valley communities (Table 3.1.4) the per capita value of country food was estimated at $823.64 ($3,294/family of 4). Subsistence provided an average of 151kg of meat per person. This is similar to the Alaskan Inuit village of Kaktovik on nearby Barter Island (adjacent to ANWR) where subsistence supplies 159kg of meat per capita (Wentworth 1973). These values suggest that a significant cost would be incurred to replace country products with southern substitutes. Moreover, the social impact of replacement could be disastrous. Alaskan studies suggest that replacement of the traditional commodities would lead to increased welfare payments and a higher incidence of crime and alcoholism (University of Alaska

Table 3.1.3 Summary table for imputed values of subsistence resources for Old Crow Yukon

TYPE	TOTAL (kgs.)	TOTAL (dollars)	$/kg	TOTAL dollars /capita pop = 200	TOTAL kgs./capita
Big Game	39,609.09	348,561.00	8.80	1,742.50	198.04
Birds	136.59	585.97	4.29	2.93	0.68
Fish	15,000.00	66,000.40	4.40	330.00	75.00
Muskrat	6,738.18	44,471.98	6.60	222.38	33.68
TOTAL	61,483.86	446,916.37		2,297.81	307.40

sources: Munro 1953, McSkimming 1975, International Caribou Committee 1978 Lortie and MacDonald 1977, Delury et al. 1975, Berger 1977.

Table 3.1.4 Summary table for imputed values of subsistence resources for Mackenzie Valley

TYPE	TOTAL (kgs.)	TOTAL (dollars)	$/kg	TOTAL dollars /capita pop = 3,100	TOTAL kgs./capita
Big Game	66,763.64	587,520.00	8.80	189.52	21.54
Birds	11,062.72	47,459.10	4.29	15.31	3.57
Fish	313,805.00	1,380,742.00	4.40	445.40	101.23
Fur bearers	49,988.18	329,922.00	6.60	106.43	16.12
Marine Mammals	10,790.90	106,800.00	9.90	34.46	3.48
Hare	15,272.72	100,800.00	8.80	32.52	4.92
TOTAL	467,683.16	2,704,173.00		823.64	150.86

sources: Berger 1977, Usher 1975, International Caribou Committee 1978

Table 3.1.5 Breakdown of annual family income for Old Crow Yukon

SOURCE	VALUE	PERCENTAGE OF INCOME
Wages	$ 4,580.00	38.33
Allowances Pensions, etc.	$ 720.00	4.45
Trapping	$ 1,500.00	9.27
Woodcutting	$ 310.00	1.91
Subsistence food value	$ 9,188.00	55.27
TOTAL	$16,298.00	100.00

source: adapted from McSkimming 1975, harvest data

1978).

Trapping plays an important role in most native economies, though revenues depend on the current market demand. Fur prices have been good the past few years. Old Crow trappers received $[illegible]4,886 in the 1976-77 season (Archibald and Olson 1978) for a harvest similar to that of 1965, when trappers only received $9,923 (Berger 1977, Table 3.1.6). Indian trapping intensity does not appear to vary with fur prices, as it does for white trappers; this suggests the importance of cultural and social components of the activity (Archibald and Olson 1978). Revenues generated from fur and the replacement value of subsistence foods account for a value double that received from wage employment. Together hunting and trapping contribute an average of $2,609 per capita ($10,436/family of 4) to the economy of Old Crow. These figures represent only the average, as some people are more dependent on subsistence than others. For these people the value of subsistence products would be much higher. For Old Crow 28% of the people derive most of their income from the land, 20% of the people derive half of their income from the land, 39% some income, and 33% derive no income from the land (McSkimming 1975, Table 3.1.7). This is not to say, however, that the people who derive no income from the land, do not use subsistence products. For there is still a great deal of sharing and trading of these domestic products. Table 3.1.7 shows a similar pattern of resource dependence for other

Table 3.1.6 Fur harvests and revenues for Old Crow Y.T. (n/a - data not available)

SPECIES	1965-1970 AVERAGE NUMBER HARVESTED	$VALUE	1971-1975 AVERAGE NUMBER HARVESTED	$VALUE	1976-77 ACTUAL NUMBER HARVESTED	$VALUE
Beaver	43	529.76	29	422.82	4	95.64
Cross Fox	n/a	n/a	n/a	n/a	6	95.64
Red Fox	n/a	n/a	n/a	n/a	12	637.81
Silver Fox	n/a	n/a	n/a	n/a	5	291.21
Arctic Fox	n/a	n/a	n/a	n/a	10	343.40
Lynx	9	214.00	22	1,124.42	6	1,636.38
Marten	63	685.00	61	911.34	249	5,126.90
Mink	13	217.00	31	578.46	34	640.22
Muskrat	8,900	8,277.00	11,852	20,859.52	12,728	63,385.44
Squirrel	n/a	n/a	n/a	n/a	3	1.83
Weasel	n/a	n/a	n/a	n/a	34	29.24
Wolf	n/a	n/a	n/a	n/a	1	84.11
Wolverine	n/a	n/a	n/a	n/a	12	2,041.92
TOTAL VALUE		9,923		23,896		74,8866.13

sources: Archibald and Olson 1978, Berger 1977.

Table 3.1.7 Reliance on subsistence foods for selected northern villages

	RESIDENCE			
PROPORTION FOOD	OLD CROW	YUKON-PORCUPINE	FORT YUKON	NORTH SLOPE (Alaska)
most	28%	27%	14%	26%
half	20%	28%	28%	14%
some	39%	24%	27%	42%
none	33%	21%	31%	18%

sources: McSkimming 1975, Kruse 1979

villages in the region.

Economic analysis can reveal the importance of maintaining the native economy. The combined economic and social costs involved in replacing the native economy suggest a continued reliance on a land-based existence. This existence depends on the ability of the land (ecological component) to sustain the economy.

3.1.3 Native Harvesting and the Resources

> The native hunters have long been furnished guns and ammunition in abundance by the whale ships wintering at Herschel Island... The same is true of the Point Barrow Natives, so that every native in the country has a modern repeating rifle and one or two thousand cartridges, every year. As they have no better knowledge of conservation than white men, they soon drove the caribou out of the country (Leffingwell 1919).

Man at every level of technology has been able to alter his environment, the alteration often resulting in the displacement or even extinction of other species. During the Pleistocene, for example, "accelerated extinction occurs only on land and only after man invades or develops specialized big-game hunting weapons" (Martin and Wright 1967). Concomitantly it may be said that there is no hunting technology today that can be claimed to have no effect on wildlife populations. Native subsistence harvesting is no exception.

Evidence suggests that even before the introduction of modern weapons natives were responsible for the extirpation of game. Hickey (1978) suggests that Inuit hunting was

responsible for the extirpation of muskoxen from Banks Island in the late 19th century. Kill sites containing up to 600 skulls have been located on the island.

The northern native traditionally possessed his own concept of conservation, one tied to the spiritual aspects of his lifestyle. Game was thought to present itself to the hunter whose duty it was to kill it; the game spirits thereby released could once again return as game. The hunter or group of hunters would thus attempt to take as many animals as possible, often the entire band (Freeman pers.comm. 1978). This cosmology, of course, had its practical side, in view of the uncertainty of getting meat in some of these areas.

The native hunting philosophy has carried over into modern times and, with the aid of modern weapons, has increased the possibility of reducing game populations. Wood (1974) reported that Inuit hunting pressure has caused a decline in caribou and seal populations in southeastern Baffin Island. He attributed this to lack of a conservation ethic, a result of historical occurrences. He stated that "the Inuit are by nature tenacious hunters. It is said in the North that a caribou seen is as good as dead."

The arctic caribou herd in Alaska, estimated in 1963 at 300,000, now numbers only 60,000, largely due to over harvesting by natives although implementation of a 3000 per year quota seems to have stopped the reduction (Bergstrand 1978, Nelson 1977b). Similar pressure from native hunters is

currently threatening the Kaminuriak herd of central Canada (Don Thomas 1979, Frank Miller pers.comm. 1979) and possibly the Bathhurst herd (Calef 1979).

3.1.3.1 Access

Depletion of game stocks is largely a function of ease of access. The native hunter today is highly mobile; snowmachines, trucks, and aircraft provide access to game. Snowmachines have had a particular influence in that they facilitate running with animals and permit the hunter to haul back several animals to camp or roadside. Studies in Alaska have shown that "the use of snowmachines has made the taking of caribou and moose relatively easier than the taking of marine mammals" and there has been a shift to hunting terrestrial species (Bergstrand 1978). The construction of roads also provides access to new areas, facilitating the depletion of game. Road access has caused some depletion of the Nelchina herd in Alaska (F. Miller pers.comm. 1979) and in Wood Buffalo National Park "there has likely been a general depletion of moose along the park's road system due to native hunting" (B. Lieff pers.comm. 1978). The construction of the Canol Road in the Yukon also made for increases in hunting by both natives and whites. Use of the just-completed Dempster Highway, which passes through the Northern Yukon, may soon threaten the existence of the Porcupine herd.

Aircraft are frequently used to provide access to game,

a fact that could lead to overharvesting. In Alaska, land claims settlements have provided some hunters with enough money to charter planes to reach areas rich in game when local resources are poor. It has been government policy in the Northwest Territories and Yukon to provide natives with access to game. Parties of native hunters are flown into areas to shoot caribou (Bissett 1974, Dave Morgan pers.comm. 1979). Native hunters from the Northwest Territories fly into the Yukon where they kill animals that are subsequently flown out and sold (Northern Yukon Task Force 1978). These hunts provided 460 caribou for Aklavik and Fort McPherson in 1972-73 (Bissett 1974), and have resulted in an overharvest of Dall Sheep in the Richardson Mountains by people from Fort McPherson and Arctic Red River (Simmons 1973). Initiatives to end these organized hunts have met with opposition from native communities (Yukon Indian News 1979).

Small game and fish are also subject to depletions from "subsistence hunting". That fur bearer stocks in Wood Buffalo National Park have declined is due partly to overtrapping; muskrat, fisher, and beaver have been most susceptible. In the late 1960's the goldeye fishery in the Peace-Athabasca Delta (operated partly in Wood Buffalo National Park) collapsed due to overfishing (Lieff pers. comm. 1978). Similar depletions have occurred in Alaska as a result of native commercial enterprises (Behnke 1978).

3.1.3.2 Current Harvest Levels

Harvesting levels for most economic species have remained stable for the past 15-20 years(Tables 3.1.8 and 3.1.9); there appears to be no general increase or reduction in harvest levels. However, the annual harvest is extremely variable. Caribou harvests for Old Crow range from 475 in 1977-78 to 964 in 1975-76(Figure 9), a difference of almost 500 animals. This immediately leads to inquiry over the relationship of the harvest to actual need. Does 475 represent an under harvest? 964 an over harvest? Or are harvest levels a function of access? For example, the people of Arctic Village usually take only a few caribou. In 1973 when the Porcupine herd passed through the village over 1000 caribou were harvested(Wentworth 1973). It is obvious from the figures that studies should be undertaken to determine the need for game rather than assuming that the number of animals taken reflects the need.

Another possible reason for the wide range of harvest figures is that the data are unreliable. There appears to be a high level of mistrust between natives and game officials. This often leads to misreporting of harvest data. Many native people fear repercussions for admitting to large or out of season harvests. This is illustrated by the discrepency between data gathered through interview and that accumulated by game officials(Table 3.1.10).

Harvest data present only one aspect of hunting; they do not reflect hunting intensity, sex ratios, or land-use

Table 3.1.8 Big game harvests for Old Crow Yukon

YEAR	CARIBOU	MOOSE	BEAR
1952	902	n/a	n/a
1963-64	706	10	n/a
1964-65	769	7	1
1966-67	582	22	1
1967-68	590	17	4
1968-69	557	24	3
1969-70	478	18	1
1970-71	505	11	5
1971-72	573	26	1
1972-73	751	22	2
1975-76	964	26	7
1977-78	475	n/a	n/a
Mean	655	18.3	2.5
Standard Error of the mean	47.14	2.18	.722

sources: Munro 1953, McSkimming 1975, International Caribou Committe 1978, Lortie and Macdonald 1977.

Figure 9
Caribou Harvest:Old Crow Yukon

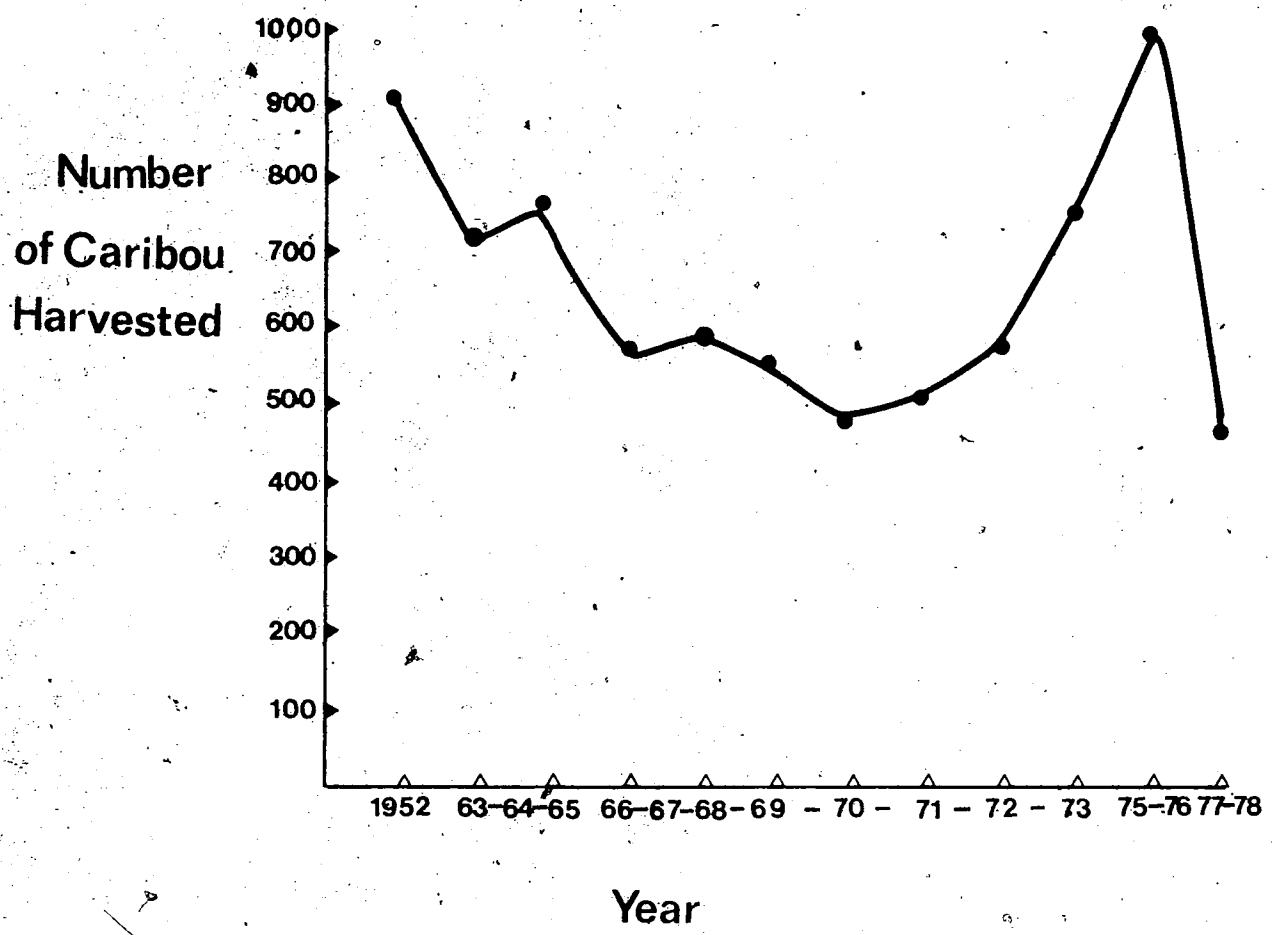


Table 3.1.9 Big game harvest for Lower Mackenzie Valley

YEAR	CARIBOU	MOOSE	SHEEP	BLACK BEAR
1964-65	1,445	102	19	25
1965-66	1,121	52	4	17
1966-67	1,008	101	23	13
1967-68	2,477	109	4	14
1968-69	1,444	73	59	21
1969-70	923	116	25	8
1970-71	1,273	69	30	14
1971-72	1,533	57	35	18
1972-73	1,490	29	n/a	n/a
1975-76	96	38	5	4
1977-78	565	n/a	n/a	n/a
Mean	1244	75	23	15
Standard Error of the mean	182.89	9.78	5.95	1.84

sources: Bissett 1974, Berger 1977, International Caribou Committee 1978, Usher 1975

Table 3.1.10 Dall's sheep harvest in the Richarson Mountains(McPherson and Delta Districts):A comparison of general hunting licence returns and harvest data gathered through interviews with local hunters. (n/a - data not available)

YEAR	KILL STATISTICS	GENERAL HUNTING LICENCE REPORTING RATE(percent)	INTERVIEWS
1967-68	4	n/a	25
1968-69	59	72	16
1969-70	25	61	30
1970-71	33	67	39
1971-72	22	n/a	40
1972-73	30	31	62
Average	35		42

Reproduced from Berger (1977) vol 2 pg.21.

patterns. For example, present harvesting of caribou may take place within a smaller land area than an equivalent harvest 20 years ago. This change in land-use can have an effect on the species not reflected in harvest data. Moreover, harvest data are difficult to interpret without reference to accurate population inventories. Thus it is impossible to determine for many species, especially furbearers, whether current harvest levels represent a safe level of use(Archibald and Olson 1978). Some researchers claim that certain species could be more intensively harvested; however, it is impossible to determine the permissible increase without accurate resource information.

3.1.3.3 Decreasing Native Land Use

If increased access has resulted in depletion of some species, lack of access has the potential for reducing populations as well. Traditionally, native people have used large tracts of land, migrating to specific resource areas with the seasons. In recent times changes in settlement patterns and general lifestyle have caused a reduction in use of former subsistence areas (McSkimming 1975, Anderson et al. 1977, University of Alaska 1978, Behnke 1978). Wage employment has limited hunting to weekends, preventing people from venturing far from the villages(Freeman 1976). This reduction in land use can mean increased pressure on local resources, which results in local depletions or extirpations. Furbearers are particularly vulnerable,

particularly the more sedentary species such as beaver (Nelson 1977b). This local intensive harvesting may also prove detrimental to caribou, since discrete subunits of the population occupy specific locales. The Richardson Mountain Group of the Porcupine Herd may be exposed to this intense harvest, while other subgroups are hardly utilized. This local pressure could result in a loss of part of the herd and the gene pool of the subunit (International Caribou Committee 1978).

3.1.4 The Potential for Harvesting Impact in the Northern Yukon

There are a number of factors that can influence harvesting pressure in an area; an examination of the situation of the proposed wilderness park will suggest some impact possibilities.

3.1.4.1 Biological Productivity

The western arctic is considered to be generally an area of low productivity (Peterson 1976). The replacement of depleted populations takes years longer than in other areas. Many species may be currently underharvested, but there are few possibilities for enhancing the overall productivity of the area (Pearson 1977, COPE 1977).

3.1.4.2 Access

The land claim settlement negotiated by COPE includes

the right to establish permanent settlements on the north slope, which will provide easier access to wildlife resources within the proposed national wilderness area.

Ease of access and changing land-use patterns have resulted in some groups using areas that were not traditionally used. For example, among the people from Tuktoyaktuk "there has been a growing tendency to hunt caribou west of the Mackenzie Delta in summer all along the coast as far west as Herschel Island within walking distance of the shore"(Freeman 1976).People from Kaktovik, Alaska often travel along the coast in spring and summer, when they take snowmobile or boat trips to visit relatives in the Mackenzie Delta (Wentworth 1978). These people, like the caribou, do not acknowledge the international border, and probably take animals within the Northern Yukon.

3.1.4.3 Human Population

The western arctic is experiencing a substantial population boom, with an average yearly increase for the Mackenzie Delta native population of 3.2%, a doubling time of 23 years (Naysmith 1972, COPE 1977). Old Crow itself, however, does not seem to be undergoing this population boom; population figures have remained constant over the past few years. (Table 3.1.11)

3.1.4.4 Increasing Demand

The increasing population will require a corresponding

Table 3.1.11 Population growth for the Lower Mackenzie Valley and Old Crow Y.T. (n/a - data not available)

YEAR	OLD CROW	INUVIK	AKLAVIK	FORT McPHERSON	ARCTIC RED RIVER
1961	217	1,681	599	509	87
1966	218	2,040	611	654	73
1971	206	2,669	677	679	108
1976	221	3,116	781	704	120
1978	n/a	3,065	797	790	119

sources: Statistics Canada, Government of the Northwest Territories 1978.

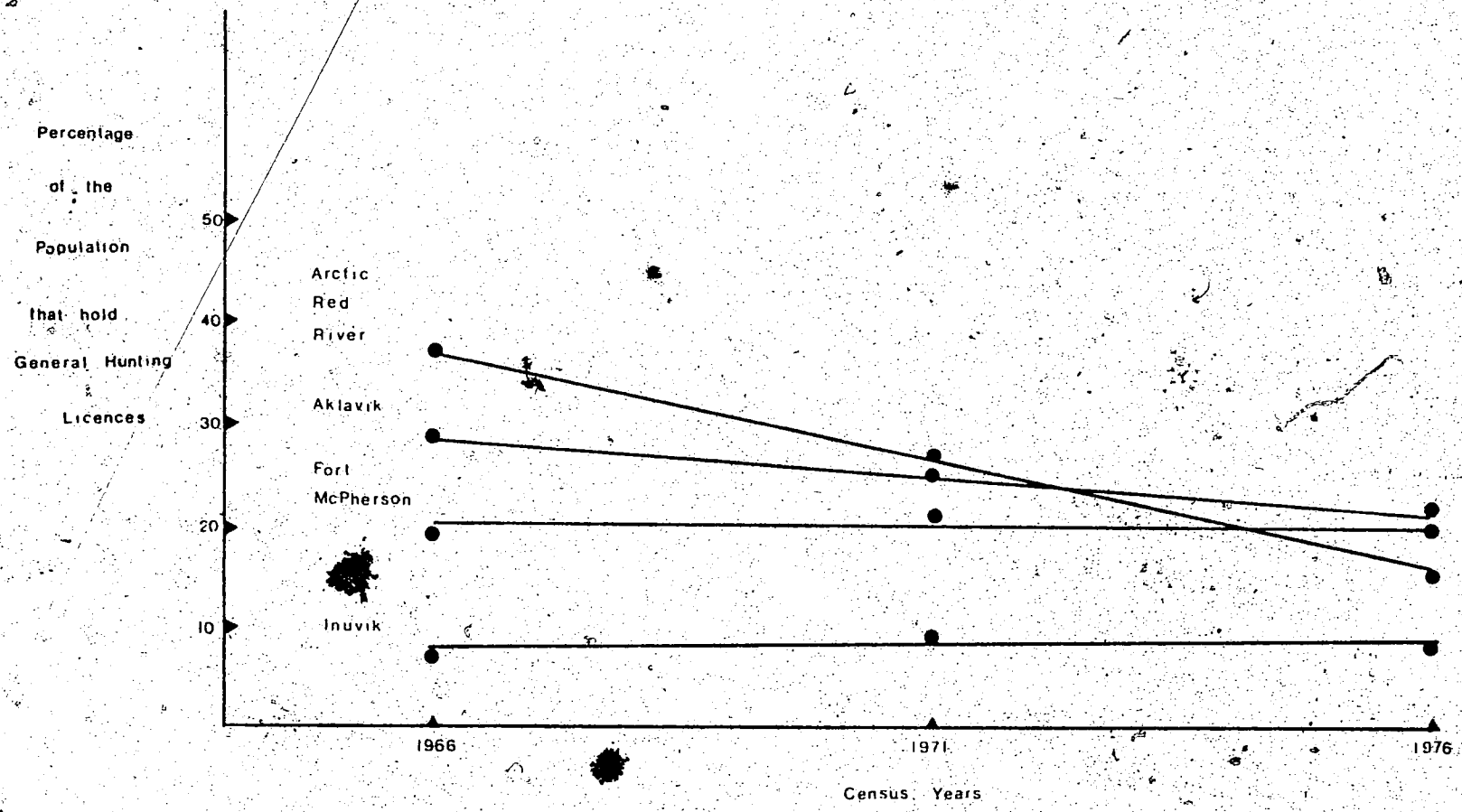
increase in food supply. The food source will depend on costs and cultural preferences. It is said that most native people prefer northern country foods(Usher 1976a). This coupled with the costs of importing southern foods will result in an increase in demand for local foods. The lack of a practical alternative will mean either an increase in harvesting or the development of industries that can produce the commodities.

3.1.4.5 Number of Hunters

In order to provide country food for the people it is necessary to maintain a population of hunters. One can estimate the hunter population by using the issuance of General Hunting Licences as an index. If the number of hunters per capita for the four Mackenzie Delta communities(Aklavik, Inuvik, Fort McPherson, Arctic Red River) is plotted against time(Figure 10) we observe a decline over the past few years for Arctic Red River and Aklavik, two of the more traditional communities. The number of hunters per capita for Inuvik and Fort McPherson has remained relatively stable. The total number of hunters per capita for these two villages is lower than both Arctic Red River and Aklavik. Although the number of hunters per capita has been declining, the absolute number of hunters has increased for many villages. However, this increase is obviously not keeping pace with population growth. This suggests a decline in the ability of hunters to provide for

Figure 10

Number of Hunters as a Percentage of the General Population



the local food needs of the Western Arctic. It may also indicate a loss of interest in subsistence, and therefore a need to find alternative methods of obtaining country foods.

3.1.4.6 Interest in subsistence lifestyle

This is an important factor in determining future impacts and demand for wildlife. It is difficult to estimate, but many observers have noted a loss of interest in the traditional lifestyle. In the Kobuk River area of Alaska, remark Anderson et al. (1977), "below the age of 30 the balance swings away from subsistence, especially among the majority who do not have families yet." This is supported by survey data gathered by Kruse (1979) for native villages adjacent to the Arctic National Wildlife Range. Usher (1971), in his study of Banks-Islanders, also found that young people were not interested in practicing the traditional skills of their fathers. Naysmith (1972) and McSkimming (1975) both acknowledge a decrease in time spent trapping. For example, ratting was formerly a family or partnership operation in the Old Crow Flats. McSkimming (1975) notes, however, that there has been a weakening of the ratting associations, and even the family unit. It appears (Table 3.1.12) that both the number of family units and the time spent ratting have declined. McSkimming (1975) did note a recent upsurge in the number of people ratting, but the time spent at the activity is much less than in past years. The loss of interest in subsistence

Table 3.1.12. Muskrat trapping associations for Old Crow Yukon

	LONG AGO	1960	1973
No. of Family units ratting	14.0	9.0	6.0
Family units as % of total ratting units	60.8	50.0	42.0
$\bar{X}$ number of days each ratted	105.0	80.0	42.0

Long ago- the time when an older person(40+) was a young man

Reproduced from McSkimming 1975

activities has led to a general decline in the use of domestic products(Usher 1978a). There is therefore little evidence for suggesting an increase in subsistence users; at best the population of hunter-fisher-gatherers will remain stable(Anderson et al. 1977).

3.1.4.7 Modern Technology

"Improperly employed this technology has and will continue to have effects on wildlife and its habitat. Regulation of methods and means will continue to be a necessity"(Melchior and Bishop 1977). There is still some question as to the impact of modern weapons on game populations. There is little doubt that rifles have made it easier to kill most animals, especially caribou. Modern weapons and travel have made hunting an individual rather than a communal endeavor, and this has weakened social organization among native groups(McSkimming 1975).

3.1.5 Preventing Harvest Impacts

> The exercise of the right to harvest shall be subject to the principle of conservation(James Bay and Northern Quebec Agreement, Section 24.34 1976).

The economic importance of renewable resources and the potential for overharvest dictate the need for a control system. Placing a limit on the harvest is one means of protecting the resource. Such a quota system has been suggested by researchers and native groups with concerns in the park(COPE 1978b, CYI 1978). Before a quota can be

assigned, however, there must be an accurate assessment of the resource. This means accurate census of the species, including information on population numbers, structure, distribution, and recruitment. Quotas must be calculated and allocated for each species within an identified harvesting area, since harvesting tends to be localized.

The establishment of a quota does not guarantee protection. The essential factor is cooperation of resource users in keeping to the prescribed quota. Accurate reporting of harvests is essential for an effective control program. Currently, accurate reporting is hampered by lack of trust and communication between users and game officials(Interdisciplinary Systems 1977). Native people want to monitor the quota system themselves. This would probably be the most effective step towards keeping accurate records, but an education program is needed to make the harvester aware of his impact on the resource and of the need for conservation. Many native people realize the importance of conservation; they should be encouraged to educate the rest of the people.

A change in both legislation and attitude is required to recognize the traditional pursuits of the native. Out of season harvests of birds and furbearers are probably not recorded. A relaxing of the 1916 Canada(ex U.K.)-United States Migratory Birds Treaty(ratified by 1916 Canadian Migratory Birds Convention Act) is needed to permit traditional use cycles. Recent negotiations between the

United States and the Soviet Union suggest that there may soon be international recognition of native harvesting rights. Once these countries decide to amend their international agreement, proceedings will probably begin in Canada to amend the Canadian-U.S. agreement. (Barry pers.comm. 1979). Natives must be assured that there will be no repercussions for out-of-season kills as long as they stay within the permitted yield.

Besides incorporating information on populations and harvesting areas, the quota must account for animals lost by wounding. For some species, especially sea mammals, losses from wounding are very significant. It has been reported that the whale recovery rate is as little as 50%-- this means an under reporting of 50% (Usher 1976a, Bergstrand 1978). Caribou and other terrestrial mammals are often wounded and not recovered, and thus are not included in game reports. Of those animals killed, hunters often leave up to 60% of the meat at the kill site (Alaska National Interest Lands Conservation Act 1978). Efforts must be made to sensitize people to the importance of recovering wounded animals and using kills more efficiently. Research should be aimed at finding more successful harvesting methods.

The other option for maintaining viable stocks of harvested species is to enhance the populations by removing other limiting factors. Jakimchuk et al. (1974) Bergerud (1978) and Calef (1979) suggest that wolf predation is a major factor in recent caribou declines. Wolves prey

primarily on calves and thus affect recruitment. Bergerud noted in his studies of caribou-wolf relations in British Columbias' Spatsizi Wilderness Park that caribou calf populations were reduced by 87% through predation. Calef's studies indicate that 3/4 of the caribou calves born will die due to accidents, wolves, bad weather, disease and other factors. Grizzly bear predation may also limit caribou recruitment. Davis and Roseneau (pers.comm. to Bergerud 1978) have found that bear predation on caribou calves is quite significant for the Porcupine and Arctic herds. Bergerud (19[illegible] concluded from his work that there is "no surplus for man in natural, undisturbed predator-caribou systems since natural deaths commonly balance natural recruitment".

Removal of some of the predation pressure could increase recruitment and thus permit higher harvests, or at least sustain present harvest levels. The removal of wolves and other large predators from a wilderness park is, however, a controversial issue, since these areas represent some of the last extensive ranges of these animals. Further, the biocentric approach to management would favor restricting human use over the removal of predators to enhance human harvests.

3.1.6 Cultural land Values

> I need to emphasize that these cultural dimensions can only be recorded and understood fully so long as they remain a part of the viable intact Native life way. Alienated from the landscape which

> is their source of sustenance, they lapse first to the monotone of memory culture, and then become extinct. (Nelson 1978b).

The native-land association is much more than an economic one, but since the invasion of the European the cultural aspects of the relationship have been weakened (Nelson et al. 1977a). This is revealed in a study of the history since contact.

During the pre-contact period the native was part of the cyclic abundance and scarcity characteristic of northern species. The people's subsistence pattern involved travelling to areas where, at specific times of the year, resources were plentiful. This meant meeting the caribou at traditional traverses in the spring and fall, fishing the rivers and coastal areas during the summer runs of fish, and moving in the winter to locations that could provide fuel, shelter, and game. This pattern usually involved extensive tracts of land. When the caribou failed to cross at their usual locations the people were forced to rely on alternate, usually less desirable, resources for their sustenance. A knowledge of the landscape, plants, and animals was needed to subsist. Before the invasion of the European the native peoples had their own cosmology, their own explanations for the cyclic richness of their environment, their own ethic of conservation. They named places of ancestral and personal importance; these were markers that served for orientation, instilled memories, and recorded history.

Game was more than mere food, for involved in the

procurement of the animal was the accumulated knowledge of generations that told the hunter where, when, and how to make the kill. There were traditional methods of butchering, distributing meat and viscera, cooking and eating the animal. After, there were stories to tell, and singing and dancing. Perhaps above all there was an achieved status as a hunter-provider, the earned respect of other band members. Subsistence reinforced the social organization, the transmission of culture, and the psychological well-being of the people.

> The first whitemen changed our community property values to that of personal property. This came about by increased trading of items such as knives, beads, kettles, and guns with our Tlingit neighbors (Yukon Native Brotherhood 1973a).

European explorers searching for new fur sources and the Northwest passage were the first to encounter the northern native. Then came the fur trader, the men of the Hudson's Bay Company, who established forts in the N.W.T. and Yukon. This created a demand for furs, for which were traded guns, ammunition, flour, tea, and other delicacies. Gradually native people became more dependent on the forts and their trade goods; their economy shifted from one of total self-sufficiency to one based primarily on the fur trade. Though still highly dependent on wild game, their survival nc longer depended totally on following game animals to specific areas. This change in lifestyle resulted in a loss of certain cultural traits and skills and in a reduction in the use of former extensive territories.

> We also learned that our ways were considered uncivilized and to become assimilated we were sent to a residential school (Yukon Native Brotherhood 1973a)

The whaler, gold seeker, and missionary followed and brought with them their own language, religion, and system of education. In a short period the native had moved from a semi-nomadic self-sufficiency to a relatively sedentary dependence, through which he was being stripped of his language, culture, and religion.

The recent industrial-commercial advance into the north has separated further the modern native from his traditions. Status now is often associated with the wage earner rather than one who can live off the land (McSkimming 1975). Wage employment, school systems, and modern towns have helped to wedge a gap between the older, more traditional people and the younger generations. This has resulted in a loss of skills and culture, two elements that have adapted the native to the land (Nelson et al. 1977a). The effect of schooling in Old Crow is a loss of traditional skills: few of the young people know how to trap or set a trap line (McSkimming 1975).

Native cultures are not transmitted by word of mouth; they are passed down through participating in the traditional activities and visiting ancestral places. With a reduction in land use many culturally important places have been forgotten, and with the modern conveniences and

opportunities now offered in the villages young people spend less time with the elders pursuing traditional activities. This is reflected in many communities by the inability of young people to converse in their native language(Kruse 1979). For example, of 35 respondents surveyed in Old Crow 74.3% spoke English in their home(Burton 1977). The result of this generation gap will be the continued weakening of the "cultural underpinnings" of subsistence.

3.1.7 Considering Native Cultures in Planning

> ...Few places in North America offer this possibility for perpetuating a landscape that is both environmentally and culturally intact (Nelson 1978b).

Land claim proceedings, National Energy Board hearings(1977) and the Berger Inquiry(1977) have recently revived an interest in guarding the northern native cultures. This objective can be achieved within the national park system if due consideration is given to these matters in the planning process.

The general themes of most national parks concern the natural features and events within the park. Though natural features are equally spectacular in the Northern Yukon, an equal emphasis should be placed on the cultures of the people who have inhabited the region since time immemorial. The Northern Yukon may be perceived as a vast wilderness area by most southerners, but the native idea of the land differs greatly. Anderson et al.(1977) noted this of the

Kobuk Eskimo: "To the Eskimos, the Kobuk River Valley is a thoroughly known, elaborately named mosaic of recognized places and features, each with a long history of human occupancy, utilization, and personal associations."
The cultural associations of the landscape bring it to life. These aspects should be a primary interest of any interpretive ventures. An effort should be made during part of the park resource-analysis to map locations significant to the native populations and to record the history and stories associated with each place. The importance of archaeological work should be stressed, so as to reveal the prehistories of the native people.

These cultural aspects must be accounted for in planning. Many areas, though not environmentally sensitive, may be important or sacred places to native people. To disrupt these would be to destroy one of the great resources of the area. The planning team should consist, in part, of a native cultural unit that could compile a cultural resource protection and interpretation plan. This plan might involve hiring native interpreter-guides who would be willing to guide people in the park. For the southerner the wilderness experience would involve minimal contact with people, and his experience would normally be limited to enjoying solitude and natural beauty. Planning with consideration of the cultural values would reveal a whole new dimension in a park experience.

3.1.8 Management Opportunities

> We wanted jobs in managing the resources of the Yukon Territory. We wanted to be managers of those resources. The supplementing of a renewable resource economy would result in jobs in which we would be interested. Instead, we are told that such an approach is dead. We were to become advisors on the management of game. We have not accepted this approach nor will we accept it in the future. It is meaningless, degrading and demoralizing (CYI 1978).

For a management regime to work effectively, the resource users must take an active role in the formulation of objectives. In the arctic the native is more than a casual resource user, and so demands an active part in every level of planning and management. Native politics are stressing involvement in the determination of the future of the north. The sentiments are that the best contributions can be made if native people can first have the means to control their own destiny. Control rests with the land and its resources, that is the emphasis of the land claims proposals. To achieve this goal natives must be integrated into the resource management agencies where they can express their interests through action. Native managers would have better ccoperation than non-natives with native resource users, thus facilitating the implementation of any required restrictive measures. Native-run education programs could use traditional native methods and language to teach conservation principles and effective harvesting practices. There is, however, the possibility that kinship ties and peer pressure would reduce the accuracy of collected harvest data.

Both native groups (COPE and CYI) have suggested the formation of game management bodies. These groups would be responsible for the allocation of game and fur quotas. Quotas would be established by native groups and wildlife agencies. COPE has also suggested the formation of a National Wilderness Park Steering Committee made up of 8 individuals representing COPE(2 members), Old Crow(1), the delta communities of Aklavik, Ft. McPherson, and Arctic Red River(1) each, Department of Fisheries (1), Department of the Environment (1), and the Yukon Territorial Government (1). The committee would advise on the purpose and function of the National Wilderness Park, interim management, and the permanent management regime (COPE Claim section 4.5 1978a).

Resource management is not a field that can be entered without formal training and an understanding of the resources. Although many native people are familiar with animal migration routes and calving areas, and many are adept at reading animal behavior, observation does not reveal the processes of population dynamics and structure, a knowledge of which is essential to the effective management of game populations. Native groups recognize the need for training as resource and park managers, and several government programs are aimed at providing training for them. The Northern Careers Program is designed to train native people for senior and middle management positions in the federal government. These positions include officer-level positions such as game wardens, park wardens,

forestry and fishery officers. The positions require a 2 year diploma from a recognized resource school. Several natives have recently been sent to the Resource Management Training Program taught by Selkirk College in Fort Smith, N.W.T. (Johns-Penikett pers.comm.1978); the field camp portion has been taught at Porter Lake N.W.T. It has been recommended that in the future more camps be held: one in an arctic marine environment, another in the Mackenzie Delta-Richardson Mountain area. The program is still in the early development stages; the Yukon currently has only three native people attending. Employment opportunities at present are limited (Rea pers.comm.1978).

National wilderness parks can help provide management training and employment for local people. Government and institutional researchers often employ natives on a seasonal basis to help with various studies. This should also be encouraged to help provide learning situations for natives.

3.1.9 Tourism

> Wildlife meat, furs, timber and tourism are the 'products' or resources (COPE Claim 1978a pg. 95).

A park that is dedicated to providing some level of public use can provide opportunities for private enterprise; tourism can offer both employment and increased revenues to villages adjacent to national parks. However, it is up to the villages to decide whether or how they want to be involved. In Old Crow there is a growing demand for more employment opportunities (McSkimming 1975), many of which could be met by a national park. In the Yukon Native Brotherhood (YNB) publication (1973a) "Together Today for our Children Tomorrow," the natives expressed a desire to enter the tourist industry: "Indians must begin to participate in this expanding industry".

The villages of the Mackenzie Delta and Old Crow in the Yukon would be ideal access points to the Northern Yukon Wilderness area. There is already some facility development in the delta, but next to nothing in Old Crow. Old Crow is considered one of the most traditional villages in Canada, but with the introduction of television and the annual influx of researchers and tourists it will be difficult for the village to retain its traditional character. It would be up to the people of Old Crow to decide whether they want to tap some of the opportunities associated with a wilderness park. The people of Old Crow have previously suggested offering their own wilderness experience:

> "A wilderness holiday concept is being developed whereby tourist families travelling by foot or river-boat will be guided to secluded places of historic interest and natural beauty, stopping in overnight camps, eating camp-cooked food, and enjoying nature as it exists in no other place in the world" (Yukon Native Brotherhood 1973b).

The Inuvialuit have also expressed some interest in developing a greater range of productive economic activities (COPE 1978a, section 12, land claims), of which tourism would be one. Tourism could be village-oriented: local cultural events, handicrafts, or local activities. Old Crow, for example, has many well developed cross-country ski trails that could attract winter tourists. The village has itself suggested the development of tourist-oriented features including a coffee shop, a motel-restaurant-tavern, a hide-tannery, river tours, a tent campground, an airplane charter service, and an advertising agency (YNB 1973b). Tourism could also be park-oriented; this might involve guided nature and cultural tours, canoe tripping, and fishing. These activities would, of course, have to be co-ordinated with park management plans.

3.1.10 The Future of Subsistence

The pattern of northern life continues to be dynamic. What is the future of subsistence? Having examined various aspects of the traditional lifestyle, two possible scenarios for the future present themselves: development of the renewable resources, and decline of the subsistence lifestyle.

3.1.11 Scenario One: Renewable Resource Development

The economic importance of northern renewable resources, the loss of many cultural aspects of the bush life, and the emergence of a native political force have all contributed to a movement that is stressing renewable resource development. Native groups (CYI 1978, COPE 1978a) have endorsed the idea of a wilderness park in the Northern Yukon not to protect its wilderness value (a southern concept) but to protect natural habitats that supply harvestable resources important to their livelihood. With the loss of traditional skills, and with the new aspirations promoted by radio and television, there will develop a move towards commercial development of the renewable resources. This can already be observed in Alaska. Native corporations formed following the land claims settlement have set up numerous commercial enterprises, turning many of the natives into "businessmen" and depleting some of the resources. Thus it seems that national parks will have to define legitimate commercial use rather than subsistence, even though part of the harvest will be for domestic use.

The viability of developing the renewable resource sector depends upon the biological limitations of the specific area and species harvested. There are basically three ways to increase present revenues from the renewable resources: increase harvests, develop secondary industries and new marketing strategies, and develop agricultural

industries such as game ranching and fur farming. The success of each option will in turn depend mainly on three factors: the effects on the resources (ecological component), the economic return (economic component), and the cultural compatibility of the enterprise (ethnological component).

3.1.11.1 Increase Harvest (Current Methods)

1. Biological impact

The area of the proposed park (and in fact the entire western arctic) is considered to be of low productivity. This means a low recovery rate for reduced stocks due to low growth rates. Harvests can only be increased to a certain level before endangering the specific resource. Some researchers feel that some species are currently under harvested and that resources could be used more efficiently (Ruttan and T'Seleie 1976, Usher 1976a).

2. Economic Viability

The increase in economic return for the required increase in harvesting intensity should be examined to determine if this is a viable alternative. This would be a labor-intensive operation, so a scarcity of labour might cause problems.

3. Cultural Compatibility

The increased harvest option would permit the continuation of traditional land-use ideas; natives would remain hunters.

3.1.11.2 Increase Harvest (Commercial Enterprises)

1. Biological impact

Commercial harvesting relies on larger yields than would a single-hunter operation. Developments of this nature in areas of low productivity have the potential for great impact.

2. Economic viability

Several commercial enterprises have been attempted in the western arctic. Many went the way of the Menzie Fish Company, an unsuccessful enterprise that operated out of the Mackenzie Delta and Herschel Island in the late 1960's. Arctic waters have a lower species diversity and lower levels of growth and productivity than warmer waters; any disruption of fish populations may affect the food web (Delury et al. 1975). Moreover, the funds required to establish these industries are great in relation to the possible returns.

3. Cultural Compatibility

Though still involving hunting and fishing, the methods are not traditional in nature. This may be one reason for their lack of success.

3.1.11.3 Secondary Industry and New Marketing Strategies

1. Biological impact

   The establishment of secondary industries such as tanning and garment industries could be accomplished without increasing harvests, and thus without endangering resource stocks.

2. Economic Viability

   Most of the revenues gained from northern renewable resources do not accrue directly to the native harvester. This is especially evident in the fur industry. Raw furs that sell for $4.00 each go into the making of coats that sell for thousands. Whitefish and char command high prices in southern markets, yet the native does not receive the bulk of the profits. The establishment of secondary industries and native marketing organizations could substantially increase revenues to northerners. Tanning and garment industries would be localized in villages outside of the park, so that the impact on the park environment would be negligible. Capturing more of the profit margin by establishing secondary industries and direct marketing techniques could not only yield greater revenues but also increase employment.

3. Cultural Compatibility

   This option would still allow for the continuation of traditional means of harvesting. These secondary industries would require the development of new

managerial and operational skills, though some products would be traditional and as such would encourage traditional skills

3.1.11.4 Domestication of Local Resources

This includes game ranching, furfarming, and aquaculture. These activities could supply both a food and clothing source.

1. Biological impact

The impact on the environment would depend on the species and the intensity of the operation. The use of native species such as caribou instead of reindeer is advisable (Scotter 1970). Impacts on vegetation would have to be considered. The raising of furbearers and fish in structures located in the communities would have less impact on the environment than traditional harvesting methods. Relying on these domestic products would reduce the impact on natural wildlife resources.

2. Economic Viability

It is difficult to predict the economic success of such a venture as the attitude towards these types of industries is crucial to their success.

3. Cultural Compatibility

A reliance on domestic game would cause a shift from traditional hunting to an agrarian lifestyle. Native people have expressed dislike for this type of existence; experience with the Tuktoyaktuk Reindeer

Reserve has illustrated their reluctance to keep and herd wildlife. However, native groups in Alaska have made the adjustment to this type of resource use(Stern 1979).

These development options are represented in a summary matrix(table 3.1.13). Each option was rated for its ability to meet the three criteria(ecological, cultural, and economic) on a scale from -2(negative impact) to +2(positive impact), 0 representing a neutral effect. Of the possible development options, the establishment of secondary industries and native-run marketing agencies appears to best meet the criteria of conservation,economic return, and cultural compatibility, and would be the most suitable to wilderness park goals.

Table 3.1.13 Renewable resource development options

CRITERIA / OPTIONS	ECOLOGICAL	CULTURAL	ECONOMIC	TOTAL
Increase harvest levels (present methods)	-1	+1	0	0
Increase harvest levels (commercial)	-2	-1	+1	-2
Secondary Industry and Marketing	+1	0	+2	+3
Domestication	+1	-1	+1	+1

-2 Strong negative effect
-1 Negative effect
0 Neutral effect
+1 Positive effect
+2 Strong positive effect

3.1.12 Scenario Two: Decline of the Subsistence Lifestyle

The next 20 years will likely see a further decline of the subsistence lifestyle. The rising expectations of northern natives and the ease with which those expectations are filled by the south will continue to separate the native from the land. At best, the present level of subsistence will be maintained.

As the push for northern development continues, formerly remote villages become easily accessible. The Dempster Highway now links the Mackenzie Delta to southern Canada and will soon be carrying the south into the Western Arctic. Old Crow remains somewhat isolated, but as the subsistence lifestyle continues to erode, and the demand for wage employment increases, the proposal to link Old Crow with the Dempster Highway will become more attractive.

Living off the land is becoming an expensive proposition, as it is necessary to maintain complex equipment. Most native people are forced to take at least some wage employment to sustain their subsistence lifestyle. This fact, plus demographic and social factors, is responsible for the continued decay of the cultural components of subsistence. Without the native languages, skills, and family associations, the native life style will begin to converge towards that of southern people. Subsistence hunting, fishing, and trapping will remain important for a few, but most will come to regard these

activities more as leisure time pursuits.

The future of northern natives depends largely on the outcome of land claims settlements. Precedent has been set in Alaska, James Bay, and now the Western Arctic, where natives have accepted large sums of money in the settlement package, and have formed regional and village corporations to invest and distribute these funds. The input of cash into the native economy will further the demise of subsistence, as natives will take up management positions and pursue profits instead of game. Profits are not to be found at the subsistence level of renewable resource use because of biological limitations; natives will have to look to other resource sectors for investment.

What significance will a decline in subsistence have for the national park in the Northern Yukon? The concerns of park managers include the viability of the renewable resources as well as the cultural and historic values associated with the land. A decline in subsistence will affect all these features. It is possible that there will be a reduction in fur and game harvests, thus relieving some of the predation presure on wildlife species. Moreover, there will be a loss of the living cultural component, as those native people with the traditional knowledge and skills pass on. The loss of the cultural component and the reduction of hunting may require a change in park policy towards native use.

3.2 RESEARCHERS

> National Parks carry international recognition as custodians of very important research resources... It is difficult to avoid some sense of conflict between the researcher and the land administrator. The researchers, in order to perform must have privileges which are not available to the usual park visitor. They also have unusual responsibilities (Cowan 1977).

The National Park goals of preservation and enjoyment suggest three key parts of the whole interrelated system, each with research needs (Cragg 1969). The first is the natural environment: research is needed both to determine the environmental effects of use and to determine appropriate management alternatives. The second category of research focuses on the visitor and his interaction with the environment, with other visitors, and with management programs. The third type of research will address the issue of areas outside the park that influence the park and its resources.

National parks also provide unique areas for fundamental and curiosity-oriented research:

> Just as the number of visitors to national parks is rising so is the need for research sites by the growing number of scientists concerned with aspects of environmental science; biologists, geographers, geologists among others require access to field areas for their studies (Marsh 1969).

The tremendous increase in research in an area after it has been established as a park is reflected by a recent bibliography compiled by Miller (1978). Of 29 studies conducted in Nahanni National Park by the Canadian Wildlife

Service, all but 5 were undertaken after 1972, when Nahanni achieved park status. The pattern is similar for other parks and can be expected for the Northern Yukon.

3.2.1 Research Needs in the Northern Yukon

The Northern Yukon and its resources were scarcely known before the proposal to build a pipeline from Prudhoe Bay to the Mackenzie Valley. This prompted a number of years of extensive ecological studies, published largely in the Arctic Gas Biological Report Series. However there still exists a void in the basic knowledge that will be required to adequately manage the area as a National Park.

Research is continuing on the archaeological and paleontological resources of the Northern Yukon. It is in this area that Harington et al. (1975) and others have found human artifacts dating back some 27,000 years. There are currently two major projects involved in archaeological research in the Northern Yukon: the University of Toronto's Northern Yukon Research Program and the Yukon Refugium Project headed by R.E. Morlan of the Archaeological Survey of Canada.

There is little or no information on the relationship of the native people to resources. There is frequent talk of imposing harvest restrictions, yet no data-base on which to make decisions. This is due both to the lack of baseline information on economic species and to the absence of information on native food requirements. For park management

it may be necessary to understand the nature of subsistence activities: which land areas are used, how much and during what periods. It will be important to understand the relationship between fluctuating resource availability and subsistence activites. Economic studies are needed to examine the nature of the dependency upon subsistence, and to suggest possible alternatives. Research into the cultural dimensions of subsistence is also needed. It may also be essential for the preservation of some species to find alternative resources or new ways of utilizing present harvests. Research must address this problem.

Data on wilderness users is essential for management of the wilderness opportunities provided in the park. At present use is low, but visitor information and feedback on wilderness quality is an essential wilderness monitoring device.

3.2.1.1 Researcher Impacts

> Like any form of men's activity, research can have detrimental effects on both the resources of the study area and those being the subject of study (Parks Canada 1978d).

Researchers will most likely constitute a major user group in the Northern Yukon. Large numbers of scientists, such as those associated with the archaeological investigations, can have significant impacts on the resources, on other users, and sociological effects on the native communities. Already the researcher population that visits Old Crow probably exceeds that of the village. Peter Lord, a resident of Old

Crow, expressed his concern at the Berger community hearings over what the large influx of researchers into Old Crow might do to the village(Mackenzie Valley Community Hearings C-14, 1975-76, pg. 1288).

Researchers must also involve native people in their work and keep them informed of their research. Natives have already expressed some disdain at the lack of communication shown by northern researchers.

> Two often in the past archaeologists have come up North, excavate then leave after having had a minimal contact with the Inuit population(Weetaluktuk 1978).

There is a need to inform native people of the purpose of the research and it is important to seek their approval. During the Pipeline community hearings in Old Crow, many of the people expressed their dissaproval of Renewable Resources Consulting Ltd. census of caribou. The people claimed that Renewable's researchers harassed the caribou, and were worried that the caribou would leave the Old Crow area. Old Crow people also reported that the Fisheries Research Board dumped some chemicals into a stream for a test without informing the people. Such actions can only lead to bad relations between researchers and the native people.

Often researchers in one field are ignorant of other resources and the potential for causing impacts. Mossop and Hayes(1977) reported disturbances to raptor nesting sites along the Old Crow River by archaeologists of the Northern Yukon Research Program. Research must also fit within the

biocentric guidelines.

A large part of researcher's impact results from the use of aircraft. Research operations often require frequent replenishing of supplies. This means frequent air travel, which can be disruptive to wildlife and recreational users. There are always options to reduce impacts, and researchers should examine these alternatives as they relate to effects on the resources. Supplies should be flown in before critical periods for wildlife, or alternative flight paths should be taken to reduce impacts on resources. Camps should be located in low impact areas and researchers must be responsible for cleaning up their camps. Survey methods could be altered to have only minimal impacts. Allison(1978) noted that ungulate biologists were responsible for harassment of caribou through their capture methods and handling, and that this often led to capture myopathy.

The research season is limited in the north because of climate and day length. Research is concentrated during the same season as recreation(summer), and conflicts may arise. As seen in the ANWR, recreationists support scientific study(73.9% in favor, Table 3.2.1) However, many qualified their response with the provision that researchers leave the wildlife unharassed and the area untrammelled. Many recreationsits in the ANWR were disappointed to see the littered camps left by researchers.

Table 3.2.1. Visitors' reactions to scientific studies within the ANWR

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	49	42.6
Favorable	36	31.3
Neutral	16	13.9
Unfavorable	5	4.3
Strongly unfavorable	9	7.8
TOTAL	115	100.0

3.2.1.2 Restrictions

Researchers already require a research permit. However. it is more of a formality than a regulatory document. The conditions for obtaining a research permit in the Northern Yukon should be made more rigorous. Research should only be permitted if it is dependent on a specific resource within the park or related to basic concerns about its management. If the research could be conducted outside the park, the researchers should be directed elsewhere. The permit should also serve an educational function; it should inform researchers of possible impacts, and of the least disruptive periods and methods for supplying their crews and constructing their field camps. Researchers, like recreationists are opposed to the regulation and bureaucratization of their activities, but if the primary goal is to protect the Northern Yukon's resources and the wilderness experience, these restrictions must be borne. There still remains of course the problem that researchers in the north are often isolated and therefore not subject to enforcement of the conditions of their permit.

3.3 RECREATIONISTS

3.3.1 Recreational Opportunities in the Northern Yukon

> ...the opportunities for wilderness recreation ... and for the primal experience of space, solitude, and beauty alone, may be the most valuable resource we have in the North (A.M. Pearson 1977).

Recreational use in the Northern Yukon at present is limited to the several parties each year that float down the Porcupine River, an occasional visitor to Herschel Island, and a few researchers that hike and fish in their spare time.

The Northern Yukon presents opportunities for a variety of wilderness associated activities: backpacking, mountain climbing, canoeing, kayaking, photographing, and nature viewing.

3.3.1.1 Backpacking and Associated Activities

The Northern Yukon's major attractions are its fluvial-influenced, unglaciated landscapes, and its abundance of wildlife, especially the Porcupine Caribou Herd (Figure 11). The best areas for viewing these features are largely concentrated in the Northern Mountain ecoregion. Along the banks of the Firth River white spruce reaches its northern limit. The entire complex of ecodistricts that cover the Firth-Malcolm area is extremely scenic and provides many opportunities for viewing wildlife, climbing mountains, or fishing for arctic char and grayling. Natural

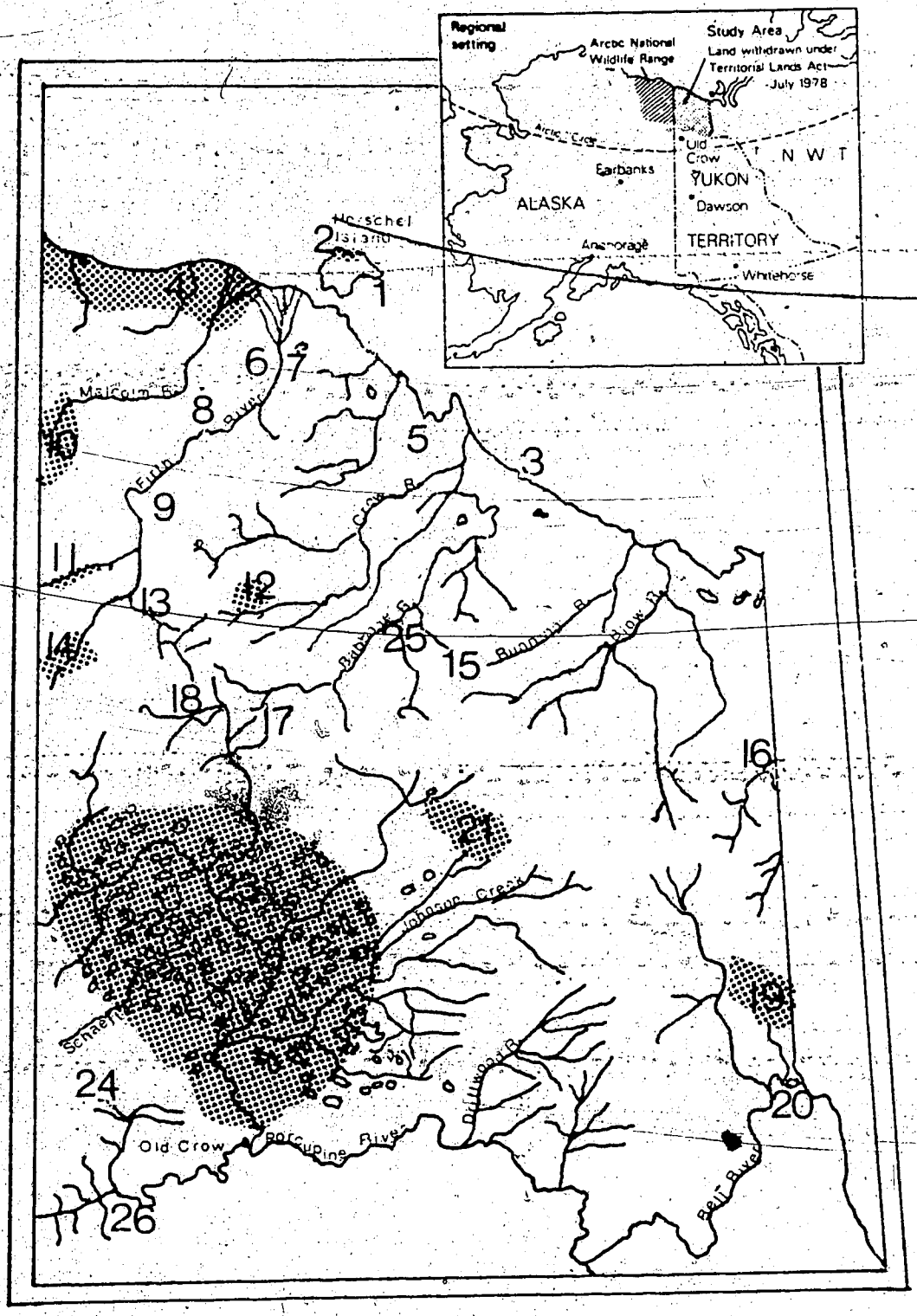
routes or corridors, such as river valleys and alpine ridges, will most likely be sought out by backpackers. River valleys will be most popular as they provide the best campsites, easy access and fuel, and the best opportunities for viewing wildlife. These ecodistricts are prime summer habitat for caribou, grizzly bear and Dall's sheep. The diverse habitats --arctic, alpine, and riparian-- produce an array of arctic plants. Everywhere along the Firth River is archaeological evidence of the cultures that formerly inhabited the region, and near the coastal plain is Engigstciak, a multi-cultural archaeological site. Near the headwaters of the Firth River and Joe Creek are extensive areas of aufeis.

In the central region lie the Barnes Mountains. This area would also provide for relatively easy hiking if hikers followed the major river systems. The Barnes Range has many erosional features, such as the spectacular Sleepy Mountain inselberg. On the Babbage River are Babbage Falls, above which lives an isolated population of Arctic Char. The mesa-like landscape presents numerous features for the photographer and geomorphologist.

The Richardson Mountains present wide vistas of treeless hills. Near the Northwest Territories border are the White Mountains whose limestone peaks contrast with the surrounding dark bedrock. Summit Lake sits on the continental divide in Rat Pass. This area of the Richardsons is the most magnificent(Wiken et al. 1978).

Figure 11

General Location of Some Outstanding Phenomena



Source: Wiken et al. 1976

Legend: Outstanding Phenomena

1. Historical Importance
2. Spectacular slumps and flows; massive ice beds
3. Spectacular slumps; massive ice wedges and ice beds
4. Komakuk Plains panorama
5. Strand lines
6. Engigstciak
7. Spillway lakes
8. Spectacular lower Firth River gorges; northernmost white spruce in Canada
9. ~~Spectacular gorges of central Firth River~~
10. Volcanic rocks
11. Joe Creek aufeis
12. Viewpoint ridge
13. Stand of immense balsam poplar trees
14. Aufeis of Firth River headwaters
15. Sleepy Mountain-inselberg
16. Incised meanders of Rapid Creek
17. Horseshoe Hill
18. Beaded drainage of Timber Creek tributaries
19. White Mountains
20. Summit Lake
21. Pediments and feather drainage
22. Old Crow flats-oriented lakes; waterfowl and muskrat habitat
23. Old Crow River-archaeological significance; pronounced incised meanders; oxbows, oxbow lakes and multiple oxbow lakes
24. Ramparts on the Porcupine River
25. Bathage Falls
26. Tors of Old Crow Range

The coastal plain and Old Crow Flats are generally too wet to be conducive to extensive wilderness travel and good campsites are rare. It is doubtful that many people will spend much time in this area. Travel will be concentrated primarily in the major river valleys of the Northern Mountain ecoregion.

3.3.2 River Recreation

Most of the rivers in the Northern Yukon are too shallow to permit canoeing, kayaking, or rafting. However, the Firth River and the Porcupine Rivers are navigible and both have been inventoried by Parks Canada's Wild River Survey (National Park Service 1972, Donaldson 1972). These two rivers are not only recreational corridors, they have been used for hundreds of years by native people, and more recently by fur traders, explorers, and men in search of gold.

3.3.2.1 Firth River Area

Historical Significance

The Firth River was used by the Vunta Kutchin Indians who followed its course to Herschel Island where they traded with the Mackenzie Inuit. The Inuit fished the rich delta of the Firth and Malcolm Rivers, and both they and the Kutchin fished at the fish hole near the headwaters of the Firth. It was at Herschel Island in 1826 that Franklin first

encountered the Kutchin Indians. As the Indians had travelled down the Firth to trade on the island, Franklin named the river the Mountain Indian River. Franklin climbed a number of peaks in the area naming them after his friends: Conybeare, Robinson, Goderich, and Huskisson(Franklin 1828).

Many other people travelled the coast, most in search of the Northwest Passage or of Franklin himself. In 1851 Collinson, leader of an expedition to find Franklin, noted the presence of whales in the area, and later recommended that a whaling industry be set up in the North. He found Herschel Island provided an adequate overwintering port(Ritchie and Childers 1977). In 1888 whalers from the United States made their first whaling voyage to Herschel Island. The following year whalers overwintered on Herschel Island. This marked the beginning of a 15 year period when Herschel Island was the centre of arctic whaling. During its peak 3000 people lived on Herschel. Often conditions forced the whalers to leave, many would then attempt the trip up the Firth River to Ft. Yukon. Most failed.

During this period an Anglican Mission (1893) and a Royal Northwest Mounted Police post(1903-1935) were established on the island(Warner 1973). As early as 1898, during the Klondike gold rush, men

ventured down the Firth in search of placer gold, and a little was found in the gravel bars of the upper Firth.

In 1889 J.H. Turner of the United States Coast and Geodetic Survey established the 141st. meridian on the Porcupine River. He made observations for magnetic declination at many points along his route northward along the Firth. He reached the coast and Herschel Island, took azimuth and latitude readings, then returned south via the same route(International Boundary Commission 1918). In 1908 Roald Amundson became the first to find the Northwest Passage. After meeting a ship that had come the opposite way he headed for Herschel Island where he spent some time with the whalers. Anxious to send out his and the crew's mail he decided to take the mail himself overland to Fort Yukon and Eagle City. He left Herschel Island and ascended the Herschel Island River(Firth) till he met the Porcupine River. He then continued on to Fort Yukon and Eagle City(Amundson 1908).

The Yukon-Alaska boundary was surveyed in 1911 and 1912. The crew consisted of a topographic party and a triangulation party. In 1911 mapping proceeded from the Porcupine River to Joe Creek on the Firth. In 1912, 84 horses and 100 men headed down the Firth River. Mapping and triangulation crews combined camp

near the head of the Malcolm River, about 30 miles from the coast. They later travelled to Herschel Island(International Boundary Commission 1918).

During the period 1913 to 1918 the Canadian Arctic Expedition led by Vilhjalmur Steffanson and Dr. R.M. Anderson explored the Western Arctic. The scientific expedition included specialists in the fields of geology, topography, oceanography, biology, marine zoology, anthropology, magnetism, photography, and medicine. In 1914 part of the crew travelled from Collinson Point to Herschel Island. A geological team then explored about 50 miles up the Firth River. Numerous fossils were collected(O'Neil 1924). In 1915 the Hudson's Bay Company established a trading post on Herschel Island, to which Indians again travelled following the Firth.

The idea that there was placer gold along the Firth became more popular when prospectors from the Dominion Explorers examined deposits in 1930. In 1947 more people ventured to the Firth to search for gold. Most people tried in the gravel bars about 40 miles in from the coast(Sandy 1948). One placer operation remains today on the Firth at Sheep Creek.

Ten years later in 1957 R.S. MacNeish, an archaeologist, reconnoitered the complete pass from Old Crow down the Firth River to the Arctic Ocean. He located over 100 archaeological sites including a

multi-cultural site at Engigstciak on the Firth (MacNeish 1957). Since MacNeish's expedition many researchers have explored this river and its tributaries, the most recent being connected with the pipeline studies.

Recreation Potential

The headwaters of the Firth River are in Alaska, from where it flows over 90 miles through the Northern Yukon to just southeast of Herschel Island. Although it has been run by a few adventurers the potential for canoeing the river is somewhat limited. The limiting factors are primarily the cost of flying a boat in and out, and the series of almost impassable rapids in the canyon section of the Firth. For access, the only lake capable of handling floatplanes is Margaret Lake, 72 miles from the river's mouth. Egress is possible from Firth Lake on the Arctic Coastal Plain, but it requires a 3-mile portage over hummocky terrain to get there. Water levels fluctuate greatly, with flood peaks occuring in the early summer; they become low near the end of August. Levels also fluctuate with the weather; prolonged periods of rain will raise the water levels in a very short period of time. The river is fairly calm up to where the canyon section of the Firth begins, near Sheep Creek. From there

the survey(National Park Service 1972) abandoned the river. The surveyors suggest that only the totally experienced canoeist take on this river.

3.3.2.2 Porcupine River

Historical Significance

The Porcupine-Bell River system was and is a major transportation link from the Northern Yukon to the Mackenzie Valley and Alaska. The Kutchin Indians used the river extensively for fishing, access to hunting and trapping areas, and as a route to trade with their kinsmen in Alaska and the Northwest Territories(Osgood 1936). It wasn't until 1845 that the first white man travelled this route. John Bell of the Hudson's Bay Company was sent out to find new regions for the fur trade. He descended the Bell River via the Rat-Bell portage and continued down the Porcupine River to the Yukon River. He established Fort MacPherson and set up a depot on the Bell River called Lapierre's House. This route later formed a connection with Fort Yukon and Rampart House(Cooke and Holland 1978).

Two years later Alexander Murray travelled from the Mackenzie River to the Porcupine River and established Fort Yukon for the Hudson's Bay Company, which was subsequently moved twice with the establishment of the Canada-U.S. border. In the

1860's came fur traders, Hardisty in 1867, Jones in 1869, and missionary, Reverend Kirby in 1862. With the gold rush came more people and river boats steamed up and down the Porcupine River. In 1912 the village of Old Crow was established at the confluence of the Old Crow River and the Porcupine (Harrington 1961). Following this period many ethnographers entered the area, the most notable being Osgood whose 1936 ethnography of the Kutchin remains the definitive work.

Recreational Potential

Many people have already run the Porcupine River. Access to the river is by float plane to Summit Lake or by paddling from the Mackenzie up the Rat River into Rat Pass. The trip from Summit Lake to Fort Yukon Alaska is 508 miles and took the river survey crew 18 days to run (Donaldson 1972). The river passes through the Boreal Forest-Arctic Tundra ecotone, and is entirely above the arctic circle. The best water levels occur from mid June through July.

Around Summit Lake are many good observation points, particularly Mt. Russel. One must portage from the lake into the Little Bell River; after 13 miles of narrow winding river the Little Bell joins the Bell River. The Bell is wide and has a slow and

steady current. It passes by historic Lapierre's House (which is in need of restoration) into the Porcupine River. The river presents no hazards, the current increasing after the Driftwood River. Egress can be made at Old Crow, where there is scheduled air service to the south, or one can continue on to Fort Yukon in Alaska.

From Old Crow the river gets more interesting. It passes into a set of narrows known as the Ramparts near Caribou Bar Creek. The current is swift for the next 50 miles. The river passes New Rampart House close to the Alaskan border (where again the historic buildings need to be restored). The river continues through the Old Ramparts to the Yukon Flats and finally Fort Yukon. Discussions on the possibility for an "international wild river" should be held with Alaska.

3.3.3 The Arctic Wilderness Recreationist

There is a need to gather information on wilderness users to gain insight into their values and preferences. A knowledge of user goals can lead to protection of the aspects of wilderness they value. The following discussion is based on data gathered by a recreation survey in the Arctic National Wildlife Range. The questionnaire was part of a study originally undertaken by Renewable Resources Consulting Ltd. as a preliminary investigation of the recreational and aesthetic resources of the ANWR. The questionnaire has not been previously analysed. Information from the survey is being used to acquire an understanding of the arctic recreationist:who he is, what he seeks in a wilderness experience, and his reactions to various management proposals. The sample of 1976 users included 119 respondents which represents approximately 50% of the 1976 users of the ANWR.

It is important to know which individuals in society are motivated to use wilderness, in this case specifically that of the Western Arctic. These data are important because they allow researchers and managers to assess visitor expectations based on the visitor's characteristics. This knowledge can be used to help predict visitor reactions to specific management practices and therefore help minimize wilderness management conflicts.

Hendee *et al.* (1968) used both demographic

characteristics and a Likert-like attitude testing scale to determine how people value wilderness. Hendee used a set of 60 short questions that related to wildland recreation values to classify visitors as to their degree of wilderness purism or "wildernism". He found that the purist user generally comes from an urban background, is highly educated, has many friends who participate in wilderness activities, and is likely to belong to one or more conservationist organizations or outdoor clubs. The "wildernist" typically rejects facilities and all artifacts of man. His purpose in seeking out wilderness is to seek respite from humans and their signs (Hendee et al. 1968).

3.3.4 Findings

The arctic wilderness user appears to fit the description of the purist. The respondents to the ANWR survey equally represent urban and non urban environments (urban or suburban 53% of the sample, rural or small town 47%), and were generally highly educated. Most of the respondents (84.9%) had at least some university education, and 30.3% had done post-graduate work. These values are similar to and slightly higher than those found by Hendee et al. 1968, Lucas (1964), the Outdoor Recreation Resources Review Commission (ORRRC, 1962) and Burch and Wenger (1967), in their studies of different wilderness areas. Ages of the respondents ranged from 12 to 78 years, with a mean of 33.5 years. Age groups clustered around the 19 to 24 range and

the 25 to 35 range; sixty percent of the respondents were less than 30. Many recreationists were unmarried(55.5%) and male(66.9%). Of those who were married only 31.6% had dependent children. The unmarried people and married people without dependent children have fewer responsibilities than married people with children, and this probably explains their larger representation. A large percentage of respondents are either professionals or employed in the white collar sector(50.4%). Other major groupings include students(13.4%) and retired individuals(8.4%). Again this is similar to studies of other wilderness users (Hendee et al.1968, Lucas 1978). The implication is that most of the respondents are in the higher income brackets. The mean annual income falls in the $15,000 to $20,000 bracket.

If membership in conservation groups is indicative of being conservation minded, this group rates very highly. Seventy-three percent of all respondents belong to at least one conservation or outdoor club(Table 3.3.1). Most belong to more than three such clubs, and some are members of up to eight different conservation organizations. This rate of participation far exceeds that found by researchers studying wilderness recreationists in the lower 48 American States (Hendee et al. 1968, Lucas 1978). large national organizations such as the Sierra Club, Wilderness Society, and Audubon Society are most frequently mentioned. It is largely through these organizations, friends, books and articles that people hear about the ANWR.

The recreationists in the ANWR came primarily from the lower 48 American states(62%), 45.9% of them(24.4% of total users) on a guided expedition sponsored by a conservation organization(Table 3.3.2). Trips such as these are becoming popular in Canada, and this type of user will likely be common in the Northern Yukon. Residents from Alaska made up 32% of the users, most of whom entered the range unguided and unaffiliated with a group. There was also one party from Canada and two parties from Norway. The relationship between place of residence and association with a guiding service was tested by Chi-square analysis(Table 3.3.3) and it was found that those from the lower 48 states were much more likely to engage a guide than were all other users(Chi-square=13.87;$p<0.001$) Very few of the respondents had ever visited the range before and for most it was their first time in the arctic.

The major method of transport from outside Alaska was by plane. Most respondents flew into Fairbanks where they transferred to commercial flights to Kaktovik on Barter Island. A few recreationists visited the south slope, and consequently flew into Arctic Village instead.

3.3.5 The Quality Experience

The ANWR and other arctic areas offer many of the elements that provide for user satisfaction. The ANWR recreationists were asked to name the qualities they thought exemplified the range. The most popular response(58% of

Table 3.3.1. Number of respondents that belong to a conservation or outdoor organization

MEMBERSHIP IN CLUB	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
YES	87	73.1
NO	32	26.9
TOTAL	119	100.0

Table 3.3.2. Number of trips taken that were associated with a club or organization

CAME WITH A CLUB	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
YES	29	24.4
NO	90	75.6
TOTAL	119	100.0

Table 3.3.3 Crosstabulation of the place of residence and use of a guiding service. Results show that there is a significant relationship; visitors from the lower 48 American states are more apt to come with a guiding service then visitors from the other locales. (Top number in each box is the absolute frequency, bottom number is the percent frequency)

RESIDENCE	USED A GUIDING SERVICE	DID NOT USE A GUIDING SERVICE	ROW TOTAL
LOWER 48 STATES	34 28.6	40 33.6	45 37.8
OTHER LOCALES ALASKA, CANADA EUROPE	5 4.2	40 33.6	74 62.2
COLUMN TOTAL	39 32.8	80 67.2	119 100.0

CHI SQUARE = 13.87 WITH 1 DEGREE OF FREEDOM.
The result is significant $p<.001$

respondents) was wilderness quality. The second most popular response was the presence of wildlife(56% of respondents). The opportunity to view wildlife in its natural habitat is a major attraction to the ANWR as it will be to the Northern Yukon. Other qualities that were highly rated include the lack of sign of man(35% of respondents) and no other people(33%). The scenery, clean rivers, and clean air were also mentioned by many of the respondents(33%). Eighteen percent mentioned remoteness as a quality, and 17% mentioned solitude. The appeal of the arctic tundra and flora was listed by 14% of the respondents. Only 4% of the people mentioned recreational opportunity as a prime quality of the ANWR.

Respondents were also asked to list those qualities that were least appealing in the ANWR. Most displeasing (39% of respondents) was finding evidence of man. People also complained, usually in a humorous tone, about the insects(mentioned by 21% of respondents), the weather(11.6%) and the difficulty or wetness of the terrain(5.3%). Twelve percent of the respondents said there were too many people in the range and that it significantly affected their experience. Fourteen percent remarked that there was too much air traffic in the ANWR, and that it had taken away from their wilderness experience. Some people were worried about pipeline proposals and other development threats in the range(7%) and a few people mentioned their disappointment in not seeing much wildlife(5.3%)

3.3.5.1 Recreation Activities

Respondents were asked to check all activities they participated in while in the range. The most common activity was hiking(95.8% of the respondents). Fourty-six percent of the people fished and 43% did some mountain climbing. The two activities most enjoyed by hikers were photography(85.7%) and nature study(67.2%). Because of the similar opportunities offered in the Northern Yukon, one can assume that these activities will be popular there. Twenty-eight people(24%) canoed or kayaked, although this was not necessarily the major activity of these people: when respondents were asked to name the activity they considered to be their major pursuit, only 12.6% of the people said boating. Again, hiking was the most common response with 45.4% of the people naming it as their major activity. Hunting was second(16.8%), followed by boating(12.6%), nature study(9.2%), photography(5.9%), mountain climbing(3.4%), pleasure flying(2.5%), scientific study(2.5%), and fishing(1.7%)(Table 3.3.4). No winter users responded to the survey.

The arctic climate means a short season for recreation. Some people entered the area in early June, but most visited the range in July(799 Vistor-User Days) and August(1011 Visitor-User Days)(Table 3.3.5). Excursions into the area ranged from one day fly-ins to trips of up to three months, but the average trip length was 20 days, though most people were in the range for only 10 days to 2 weeks (Table 3.3.6)

Table 3.3.4. The major recreational activities in the ANWR

ACTIVITY	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Hiking	54	45.4
Hunting	20	16.8
Boating	15	12.6
Nature Study	11	9.2
Photography	7	5.9
Mountain Climbing	4	3.4
Pleasure Flying	3	2.5
Scentific Study	3	2.5
Fishing	2	1.7
TOTAL	119	100.0

Table 3.3.5 Recreational use in the ANWR.

Visitor User Days/Month in the ANWR						
	May	June	July	August	Sept.	Oct.
Number of visitor user days	8	351	799	1011	172	1
Percentage visitor user days	0.34	14.9	34.1	43.2	7.3	0.04

Total Visitor User Days=2342
Based on 24 hr. day

Table 3.3.6 The length of stay in the ANWR

	NUMBER OF DAYS				
	less than 10	10-15	16-20	21-30	More than 30
Number of People	18	29	17	11	18
Percent of Total	19.3	31.1	18.3	11.8	19.3
	Mean length of stay=20 days (based on actual length of stay)				

The use period, as dictated by climate, will be much the same in the Northern Yukon.

3.3.6 Carrying Capacity in an Arctic Wilderness

The concept of carrying capacity goes back hundreds of years, but was first popularized by the English clergyman and economist, Thomas Malthus, in 1798. Malthus noted that population increase is checked by environmental limitations, including lack of food, disease, predation, strife, and lack of space. Ultimately, human populations must stabilize at some level of subsistence, since there is an ecological limitation to the number of any species the earth can support (Smith 1966). The concept was later incorporated into the wildlife management field to describe the maximum number of animals that can be supported year round in a given habitat. In 1964 Wagar adapted the concept to recreation. "Recreational carrying capacity" combines the physical or ecological meaning intended in the wildlife management literature with the sociological component of user satisfaction or quality of experience. Recreational carrying capacity is defined by Stankey (1973) as the kind and amount of use an area can support over a specified time without causing an unacceptable change in either the physical environment or the recreation experience.

The crucial part of this process, of course, is deciding what constitutes "acceptable" (or unacceptable) change (Frissel and Stankey 1972). The answer lies in three

interrelated determinants of carrying capacity: management objectives, visitor attitudes, and impacts on physical resources. No single factor sets capacity, but their relative significance varies from one opportunity to another (Stankey 1973). It is management objectives that establish some level of optimum use.

In the case of Northern National Parks and other arctic wilderness areas, management objectives should concern themselves first with the biological resources (biocentric approach). Objectives for use should consider the impact on the environment and the user's perception of appropriate use.

Stankey (1973) found that visitor perception of wilderness quality could be influenced by three broad factors: recreation use-related influences, environmental-related influences, and management-related influences. Recreation-use factors include level of use, type of use, spatial temporal variations in use, and depreciative behavior. It appears from the data analysis that arctic wilderness users are very sensitive towards these factors. In the arctic setting the recreationist likes to feel that he is among the first persons to set foot in this land, or at least the only one there at that time. People have travelled a long way to reach these remote areas, and are disappointed when they find they are not alone, nor the first to be there. Solitude is one of the major qualities attributable to wilderness, and the degree

to which this is found will be a contributing factor to the perceived carrying capacity.

When asked how they would respond to an occasional encounter with another party, 49.6% of the respondents disapproved of such a meeting(37% were neutral) and only 13.4% were favorable, Table 3.3.7). Sixty-three percent of the recreationists actually encountered other parties during their trip, 78.6% of them met from 1 to 3 parties, 21.4% met over 3 parties in the wilderness(Table 3.3.8). Of those people who encountered other parties 62.2% had an adverse reaction. (An additional 25.8% were neutral, Table 3.3.9). Chi-square analysis shows that there is no significant relationship between the number of parties encountered and the reaction(Table 3.3.10 Chi-square=1.39 p=.42, Table 3.3.11 Chi-square= 0.02 p=.87). Nor are people engaged in one particular activity more unfavorable or favorable towards meeting another party; there is a negative reaction towards meeting another party in this wilderness area regardless of the activity engaged in and regardless of whether one encounters no parties or 6 parties. One expects that in such an area one will not encounter others; it degrades the experience if one does. This suggests that these areas have a very low social carrying capacity and that management should manage for such a value to protect the wilderness experience.

Table 3.3.7. Visitors' reactions to occasionally meeting another party in the ANWR

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	1	0.8
Favorable	15	12.6
Neutral	44	37.0
Unfavorable	39	32.8
Strongly unfavorable	20	16.8
TOTAL	119	100.0

Table 3.3.8 The number of parties encountered by visitor parties during their stay in the ANWR(includes only those people who actually encountered parties N=75)

NUMBER OF PARTIES	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
One	30	40.0
Two	19	25.3
Three	10	13.3
Four	5	6.7
More than four	11	14.7
TOTAL	75	100.0

Table 3.3.9. Visitors' reactions to encountering other parties in the wilderness(includes only those respondents who encountered other parties N=74)

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	1	1.4
Favorable	8	10.8
Neutral	19	25.8
Unfavorable	24	32.5
Strongly unfavorable	22	29.7
TOTAL	74	100.0

Table 3.3.10 Crosstabulation of the number of parties encountered with visitors' reactions to meeting parties. Results indicate that the reaction to seeing another party in the wilderness is independent of the number of parties encountered. (Results have been aggregated, neutral responses were omitted, top number in each box is the absolute frequency, the bottom number is the percent frequency)

REACTION TO SEEING ANOTHER PARTY

NUMBER OF PARTIES SEEN	FAVORABLE	UNFAVORABLE	ROW TOTAL
ONE - THREE	9 16.6	32 59.3	41 75.9
FOUR OR MORE	1 1.9	12 22.2	13 24.1
COLUMN TOTAL	10 17.5	44 81.5	54 100.0

CHI SQUARE = 1.39 WITH 1 DEGREE OF FREEDOM.
The result is not significant p=.42

Table 3.3.11 Crosstabulation of whether or not a visitor encountered another party in the wilderness, with the visitor's attitude towards occasionally meeting another party. Results indicate that there is no difference in attitude between those who did encounter a party and those who did not. Both groups are generally opposed to such a meeting. (Results have been aggregated into favorable vs. unfavorable, neutral responses were omitted, top number in each box is the absolute frequency, the bottom number is the percent frequency)

REACTION TO OCCASIONALLY SEEING ANOTHER PARTY

	FAVORABLE	UNFAVORABLE	ROW TOTAL
ENCOUNTERED A PARTY	11 14.7	37 49.3	48 64.0
DID NOT ENCOUNTER ANOTHER PARTY	5 6.7	22 29.3	27 36.0
COLUMN TOTAL	16 21.3	59 78.7	75 100.0

CHI SQUARE = 0.02 WITH 1 DEGREE OF FREEDOM.
The result is not significant p=.87

3.3.6.1 Party Size

The size of group one encounters may contribute to the degradation of the recreation experience, and large groups generally have more impact on the environment (Hendee et al. 1968). In Stankey's study (1973) over two-thirds of the people surveyed concurred with the statement that "seeing a large party (a dozen or more) reduces the feeling that you are out in the wilderness". Purists agreed most strongly with this statement.

In the ANWR 61% of the people travelled in groups of 4 or fewer (includes 8 solo people), 15 people belonged to groups of more than 10 people. Chi-square analysis illustrates a relationship between party size and comming with an organized group (the large groups appear to be from the lower 48 American States) (Table 3.3.12 Chi-square=28.10 $p<.001$). The average party size, including these groups, was 3.9, and only 3.3 without them. When people were asked how they felt towards restricting party size 73.9% were in favor (Table 3.3.13). Most people thought a group of 6-8 was maximum.

Not only does the sight of man degrade the experience, but so does the sight of any sign of man. People expect these areas to be pristine and are upset when they find fuel caches and littered campsites. Stankey (1973) and Burch and Wenger (1967) both found that wilderness visitors were opposed to camping within the sight, sound or evidences of other campers. Two out of three strong purists in some areas

Table 3.3.12 Crosstabulation of party size with whether or not a party came associated with an organized group. Results significantly show that the larger groups (greater than 6) came with such organizations. (Top number in each box is the absolute frequency, the bottom number is the percent frequency)

PARTY SIZE	CAME WITH CLUB	DID NOT COME WITH CLUB	ROW TOTAL
ONE - FIVE	6 5.1	69 58.5	75 63.6
SIX OR MORE	23 19.5	20 16.9	43 36.4
COLUMN TOTAL	29 24.6	89 75.4	118 100.0

CHI SQUARE = 28.10 WITH 1 DEGREE OF FREEDOM.
The result is significant $p<.001$

Table 3.3.13 Visitors' reactions towards restricting the size of recreational parties in the ANWR

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	56	47.0
Favorable	32	26.9
Neutral	14	11.8
Unfavorable	9	7.6
Strongly unfavorable	8	6.7
TOTAL	119	100.0

indicated either a loss of enjoyment, or a shortened visit (Stankey 1973). Finding litter or evidence of vandalism was found to be even more disturbing than seeing too many people in the wilderness.

Seventy-nine percent of all ANWR users found some evidence of previous parties, an indication of the use this area has received by scientists, resource people, and natives. The same conditions exist in the Northern Yukon. On a trip up the Firth River in 1978 several fuel caches and numerous littered campsites were encountered (Thorsell and Zivot 1979). Eighty-five percent of all respondents had a negative response to seeing any evidence of man (Table 3.3.14). In a few cases, where the campsite had been cleaned or the area appeared historically or anthropologically interesting, favorable responses to seeing these signs were given.

3.3.7 Access and Aircraft

Access to the ANWR is primarily by aircraft. From Barter Island, a few people have hired locals to take them to the mainland. As use increases so does the required number of supportive flights. When access to the area is directed largely out of one centre, the flight paths soon become well established. Short trips mean more frequent flights to drop off and pick up users. For example during a single month 15 parties of 4 will be exposed to 30 overhead flights, or one a day for access and egress. This is far in

Table 3.3.14 Visitors' reactions to finding evidence of man(garbage, oildrums, tracks) in the ANWR(includes only those people who found evidence N=88)

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	1	1.1
Favorable	5	5.7
Neutral	7	8.0
Unfavorable	14	15.9
Strongly unfavorable	61	69.3
TOTAL	88	100.0

excess of the number tolerated by people in a wilderness situation. Longer expeditions often demand air drops of supplies, further increasing the number of flights. It is obviously important therefore to examine recreationists reactions to aircraft and possibly determine an aircraft carrying capacity for the area.

In the ANWR 92.4% of all respondents encountered overhead flights during their wilderness experience. Almost half of these parties(43.4%) saw more than 5 aircraft during their stay. Fifty-eight percent of the respondents had a negative reaction to seeing or hearing aircraft in the wilderness(Table 3.3.15). As revealed in the Chi-square analysis, there appears to be a relationship between the number of planes seen and the reaction towards aircraft in the wilderness(Table 3.3.16 Chi-square=4.28 significant $p<.04$) Those people who sighted 3 or more aircraft appeared to react more negatively than people who sighted only 1 or 2 aircraft during their visit. Chi-square analysis of flight frequency and reaction does not reveal a significant relationship; people tend to be adverse to seeing or hearing aircraft regardless of the frequency (Table 3.3.17 Chi-square=1.92 not significant $p=.59$). These results illustrate the need for establishing a limit on aircraft access to wilderness areas although more study is required to establish a definitive carrying capacity.

When respondents were asked how they would react to seeing a plane on a daily basis 73.2% (92.5% with neutral)

Table 3.3.15 Visitors' reactions to seeing aircraft in the ANWR(includes only those respondents who saw aircraft N=104)

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	1	1.0
Favorable	8	7.7
Neutral	35	33.6
Unfavorable	28	26.9
Strongly unfavorable	32	30.8
TOTAL	88	100.0

Table 3.3.16 Crosstabulation of the number of aircraft encountered with the visitor's reaction to seeing aircraft in the ANWR. Results indicate a significant relationship between the number of aircraft sighted and the vistor's reaction. (Results have been aggregated into favorable vs. unfavorable, neutral responses were omitted, top number in each box is the absolute frequency , the bottom number is percent frequency)

REACTION TO SEEING AIRCRAFT

NUMBER OF AIRCRAFT ENCOUNTERED	FAVORABLE	UNFAVORABLE	ROW TOTAL
ONE - TWO	4 6.3	9 14.1	13 20.3
THREE OR MORE	3 4.7	48 75.0	51 79.7
COLUMN TOTAL	57 89.1	7 10.9	64 100.0

CHI SQUARE = 4.28 WITH 1 DEGREE OF FREEDOM.
The result is significant $p<.04$

Table 3.3.17 Crosstabulation of how often visitors saw aircraft with visitors' reaction towards seeing aircraft in ANWR. Results indicate that the reaction to seeing aircraft is independent of the frequency of aircraft. (Results have been aggregated into favorable vs. unfavorable, neutral responses have been omitted, the top number in each box is the absolute frequency, the bottom is the percent frequency)

FREQUENCY OF AIRCRAFT	FAVORABLE	UNFAVORABLE	ROW TOTAL
ONE OR MORE PER DAY	4 6.6	25 41.0	29 47.5
ONE EVERY TWO TO FIVE DAYS	2 3.3	18 29.5	20 32.8
ONE EVERY 6 OR MORE DAYS	3 4.9	9 14.7	12 19.7
COLUMN TOTAL	9 14.8	52 85.2	61 100.0

CHI SQUARE = 1.92 WITH 2 DEGREES OF FREEDOM.
The result is not significant p=.59

were opposed. When asked if seeing a plane weekly would be disruptive, 23.5% responded that it would. Again Chi-square analysis shows no relationship between the experience(encountering aircraft) and the reaction(adverse to seeing aircraft,Table 3.3.18, Chi-square=0.62 not significant p=.43). Thirty percent of the respondents would tolerate seeing a plane once a week(Table 3.3.19). Comments indicated that people favor weekly overflights for security reasons, in case of injury to party members or other trouble. People opposed to seeing planes even once a week often stated that they came to this remote place to escape such intrusions, and if people want security they should seek out other areas such as the national parks. One respondent expressed "...Disappointment and real anxiety wondering where in the entire world one could escape them(planes) if not in the ANWR"

Respondents were asked how they felt about restricting air traffic in the ANWR. Seventy-five percent of the respondents favored imposing some restrictions. This itself illustrates the adverse effects aircraft can have on the wilderness experience. There appears to be no relationship between the number of planes encountered and the willingness to restrict aircraft(Table 3.3.20, Chi-square= 2.37, not significant p=.12) People were also asked to react to the question of having a Fish and Wildlife Service plane check on them occasionally. Again, probably largely for reasons of security, 47.9% of the respondents were in favor of this

Table 3.3.18 Crosstabulation of whether or not visitors encountered aircraft with the visitor's attitude toward accepting daily overflights. Results show that both groups are equally opposed to accepting daily overflights. (Results have been aggregated into favourable vs. unfavourable, neutral responses have been omitted, the top number in each box is the absolute frequency, the bottom is the percent frequency)

REACTION TO SEEING AIRCRAFT ONCE A DAY

	FAVORABLE	UNFAVORABLE	ROW TOTAL
ENCOUNTERED AIRCRAFT	7.0 7.3	80.0 83.3	87.0 90.6
DID NOT ENCOUNTER AIRCRAFT	2.0 2.1	7.0 7.3	9.0 9.4
COLUMN TOTAL	9.0 9.4	87.0 90.9	96.0 100.0

CHI SQUARE = 0.62 WITH 1 DEGREE OF FREEDOM.
The result is not significant p= .43

Table 3.3.19 Visitors' reactions toward seeing aircraft once a week in the ANWR

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	5	4.2
Favorable	31	26.1
Neutral	55	46.2
Unfavorable	20	16.8
Strongly unfavorable	8	6.7
TOTAL	119	100.0

Table 3.3.20 Crosstabulation of the number of aircraft seen with the visitor's attitude toward restricting air traffic in the ANWR. Results show that regardless of the number of aircraft seen visitors agree that there should be restrictions. (Results have been aggregated into favorable vs. unfavorable, neutral responses have been omitted, top number in each box is the absolute frequency, the bottom number is the percent frequency)

REACTION TO RESTRICTING AIR TRAFFIC

NUMBER OF AIRCRAFT SEEN	FAVORABLE	UNFAVORABLE	ROW TOTAL
ONE - TWO	21 24.7	0 0.0	21 24.7
THREE OR MORE	54 63.5	10 11.8	64 75.3
COLUMN TOTAL	75 88.2	10 11.8	85 100.0

CHI SQUARE = 2.37 WITH 1 DEGREE OF FREEDOM.
The result is not significant p=.12

action (23.1% disapproved). Crosstabulation of the response with the major activity of visitors showed that those who disapproved (23.1%) were mostly hunters (Chi-square=8.3 not significant p=.08). They obviously did not want the agency responsible for game checking on their parties. Lack of this type of intrusion is most likely a major part of the wilderness hunting experience, and this is why it is vehemently opposed by hunters.

3.3.8 Rationing Wilderness Use

One of the principles of wilderness management laid down by Hendee et al. (1978) is that managers should implement the minimum amount of regulation necessary to achieve management objectives. The themes of freedom, spontaneity and escape have emerged as important components of the wilderness experience. Therefore the decision to impose use restrictions must be carefully considered.

Wilderness permits are now required in 50% of American wilderness areas and are becoming more evident on the Canadian scene. Banff National Park recently introduced the park-use permit system (Thorsell 1978). Permits provide a means of limiting or directing use, provide managers with information about users, and allow for user-management contact. This contact can be an opportunity to relay information to the public and promote the agency.

Recreationists in the ANWR seem quite willing to at least filling out a mandatory trip plan (56% of the

respondents). However when the freedom of wilderness use is in question the respondents are less agreeable to restrictions.

Spatial distribution of use may be necessary in order to separate incompatible uses, protect biological resources, and to reduce the rate of encounters in the backcountry. This, of course impinges on the freedom of wilderness travel. When people were asked how they felt about having the area of their trip regulated, only 36.4% were in favor (Table 3.3.21), and 30.5% were in favor of restricting the timing of their trip (Table 3.3.22). But even among the people that opposed such restrictions many mentioned that if the restrictions were to protect the environment and the wilderness experience that they would be in favor (Many, however, felt there was simply no need as yet for such restrictions). Chi-square analysis shows no relationship between the number of parties encountered and the response to time and area restrictions (Table 3.3.23 Chi-square=0.40 not significant p=.53, Table 3.3.24 Chi-square=0.69 not significant p=.42).

3.3.8.1 Facilities and Wilderness

Hendee et al. (1968) found that purists were most highly opposed to facility development in wilderness. In 1966 Watt conducted a survey of outdoor recreationists, asking three different groups, the Sierra Club, the Adirondack Mountain Club and the National Campers and Hikers Association, how

Table 3.3.21 Visitors' reactions toward having the area of their trip regulated

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	22	18.6
Favorable	21	17.8
Neutral	11	9.3
Unfavorable	35	29.7
Strongly unfavorable	29	24.6
TOTAL	118	100.0

Table 3.3.22 Visitors' reactions toward having the timing of their trip regulated

RESPONSE	ABSOLUTE FREQUENCY	FREQUENCY (PERCENT)
Strongly favorable	20	18.5
Favorable	13	12.0
Neutral	14	13.0
Unfavorable	33	30.6
Strongly unfavorable	28	25.9
TOTAL	108	100.0

Table 3.3.23 Crosstabulation of the number of other parties encountered in the wilderness with the visitor's attitude towards having the area of their trip regulated. Results indicate that the user's willingness to accept regulation of the area of their trip is independent of the number of the parties encountered. (Results have been aggregated into favorable vs. unfavorable, neutral responses have been omitted top number in each box is the absolute frequency, the bottom number is the percent frequency)

REACTION TO HAVING AREA REGULATED

NUMBER OF PARTIES SEEN	FAVORABLE	UNFAVORABLE	ROW TOTAL
ONE TO THREE	19 29.7	32 50.0	51 79.7
FOUR OR MORE	3 4.7	10 15.6	13 20.3
COLUMN TOTAL	22 34.4	42 65.6	64 100.0

CHI SQUARE = 0.40 WITH 1 DEGREE OF FREEDOM.
The result is not significant p=.53

Table 3.3.24 Crosstabulation of the number of other parties encountered in the wilderness with the visitor's attitude towards having the timing of their trip regulated. Results indicate that the user's willingness to accept regulation of the timing of their trip is independent of the number of parties encountered. (Results have been aggregated into favorable vs. unfavorable, neutral responses have been omitted, top number in each box is the absolute frequency, the bottom number is the percent frequency)

REACTION TO HAVING TIME REGULATED

NUMBER OF PARTIES SEEN	FAVORABLE	UNFAVORABLE	ROW TOTAL
ONE - THREE	20 31.7	30 47.6	50 79.4
FOUR OR MORE	3 4.8	10 15.9	13 20.6
COLUMN TOTAL	23 36.5	40 63.5	63 100.0

CHI SQUARE = 0.69 WITH 1 DEGREE OF FREEDOM.
The result is not significant p=.42

they felt about three proposed developments for the ANWR: guide service, trail shelters, and air strips. Fifty-three percent of all respondents(N=205) were in favor of a guide service, 73% of all respondents were in favor of trail shelters, and 35% were in favor of air strips in the ANWR. Since this time, perhaps, people have become more sensitive to environmental concerns and the value of wilderness, or perhaps Watt's survey of user groups was not representative of the people who would eventually use this arctic wilderness.

The 1976 survey shows that people are generally against any type of development in the ANWR. Ninety-five percent of the respondents opposed the construction of landing strips, 81.5% were opposed to trail shelters, and 83% were opposed to the construction of trails. Respondents were also asked if they would accept an interpretive centre in the range; 76% opposed this idea. However, many who did oppose an interpretive centre commented that one would be appropriate outside of the range either in Kaktovik, on Barter Island, or in a major centre of departure such as Fairbanks or Anchorage. This in fact parallels Parks Canada's policy towards interpretive facilities in National Wilderness Parks(Parks Canada 1978c). Most of the respondents were also against sport hunting in the range(60.2%), and said that hunting in a wildlife range set up to protect wildlife was ironic and contradictory. A few respondents mentioned that only native subsistence hunting should be permitted. Guided

hunting was also opposed by 66% of the respondents, and the use of pack animals in the range was rejected by 70% of those surveyed.

4. IMPLICATIONS OF USER DATA

4.1 MANAGEMENT OPTIONS

Use statistics from other northern park areas indicate the current low levels of wilderness use(Wall and Bates 1978). Nahanni National Park use has varied between 200 and 400 visitors per year since it was established. Kluane attracted only slightly over 100 backcountry users in 1977. The wilderness portions of Wood Buffalo and Auyuittuq similarly attract fewer than 400 visitors annually. In the adjacent area of Alaska's Arctic National Wildlife Range 877 visits were recorded in 1977 including a high proportion of airborne hunters(Ritchie and Childers 1977). It is evident from these figures from areas better known and more accessible than the Northern Yukon, that direct use of this wilderness park will not likely exceed several hundred visitors annually unless a major promotion program is initiated.

Two management options exemplify the range of possibilities, the first allows for maximum protection of the environment and the wilderness experience, the second sacrifices both, by risking some environmental disturbance and some bureaucratizing and degrading of the wilderness experience.

4.1.1 Option 1: No Management

The best way to protect the environment of the Northern Yukon and to offer the highest quality wilderness experience is to limit or prevent access. If air access into the park is prohibited there will be little need for the intensive management that often frustrates wilderness purists. There are currently only commercial means of getting to Inuvik, Fort McPherson, Arctic Red River, and Old Crow. If access is limited to these settlements, the only means of access to the interior of the Northern Yukon will be on foot or by boat. This option would ensure little or no aircraft harassment of wildlife and no aircraft disturbance to wilderness users. Flights from the Northwest Territories to Alaska would have to fly off the coast. There would be little need for restricting use as lack or difficulty of access is an indirect management tool that can effectively safeguard wilderness values.

4.1.2 Option 2: Providing Access

To provide for use during a short season, it is necessary to provide some level of access. As seen in the ANWR data, the average wilderness trip is less than 20 days. Most people do not want to spend most of their time going to and returning from an area; a party with a relatively short period of time will be unable to afford to enter an area such as the Northern Yukon. Limited aircraft access can

provide for use. This option lies more towards the use end of the management spectrum but it is also conceived within the biocentric context. As seen in the data analysis, even low levels of use can be disruptive when they are concentrated at key sites or in natural corridors, and may have deleterious local impacts on the resources. A public use management plan such as has been prepared for the Arctic National Wildlife Range(U.S. Fish and Wildlife Service 1978) is one option that should be considered for the Northern Yukon. This plan should be based on biocentric principles but also strive to protect the wilderness experience. As much of the public use will consist in viewing wildlife the mananagement plan should follow a time and space zoning scheme that recognizes key periods and locations where disturbance to wildlife can be avoided.

4.1.3 Controlling and Monitoring Use

Analysis of the user data for the ANWR illustrated that a quality experience for the user is based on his perception of the remoteness and undisturbed nature of the environment reflected by the absence of man or his sign. As in the ANWR there are many areas, in the Northern Yukon that are far from pristine.

4.1.3.1 Wilderness Park Access

Access to the interior of the Northern Yukon will be from three locations: Old Crow in the south, and Ft.

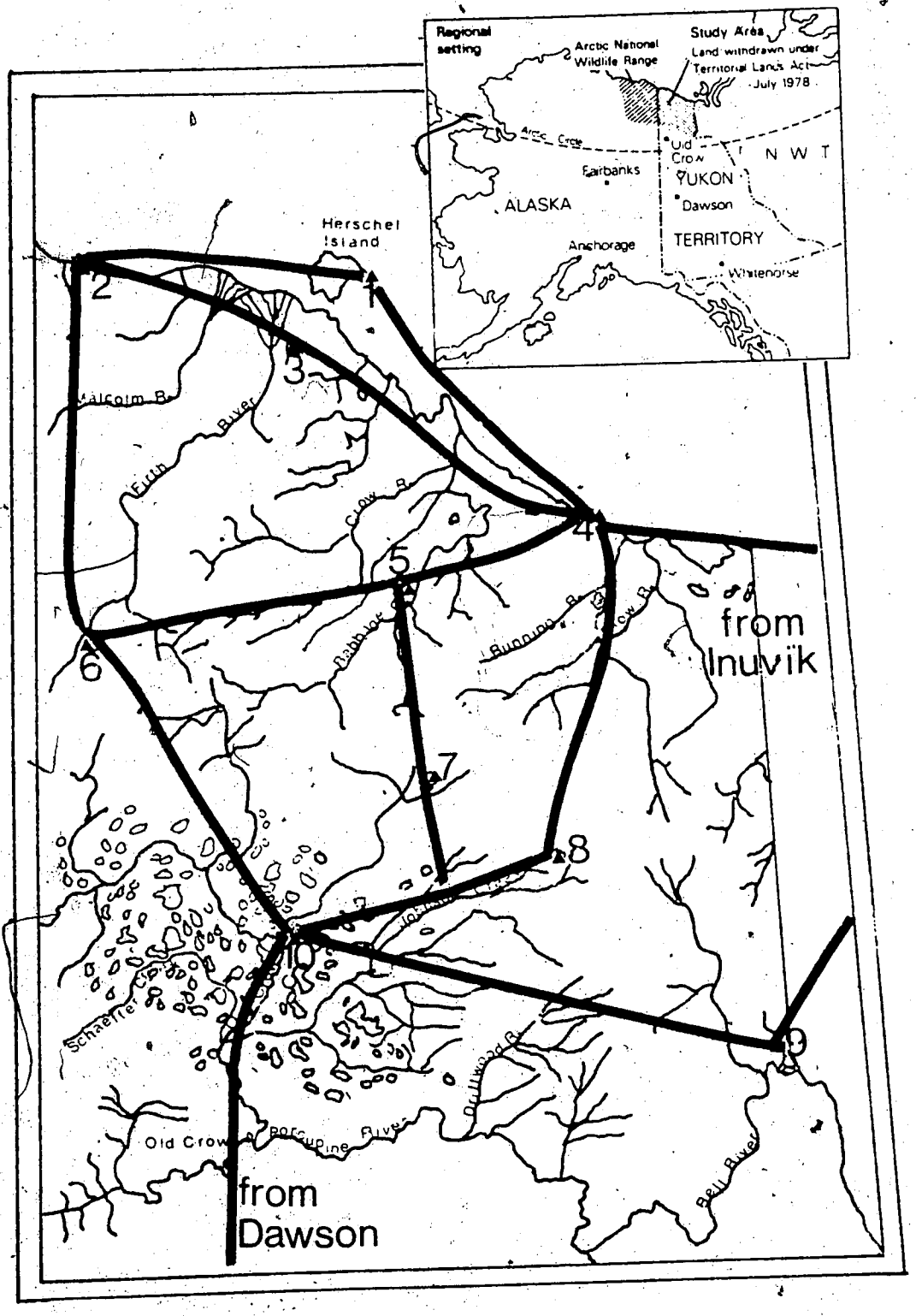
MacPherson and Inuvik from the east. Entry to the area will be limited almost exclusively to air travel, though Herschel Island and the coastal area are accessible by boat in mid summer, and the Porcupine River could be reached by boat from the Mackenzie River system.

To facilitate monitoring visitors, access points within the park should be limited and clearly defined. At each entry point a patrol cabin and warden would be located. These individuals should be native people with at least diploma-level training in resource management. They would be responsible for making contact with visitors, informing them of proper wilderness etiquette, and enlightening them as to specific areas of natural, cultural, and historic interest. Wardens should also be members of "native game councils" responsible for monitoring native subsistence activities. Their presence could help prevent poaching and illegal export of game. Ten possible access points are located on Figure 12. These sites have been used previously either by researchers or DEW line operators.

If air access is to be permitted it must be in such a manner as to produce minimum impacts on the resources and on the wilderness experience. Unlike the ANWR, there are no commercial flights in the Northern Yukon that provide access to the north slope. Having few access points can lead, as it has led in the ANWR, to a concentration of recreational use and a concentration of air traffic. As seen in the data analysis this is degrading to the wilderness experience,

Figure 12

Wilderness Access and Control

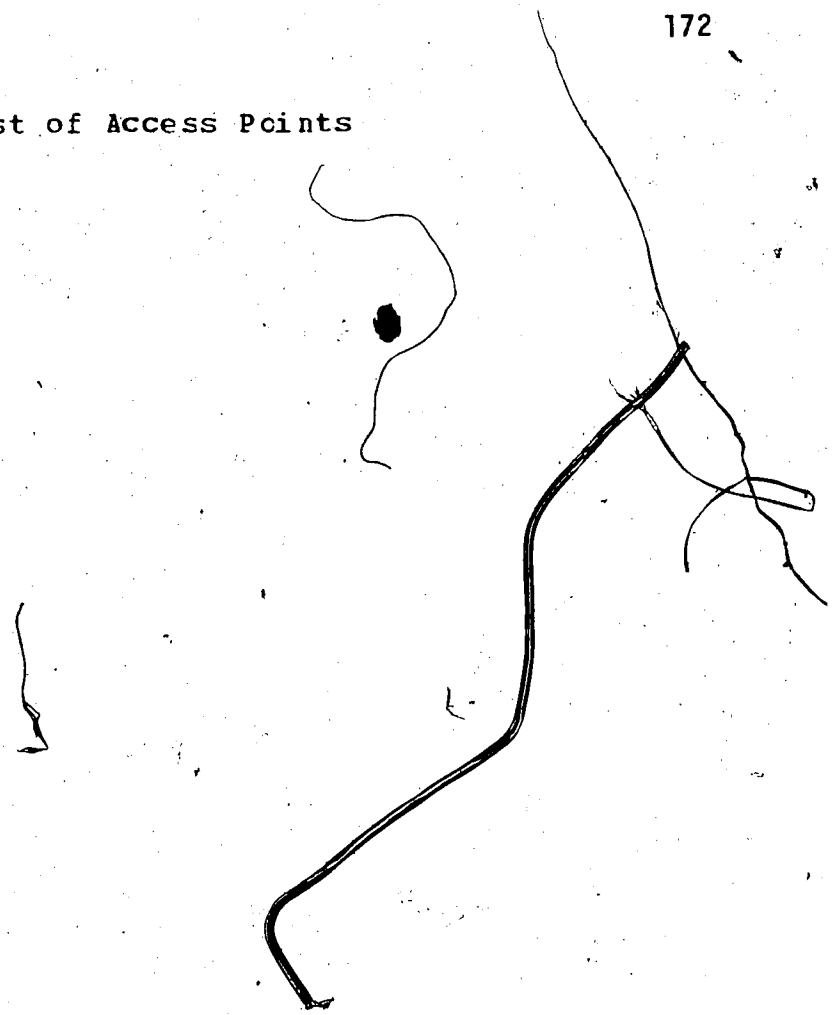


▲ Patrol Cabin

Air Corridors

List of Access Points

1. Herschel Island
2. Komakuk Beach
3. Firth Lake
4. Shingle Point
5. Trout Lake
6. Margaret Lake
7. Sam Lake
8. Bonnet Lake
9. Summit lake
10. Old Crow Flats



and frequent overflights can endanger certain wildlife species. Designating several access points can help disperse use and air traffic. This might be accomplished through the delineation of an air corridor system. By defining specific air corridors and locating them in low impact areas the effects of air traffic can be localized; aircraft would be prevented from making haphazard flights that would disturb wilderness users and wildlife. Further, the corridor system would provide a means of control over the use of the park airspace, thus reducing the chances of poaching.

Climate dictates that the recreational season will be principally from early summer to early fall. Caribou migrations and calving occur primarily outside of this period and would be subject to negligible impacts. Events such as post-calving, however, do occur at this time and access corridors used during this period should be located away from the land where this takes place. Raptor nest sites and waterfowl nesting and staging areas are other factors to consider when delineating corridors.

Another access restriction relates to flight levels and type of aircraft used. According to various studies in the North (Jakimchuk et al. 1974, Geist 1975), helicopters induce panic in caribou. Calef (1974) suggests that 300m is a minimum flight altitude to prevent wildlife harassment, but 600m has been suggested

for the Arctic Wildlife Range(U.S. Fish and Wildlife Service 1978) and LGL environmental consultants(1975) recommend a 750m altitudinal restriction in areas populated by raptors and waterfowl.

As caribou are reasonably tolerant of fixed wing aircraft flying at least 600m altitude, and as patrol cabin locations are all close to water, float planes should be the only aircraft used for access into the park, except for emergencies.

4.1.3.2 Flight Frequencies

Many species, specifically snow geese, are sensitive to frequent aircraft overflights. In a 1973 study(LGL 1975) of flight frequency on the north slope, researchers counted an average of 1 flight every 4 hours. This may have some impact on waterfowl and would surely degrade the wilderness experience. The ANWR recreationists overwhelmingly rejected the idea of daily overflights. Recreationists were more agreeable to weekly overflights, which suggests that a limit of one or two aircraft a week may be the best compromise for wildlife and wilderness users.

4.1.3.3 Wilderness User Regulations

As seen in the ANWR, many of the respondents(56%) were in favor of filing a trip plan, and a considerable proportion (17%) were agreeable to having the timing and area(36%) of their trip regulated. A permit system would

provide for control within the access option. All recreational use of the Northern Yukon should require a permit, the presentation of which is necessary before a plane or boat could be chartered. Such permits would be issued by the responsible agency and would facilitate screening, monitoring, and education functions. Permits would allow control over access periods, and locations. This would protect the resources and ensure a quality experience for users.

Of the ten access/patrol stations suggested(Figure 11) four will probably attract the majority of recreational use. The Margaret and Firth Lake areas and Herschel Island will attract backpacker/photography groups, while the Summit Lake station would serve as the take-off point for river trips down the Porcupine. Visitors could be encouraged to visit other areas and use other access points. A major requirement for users will be a public use map and publication dealing with opportunities and regulations for the area.

SUMMARY

Some areas in the Northern Yukon, such as the Coastal Plains, and the Old Crow Flats, are sensitive to human disturbance. Special protection for these areas may be necessary. Although some visitors will visit the coast and the Old Crow flats to view wildlife and the cultural features, most recreational use will be centered in the Northern Mountains Ecoregion. Recreational use should interfere with few native activities, as the native people primarily use different areas, and their land-use is concentrated outside of those months suitable for recreation. At present native people use only those resource areas close to their villages. Many still depend on renewable resources for their subsistence; this means a continued harvest of many wildlife species found within the proposed park. Due to demographic, social, and technological factors native hunting could reduce renewable resource stocks. It may therefore be necessary to impose some constraints on hunting as well as to monitor its effects on wildlife populations. Recreation and research activities may also require restrictions when they conflict with critical wildlife habitat or important periods in a species life cycle.

As seen in the ANWR, guided trips are popular. Native people might wish to seek employment as guides or develop other aspects of tourism. Their knowledge and familiarity with the land would be a great educational asset should they

do so.

The North offers many opportunities for research, and the establishment of parks will require research to aid in their management. Conflicts are possible as research will be conducted on lands used by native people, and the mere presence of researchers could detract from the wilderness experience sought by the park visitor. If there is communication among the various user groups, park managers that understand the users, and a management plan that is effective in co-ordinating the uses, social and environmental impacts can be minimized. There is a wide range of options that can provide for native, recreational, and research uses within the principles of biocentricity. Through further study of the user groups and their effects on the environment an effective management plan can be formulated for the Northern Yukon.

Literature Cited

Alaska Highway Pipeline Panel. 1978. The Porcupine Caribou Herd and the Dempster Corridor. Pamphlet. 7p. Alaska Highway Pipeline Panel. Box 1409 Winnipeg.

Alaska National Interest Lands Conservation Act of 1978. Report of the Committee on Interior and Insular Affairs House of Representatives. Fairbanks, Alaska. 411p.

Allison, L. 1978. Caribou: Management of a Vital Resource. Northern Perspectives 6(3):5-8.

Amundson, Roald. 1908. The Northwest Passage. 2 Vol., Archibald Constable and Company, London.

Anderson, Douglas D., Ray Bane, R.K. Nelson, W.W. Anderson, and Nita Sheldon. 1977. Kuuvanmiit Subsistence: Traditional Eskimo Life in the Latter Twentieth Century. National Park Service, U.S. Dept. of the Interior. Wash. D.C. 775p.

Archibald, W. Ralph. 1978. The Future of Trapping. Yukon Game Branch, Whitehorse (unpublished report, 8p.).

Archibald, W. Ralph, and Wes Olson. 1978. 1976/77 Fur Report. Yukon Game Branch, Whitehorse (unpublished report, 12p).

Balikci, Asen. 1963. Vunta Kutchin Social Change. Department of Northern Affairs and Natural Resources. Northern Co-ordination and Research Centre (NCRC 63-3). 161p.

Banfield, A.W.F. 1954. Preliminary Investigation of the Barren Ground Caribou. C.W.S. Wildlife Management Bull. Ser. 1, 10A and 10B.

Barr, W. 1972. Landforms of the Lower Mackenzie Valley and Northern Yukon. Univ. of Saskatchewan, (unpublished). 93p.

Barry, Tom. 1979. (Canadian Wildlife Service, Edmonton) personal communication.

Behnke, Steven R. 1978. Resource Use and Subsistence in the vicinity of the Proposed Lake Clark National Park, Alaska and Additions to Katmai National Monument. Anthropology and Historic Preservation. Cooperative Parks Studies Unit. University of Alaska, Fairbanks, Alaska. Occasional Paper No. 15. 175p.

Berger, T. R. 1977. Northern Frontier, Northern Homeland. The report of the Mackenzie Valley Pipeline Inquiry. Supply and Services. Ottawa, Canada. 2 vol.

Bergerud, A.T. 1978. The Status and Management of Caribou in British Columbia. British Columbia Ministry of Recreation and Conservation, Fish and Wildlife Branch Report (unpublished report, 150p.).

Bergstrand, Jay. 1978. Fish and Wildlife Use and Management in Alaska. Federal-State Land Use Planning Commission for Alaska. publ. #31. 50p.

Bissett, Don. 1974. Resource Harvests: Hunter-Trappers in the Mackenzie Valley (Economic and Social Significance). Northern Policy and Program Planning Branch DIAND for the Envir.-Social Program Northern Pipelines July 1974. Report No. 74-42. 208p.

Burch, W.R., Jr. and W.D. Wenger. 1967. The social characteristics of participants in three styles of

family camping. Pacific Northwest Forest and Range Exp. Sta. U.S. Forest Service. Res. Pap. PNW-48 30p.

Burton, T.L. 1977. Outdoor Recreation in the Yukon. Prepared on behalf of the Government of the Yukon Territory(Parks and Historic Sites Division) and Parks Canada(Prairie Region and the Socio-economic Research Division Ottawa). 2 vol.

Bryant, J.E. 1957. Old Crow, Yukon Territory Muskrat Investigation. March-April. Canadian Wildlife Service, Aklavik, N.W.T. (unpublished report).

Calef, George. 1974. The predicted effect of the Canadian Arctic Gas Pipeline Project on the Porcupine Caribou Herd. p.101-120 In Environmental Impact Assessment of the Mackenzie Gas Pipelne from Alaska to Alberta Vol. 4. Chapter 5. Research Reports.

Calef, George. 1979. Quoted in the Edmonton Journal article: "Controls on hunters, wolves urged to save caribou". January 20/1979

Calef, George and G.M. Lortie. 1973. Observations of the Porcupine caribou herd, 1972. Sec. 1. Appendix 1, Rept. No. 3. Environmental Protection Board Winnipeg, Man. 45p.

Committee for the Original Peoples Entitlement(COPE) 1977. "Inuvialuit Nunangut" The Proposal for an Agreement-In-Principle to achieve the settlement of Inuvialuit Land Rights in the Western Arctic Region of the Northwest and Yukon Territories Between: The

Government of Canada and The Committee for the Original Peoples Entitlement. Given to Government May 13, 1977. 85p.

COPE/Government Working Group. 1978a. Joint Position Paper on the Inuvialuit Land Rights Claim. 105p.

COPE/Government Working Group. 1978b. Joint Position Paper on Wildlife. 20p.

Cooke, Alan and Clive Holland. 1978. The Exploration of Northern Canada 500-1920:a chronology. Arctic History Press. 549p.

Council for Yukon Indians. 1978. Land Claim (Draft, unnumbered pages).

Cowan, I. McTaggart. 1977. Natural Resources Research In Canada's National Parks: An Evaluation. Parks Canada Contract Report. 196p.

Cragg, J.B. 1969. Research in National and Provincial Parks: Possibilities and Limitations 1: 199-227 In The Canadian National Parks: Today and Tomorrow proceedings of a conference organized by the National and Provincial Parks Assoc. of Canada (NPPAC) and the University of Calgary. edited by J.G. Nelson and R.C. Scace. 2 Vol.

Craig P. and P.J. McCart 1974. Fall spawning and overwintering areas of fish populations along routes of the proposed pipeline between Prudhoe Bay and the Mackenzie Delta 1972-73. Canadian Arctic Gas Study Ltd. Can. Arctic Gas Biol. Rept. Series Vol. 15 Chapter III. 34p.

Curatolo, J.A. and G.D. Moore 1974. Home Range and Population Dynamics of Grizzly Bear in the Eastern Brooks Range, Alaska. Canadian Arctic Gas Study Ltd. Can. Arctic Gas Biol. Rept. Series Vol. 32 Chapter I. Calgary, Alberta. 79p.

Curatolo, J.A. 1976. as quoted in Ritchie, B. and B. Childers, 1977. The Recreational and Aesthetic Resources of the Arctic National Wildlife Range. Renewable Resources Consulting, Fairbanks, Alaska. (unpublished report, 240p.).

Davis, J. and D. Rosenean. 1978. as quoted in Bergerud, A.T. 1978. The Status and Management of Caribou in British Columbia. British Columbia Ministry of Recreation and Conservation, Fish and Wildlife Branch. (unpublished, report 150p.).

Delury, R.T., M.S. Elson, and L.W. Steigenberger. 1975. Aspects of the Historical and Present day Fisheries Exploitation in the Northern Yukon Territory. Northern Yukon fisheries studies, 1971-74. Vol. I Chapter V, Fisheries and Marine Service. 66p.

Doll, D., W.P. McCrory and J.D. Feist. 1974. Observations of moose, wolf, and grizzly bear in the Northern Yukon Territory. Arctic Gas Biol. Rept. Series, Vol 22, Ch. III. Can. Arctic Gas Study Ltd., Calgary, Alberta. 50p.

Donaldson, Ian. 1972. A Report on the Bell and Porcupine Rivers, Yukon Territory. National Park Service, Dept. of Indian Affairs and Northern Development (unpublished

report, 7p.).

Drew, J.V. and R.E. Shanks. 1965. Landscape relationships of soils and vegetation in the forest-tundra ecotone, upper Firth River valley, Alaska-Canada. Ecol. Mono. 35:285-306.

Firey, W.I. 1960. Man, Mind and Land: the Theory of Resource Use. Glencoe Ill. Free Press. 256p.

Franklin, Sir John. 1828. Narrative of a Second Expedition to the shores of the Polar Sea in the years 1825,1826, and 1827. Including an account of the progress of a detatchment to the eastward by John Richardson... J. Murray Co. London. rpt. 1971 by M.G. Hurtig Ltd. Booksellers and Publishers Edmonton. 768p.

Freeman, Milton. 1976. Inuit Land Use and Occupancy Project: a report/prepared by Milton Freeman Research Ltd. Ottawa: Department of Indian and Northern Affairs, 3 vol.

Freeman, Milton. 1978. (McMaster University) personal communication.

Friesen, Fred B. 1975. Potential Inuit Benefits from Commercial and Sports Use of Arctic Renewable Resources. Renewable Resource Studies. Inuit Tapirisat of Canada. vol 10. 176p.

Frissel, S. and G.H. Stankey. 1972. Wilderness environmental quality: search for social and ecological harmony. Soc. Am. For. Proc. Hot Springs, Ark. p.170-183.

Geist, Valerius. 1975. Harassment of Large Mammals and Birds

with a critique of research submitted by Arctic Gas Study Ltd. on this subject. Report to the Berger Commission. (unpublished, Boreal Institute, Edmonton).

Glova G. and P.G. McCart. 1974. Life History of the Arctic char in the Firth River, Yukon Territory. In P.J. McCart (ed.) Life histories of anadromous and freshwater fishes in the Western Arctic. Arctic Gas Biol. Rept. Series. Vol. 20. Chapter III. 37p.

Gollop, M.A. and R. A. Davis. 1974. Studies of bird populations and productivity on lakes on the Yukon North Slope, July 1972. Arctic Gas Biol. Rept. Series, Vol. 12 Can. Arctic Gas Study Ltd., Calgary, Alta. 35p.

Gollop, M.A. and W.J. Richardson. 1974. Inventory and habitat evaluation of bird breeding and moulting areas along the Beaufort Sea coast from Prudhoe Bay, Alaska, to Shingle Point, Yukon Territory. Arctic Gas Biol. Rept. Ser., Vol 26, Chapter IX Can. Arctic Gas Study Ltd., Calgary, Alta. 61p.

Government of the Northwest Territories. 1978. Territorial Census.

Hanna, L. and J. W. Thorsell. 1979. Annotated Bibliography for the Northern Yukon Land Withdrawl Area. A Contract Report to Parks Canada. Dept. of Forest Science, University of Alberta, Edmonton. (unpublished).

Harington C.R., Robson Bonnichsen, and Richard E. Morlan. 1975. "Bones say men lived in Yukon 27,000 years ago." Canadian Geographical Journal Vol. 91(1&2) July-August

p. 44-48.

Harrington, Lyn. 1961. Yukon's Arctic Village:Old Crow. Beaver Outfit 292:4-10(winter).

Hendee, J.C., William R. Catton Jr., Larry D. Marlow, and Frank Brockman. 1968. Wilderness Users in the Pacific Northwest-Their Characteristics, Values and Management Preferences. U.S.D.A. Forest Service Research Paper PNW-61. 92p.

Hendee, J.C. and Stankey G.H. 1973. Biocentricity in Wilderness Management. Bioscience 23:535-538.

Hendee, J.C., G.H. Stankey, and R.C. Lucas. 1978. Wilderness Management. Forest Service U.S. Dept. of Agriculture. 381p.

Hettinger, L., A. Janz and R.W. Wein. 1974. Vegetation of the Northern Yukon Territory. Arctic Gas Biol. Rept. Ser., Vol. I. Can. Arctic Gas Study Ltd., Calgary Alta. 174p.

Hettinger, L. 1979.(R.W. Hardy and Assoc. Calgary) personal communication.

Hickey, G. Clifford. 1978. Of Man and Muskox: New light on a very old relationship. Presented at the annual meeting of the Canadian Archaeological Association 26-30 April, 1978, Quebec City, Quebec. 19p.

Hickey, G. Clifford. 1978.(Department of Anthropology, University of Alberta) personnal communication.

Hoefs, M. 1974. Game Survey in British Mountains. Report for the Yukon Game Branch, Whitehorse. (unpublished report).

Hoefs, M. 1978. Dall Sheep in the Richardson Mountains-Distribution, Abundance, and Management Concerns. Yukon Game Branch Report No. 78-2. (unpublished report, 48p.).

Hunt, Constance, Rusty Miller, and Donna Tingly. 1979. Legislative Alternatives for the Establishment of a Wilderness Area. Northern Perspectives, VII(2):2-6.

Interdisciplinary Systems Ltd. 1977. A Comprehensive Study of Past and Potential Land Use in Area "A" Proposed Tuktoyaktuk Land Freeze. Prepared for Department of Indian and Northern Affairs. Ottawa, Ontario. (unpublished report, 106p.).

International Boundary Commission. 1918. Establishment of the Boundary between the United States and Canada, Arctic Ocean to Mt. St. Elias. Dept. of State.

International Caribou Committee Notes 1978. (minutes of meeting held in Vancouver, November 27 and 28, 1978.)

Irving, Lawrence. 1958. Naming of Birds as part of the Intellectual Culture of Indians at Old Crow. Arctic 11:117-122.

Jacobson, J.O. 1974. Potential impact of the Mackenzie Gas Pipeline on Bird Populations in the Yukon and Northwest Territories. p.121-176 In Environmental Impact Assessment of the Mackenzie Gas Pipeline from Alaska to Alberta. Research Reports. Vol. 4 Chapter 6.

Jakimchuk, R.D., E.A. Debock, H.J. Russel, and G.P. Semenchuk. 1974. A Study of the Porcupine Caribou Herd

1971. In Jakimchuk(ed.) The Porcupine Caribou Herd Canada. Arctic Gas Biol. Report Series Vol.4 Chapter I. Canadian Arctic Gas Study Ltd., Calgary, Alta. 102p.

James Bay and Northern Quebec Agreement. 1976. Editeur officiel du Quebec XXIV. 455p.

Johns-Penikett, L. 1978. (Northern Careers Program, Whitehorse) personal communication.

Kennedy, A. 1979. (C.W.S., Edmonton) personal communication.

Koski, W.R. 1975. Study of the distribution and movement of snow geese, other geese, and whistling swans on the Mackenzie Delta, Yukon north slope and Alaskan north slope in August and September 1975. Arctic Gas Biol. Rept. Ser., Vol. 30, Chapter I Can. Arctic Gas Study Ltd., Calgary, Alta. 58p.

Kruse, J. 1979. Subsistence:A discussion of relevant concepts and some observations on patterns of Change in Alaska. p.78-92 In The Subsistence Lifestyle in Alaska Now and in the Future. School of Agricultural and Land Resources Management. Univ. of Alaska, Fairbanks.

LGL Environmental Research Associates. 1975. A summary of ornithological recommendations in regard to the proposed gas pipeline route. Edmonton. 37p. (unpublished report).

Leffingwell, E. 1919. The Canning River Region, North Alaska United States Geological Survey Professional Paper 109. 251 p.

Lieff, B.G. 1978. (Parks Canada, Wood Buffalo National Park) personal communication.

Lortie, G.M., and John McDonald. 1977. Game Harvest Report and Summary of the Questionnaire analysis. Yukon Game Branch, Whitehorse (unpublished report, 22p.).

Lortie, G.M. 1978. personal communication to J.W. Thorsell.

Lucas, R.C. 1964. The recreational capacity of the Quetico-Superior Area. Lake States Forest Exp. Sta. U.S. Forest Service. Pap. LS-15, 34p.

Lucas, R.C. 1973. Wilderness:a management framework. Journal of Soil and Water Conservation 28:150-154.

Lucas, R.C. 1978. The Characteristics of visitors to wilderness and related areas in the Northern Rockies and California Sierras. U.S.D.A. For. Serv. Res. Pap. Intermtn. Forest and Range Exp. Sta. Ogden, Utah.

Mackenzie Valley Pipeline Inquiry: Proceedings and Community Hearings. 1975-76. Allwest Reporting Ltd. Burnaby, B.C. 77 vol.

MacNeish, R.S. 1957. Archaeological investigations in the Arctic and Subarctic. Arctic 10:189-90.

Macpherson, A.H. 1969. The dynamics of Canadian Arctic Fox populations. Canadian Wildlife Service Report Series No. 8. 52p.

Marsh, John S. 1969. Maintaining the Wilderness Experience in Canada's National Parks. 1:228-242 In The Canadian National Parks:Today and Tomorrow proceedings of a conference organized by NPPAC and the University of Calgary. edited by J.G. Nelson and R.C. Scace. 2 vol.

Martin, Paul.S., and H.E. Wright (eds.) 1967. Pleistocene

Extinctions: the search for a cause. Yale University Press. New Haven Conn. 453p.

McGhee R. 1976. The Nineteenth Century Mackenzie Delta Inuit 2:141-152 In Milton Freeman(ed.) Inuit Land Use and Occupancy Project: Dept of Indian Affairs and Northern Dev. 3 vol.

McSkimming, R.J. 1975. Territory, Territoriality, and Cultural Change in an Indiginous Society: Old Crow, Yukon, M.A. Thesis, Univ. of B.C., Dept. of Geography. 203p.

Melchior, Herb and Dick Bishop 1977. Subsistence: A Starting Point. In Alaska Conservation Review The Alakan Conservation Society special (d)(2) issue.

Miller, F. 1979 (Canadian Wildlife Service, Edmonton) personal communication.

Miller, G. 1978. Canadian Wildlife Service Studies in Canada's National Parks;A Bibliography. C.W.S. Edmonton. 179p.

Moore, G.D. and Roland Quimby. 1974. Environmental considerations for the Polar Bear(Ursus maritimus) of the Beaufort Sea. Arctic Gas Ltd. Can. Arc. Gas. Bio. Rept. Ser. vol.32 Chapter II. Calgary, Alta. 55p.

Morgan, Dave 1979 (DINA, Yukon Forestry) personal communication

Morlan, R.E. 1973. The Later Prehistory of the Middle Porcupine Drainage, Northern Yukon Territory. National Museum of Man, Archaeological Survey of Canada paper No.

11. 935p.

Morlan, R.E. 1977. Early Man in the Northern Yukon Territory: Perspectives as of 1977. In Early Man in America From a Circum-Pacific Perspective. edited by Alan Lyle Bryan. 327p.

Mossop, D. and R. Hayes. 1977. Ornithological Investigations in the Northern Yukon. Yukon Game Branch, Whitehorse.(unpublished report, 75p.).

Munro, David A. 1953. A Preliminary Report on the Caribou of the Northern Yukon Territory. C.W.S.

National Energy Board Hearings pertaining to Mackenzie Valley-Yukon Pipeline 1977. Toronto.

National Parks Service, 1972. The Firth River Yukon Territory. A Wild Rivers Survey Descriptive Report. Ottawa. 9p.

Naysmith, John R. 1972. The Impact of Technology upon Native People and their Traditional Pursuits. Presented at the Seventh World Forestry Congress Buenos Aires, Argentina. 22p.

Nelson, Richard K. 1973. Hunters of the Northern Forest. University of Chicago Press, Chicago and London. 340p.

Nelson, R.K., G.R. Bane, S.Behnke, R.Bishop, R.Caulifield, D.Gisler, K. Hekrdle , S. McNeary, H. Reckork, M. Tuten, R. Uhl. 1977a. Subsistence Activities in Proposed Alaskan Parklands (preliminary report). National Park Service Areas in Alaska. Alaska Area Office, National Park Service.(unpublished report, 22p.).

Nelson, R.K. 1977b. Forest Resources in the Culture and Economy of Native Alaskans p. 207-223 In North American Forest Lands at Latitudes north of 60 degrees: Procedings of a Symposium held at the University of Alaska Fairbanks Sept.19,20,21,22, 1977.

Nelson, R.K. 1978a. Subsistence in Future Alaskan Parklands: An Overview. University of Alaska, Fairbanks. (unpublished report, 22p.).

Nelson, R.K. 1978b. National Significance of Subsistence Culture. University of Alaska, Fairbanks. (unpublished report, 5p.).

Northern Yukon Task Force. 1978. Draft Report. (unpublished, unnumbered pages).

O'Neil, J.J. 1924. The geology of the Arctic coast of Canada, west of the Kent Peninsula. Pt. A. In Canadian Arctic Expedition Reports, 1913-1918. vol. 11. F.A. Acland. Printer to the Kings most Excellent Majesty. Ottawa.

Outdoor Recreation Resources Review Commission. 1962. Wilderness and recreation-a report on resources, values, and problems. ORRRC study Report No. 3 Univ Calif Wildland Res. Center. 352p.

Osgood, Cornelius. 1936. Contributions to the Ethnography of the Kutchin. In Yale University Publications in Anthropology. No. 14. Yale University Press. 189p.

Parks Canada. 1978a. National Wilderness Parks North of 60°. p. 231-236. In Keith, R.F., and Wright, J.B. eds.

Northern Transitions Second National Workshop on People, Resources, and the Environment North of 60°, Vol II, CARC, 1978. 470p.

Parks Canada. 1978b. Press Release announcing the withdrawl of the Northern Yukon. Department of Indian Affairs and Northern Development.

Parks Canada. 1978c. Parks Canada Policy(Draft). Program Policy Group, Parks Canada. Department of Indian and Northern Affairs.Mimeo 117p.

Parks Canada. 1978d. Information Analysis Kluane Alternatives. Indian and Northern Affairs. Mimeo 70p.

Parks Canada. 1979. Parks Canada Policy. Program Policy Group, Parks Canada. Department of Indian and Northern Affairs. Mimeo 69p.

Pearson, A.M. 1977. Management of Forest Systems North of 60° For Subsistence, Recreation, Fish and Wildlife: Towards Developing A Policy in the Yukon, p.197-205 In :North American Forest Lands at Latitudes North of 60° Symposium Proceedings, University of Alaska.

Peterson, E.B. 1976. Biological Productivity of Arctic Lands and Waters: A Review of Canadian Literature. p.85-100 In Milton Freeman(ed.) Inuit Land use and Occupancy Project. Department of Indian and Northern Development. Vol. 2.

Platt, J.B. and C.E. Tull. 1977. A study of wintering and nesting gyrfalcons on the Yukon North Slope during 1975 with emphasis on their behavior during experimental

overflights by helicopters. Arctic Gas Biol. Rept. Series Vol. 35. Ch. I Can. Arctric Gas Study Ltd., Calgary Alta. 90p.

Raddi, Sam. 1978. (President of COPE, Inuvik) personal communication.

Rea, S. 1978. (Manpower Planning Branch Yukon Territorial Government.) personal communication.

Renewable Resource Technology Program N.W.T. 1977. Porter Lake Camp Report. (unpublished report, unnumbered pages).

Ritchie, B. and B. Childers, 1977. The Recreational and Aesthetic Resources of the Arctic National Wildlife Range. Renewable Resources Consulting Ltd. Alaska. (unpublished report, 240p.)

Roseneau, D.G. and C. Warbelow. 1974. Distribution and numbers of muskoxen in northeastern Alaska and the Northern Yukon 1973. Arctic Gas Biol. Rept. Ser., Vol. 22, Chapter V. Can. Arctic Gas Study Ltd., Calgary, Alta. 30p.

Roseneau, D.G., P.M. Stern, and C. Warbelow. 1974. Distribution and movements of the Porcupine caribou herd in northeastern Alaska, 1972. Arct. Gas Biol. Rept. Ser., Vol. 22, Chapter IV. Can. Arctic Gas Study Ltd., Calgary, Alta. 197p.

Roseneau, D.G. and P.M. Stern. 1972. Distribution of Moose, Muskox, and Sheep in N.E. Alaska. Arctic Gas Biol. Rept. Ser., Vol. 6 Chapter I. Can. Arctic Gas Study Ltd., Calgary, Alta. 61p.

Roseneau, D.G., J. Curatolo, and G. Moore. 1974. The distribution and movements of the Porcupine Caribou herd in N.E. Alaska and The Yukon Territory. Arct. Gas Biol. Rept. Series., Vol 32. Chapter III. Can. Arctic Gas Study Ltd., Calgary, Alta. 104p.

Roseneau, D.G. and J.A. Curatolo. 1975. The distribution and movements of the Porcupine Caribou herd in N.E. Alaska and The Yukon Territory. Arct. Gas Biol. Rept. Ser., Vol. 36. Chapter I. Can. Arctic Gas Study Ltd. Calgary, Alta. 32p.

Ruttan, R.A. 1974. Observations of grizzly bear in the Northern Yukon Territry and Mackenzie River Valley, 1972. Arctic Gas Biol. Rept. Series., Vol. 9, Chapter VII, Can. Arctic Gas Study Ltd., Calgary, Alta. 31p.

Ruttan, R.A. 1974a. Arctic Fox on the north slope of the Yukon Territory, 1972. Arctic Gas Biol. Rept. Ser., Volume 9, Chapter I. Can. Arctic Gas Study Ltd., Calgary, Alta. 52p.

Ruttan, R. A. 1974b. Muskrat studies on Old Crow Flats, Yukon Territory, 1972. Arctic Gas Biol. Rept. Ser., Volume 9, Chapter IV. Can. Arctic Gas Study Ltd., Calgary, Alta. 124p.

Ruttan, R.A. 1974c. Observations of moose in the Northern Yukon Territory, 1972. Arctic Gas Biol. Rept. Ser., Vol 9. Chapter VI. Can. Arctic Gas Study Ltd., Calgary, Alta. 45p.

Ruttan R.A. and Wooley. 1974. A study of fur bearers

associated with proposed pipeline routes in the Yukon Territory and Mackenzie River Valley 1971. Can. Arctic Gas Biol. Rept. Series Vol. 8. Calgary, Alta. 118p.

Ruttan, R.A. and John T'Seleie. 1976. Renewable Resource Potentials for Alternative Development in the Mackenzie River Region. Evidence presented on behalf of the Indian Brotherhood of the Northwest Territories to the Mackenzie Valley Pipeline Inquiry. Yellowknife. 169:26209-26367.

Sandy, R.W. 1948. Placer Gold on the Firth River--routes to the area. Western Miner 21(6):85-86(June 1948).

Schweinsburg, R.E. 1974. An ornithological study of proposed gas pipeline routes in Alaska, Yukon Territory and the Northwest Territories, 1971. Arctic Gas Biol. Rept. Ser., Vol. 10. Can. Arctic Gas Study Ltd., Calgary, Alta. 215p.

Scotter, G. 1970. Reindeer Husbandry as a land use in Northern Canada. p.159-169. In Productivity and Conservation in Northern Circumpolar Lands. ed. W.A. Fuller and P.G. Kevan (Morges I.U.C.N. Spec. Publ. No. 16).

Simmons, N. M. 1973. Dall's Sheep Harvest in the Richardson Mountains, Northwest Territories. Canadian Wildlife Service. (unpublished report, CWSC 1540. Fort Smith N.W.T.).

Smith, Robert Leo. 1966. Ecology and Field Biology. Harper and Row. 850p.

Spetzman, L.A. 1959. Vegetation of the Arctic Slope of Alaska. U.S. Geol. Surv. Prof. Pap. 302. 58p.

Stankey, George H. 1973. Visitor perception of wilderness recreation carrying capacity. USDA For. Serv. Res. Pap. INT-142, Intermt. For. and Range Exp. Stn., Ogden, Utah. 61p.

Statistics Canada, 1971. Census of Canada. Population: Unincorporated settlements. Dept. of Industry, Trade and Commerce. Ottawa.

Statistics Canada, 1976. Census of Canada. Supplementary Bulletins: Geographic and Demographic. Dept. of Industry, Trade, and Commerce. Vol 8. Catalogue 92-830. Ottawa.

Statistics Canada, 1976. Census of Canada. Population: Geographic Distributions. Census Divisions and Subdivisions Western Provinces and the Territories. Dept. of Industry, Trade and Commerce. Ottawa.

Steigenberger, L.W., M.S. Elson and R.T. Delury (eds.) 1975. Northern Yukon Fisheries Studies, 1971-1974, 6 Vol. Fish. and Mar. Serv., Vancouver, B.C.

Stern, R.O. 1979. Alaskan Reindeer Herding and Value Systems. p.149-155. In The Subsistence Lifestyle in Alaska Now and in the Future. School of Agricultural and Land Resources Management. Univ. of Alaska, Fairbanks.

Stirling, I. 1979. (C.W.S., Edmonton) personal communication.

Surrendi, D.C. and E.A. DeBock. 1976. Seasonal distribution population status and behavior of the Porcupine caribou

herd. Can. Wildl. Serv., Ottawa. (unpublished report, 144p.).

Telfer, E. 1979. (C.W.S., Edmonton) personal communication.

Theberge, J. 1978. "New Northern parks Update and Analysis", Park News, 14(3):7-10.

Thomas, D. 1979. As Quoted in the Edmonton Journal article: "Public Pressure Urged to Save Caribou Herds." January 5, 1979.

Thorsell, J.W. 1978. A review of literature and agency policies relating to backcountry recreation management in Kananaskis Provincial Park, Alberta. Appendix B. 47p. In Trails and wildlands study Kananaskis Country recreation plan. Vol. 2. Prepared by the Lombard North Group Ltd. (draft, unpublished).

Thorsell, J.W. and L. J. Zivot. 1978. Progress Report to the Canadian Arctic Resources Committee. (unpublished report).

Thorsell, J.W. and L.J. Zivot. 1979. Emerging Management Issues in National Wilderness Parks: A Case Study of the Northern Yukon. Prepared for the Canadian Arctic Resources Committee (in press).

Tull, E. 1979. (LGL Consulting, Edmonton) personal communication.

United States Fish and Wildlife Service. 1976. "Experiencing the Arctic National Wildlife Range", Pamphlet. 4p.

United States Fish and Wildlife Service. 1978. "Public Use Management Plan Arctic National Wildlife Range," (Draft,

23p.).

University of Alaska. 1978. Subsistence Analysis Package of National Parks. Anthropology and Historic Preservation, Cooperative Park Studies Unit. Fairbanks, Alaska. (unpublished reports).

Usher, P. J. 1971. The Bankslanders: Ecology and Economics of a Frontier Trapping Community. Ph.D. Thesis. Univ. of British Columbia. 381p.

Usher, P.J. 1975. Historical statistics approximating fur, fish and game harvests within Inuit lands of the NWT and Yukon 1915-1974 with text. Ottawa, Inuit Tapirisat of Canada, Renewable Resources Project Vol. 71p.

Usher, P.J. 1976a. Evaluating Country Food in the Northern Native Economy. In Smith(ed.) Mackenzie Delta-Domestic Economy of Native Peoples: a preliminary study. Department of Indian and Northern Affairs, Northern Co-ordination and Research Centre, Ottawa. 59p.

Usher P.J. 1976b. Inuit Land Use in the Western Arctic. p.153-168. In Milton Freeman(ed.) Inuit Land use and Occupancy Project. Department of Indian Affairs and Northern Development. vol 2. 287p.

Usher, P.J. 1978a. Working Group Paper. Renewable Resource Development in Northern Canada pp.154-162 In Northern Transistions Second National Workshop on People, Resources, and the Environment North of 60° Vol. II CARC. 470p.

Usher P.J. 1978b. Native Northerners: Are they obstacles to

progress. Northern Perspectives vol. 6(1):1-5.

Van Zyll DeJong, C. G. 1975. The distribution and abundance of the wolverine(Gulo gulo) in Canada. Can. Field Naturalist 89:431-437(Oct.-Dec.).

Wagar, J. Alan, 1964. The carrying capacity of wildlands for recreation. Forest Sci. Monogr. 7, 24pp.

Wall, G. and Bates W. 1978. Visitor Use of Northern National Parks, Park News, Vol 14(3):11-15.

Warner, Iris. 1973. Herschel Island. Alaska Journal History and Arts of the North Quarterly. 3:130-143.

Watt, R. 1966. The Recreational Potential of the Arctic National Wildlife Range. Ms. Thesis. Univ. of Alaska. 103p.

Weetaluktuk, Daniel. 1978. Canadian Inuit and Archaeology. Paper given at the 11th annual meeting of the Canadian Archaeological Association, Quebec City Quebec. April 27-30.

Wein, Ross W. and L.C. Bliss. 1973. Changes in Arctic Eriophorum Tussock Communities following Fire. Ecology 54:845-852.

Wentworth, Cynthia. 1973. Socio-Economic Considerations-Proposed Alaska National Wildlife Refuges. Alaska Planning Group, U.S. Dept. of the Interior. (unpublished report, 200p.)

Wentworth, Cynthia. 1978. Kaktovik Synopsis: an Excerpt from A Study of Land Use Values Through Time. Prepared by The North Slope Borough Contract Staff for NPR-A Planning

Team, Anthropology and Historic Preservation Cooperative Parks Unit, Fairbanks, Alaska. p.217-249.

Wiken, E., D. Welch, D. Taylor, J. Thie, and G. Ironside. 1978. The Northern Yukon: An Ecological Land Survey. Prepared for Parks Canada by Ecological Land Classification and Evaluation Division. Lands Directorate. 9 vol.

Wood, T.J. 1974. Wildlife in the vicinity of Baffin Island National Park. An assessment of the Inuit hunting and other factors on wildlife populations in southeastern Baffin Island. C.W.S. Fredricton N.B. (unpublished report).

Yukon Indian News 1979. "Council 'Kills' Motion to Cancel Organized Hunts" Feb 15, p. 3

Yukon Native Brotherhood 1973a. Together Today for Our Children Tommorrow? 16p.

Yukon Native Brotherhood. 1973b. Yukon Territory Indian Land Claim of 1973 the position papers of the Yukon Native Brotherhood and the Yukon Assoc. of Non Status Indians. Published by the Whitehorse Star, 32p.

APPENDIX I--List of People Consulted

Bob Childers, Renewable Resources Consulting. Fairbanks, Alaska.

Tom Andrews, Graduate Student Univ. of Alberta. (Northern Yukon Archaeology).

Connie Hunt, Professor of Law, Univ. of Calgary. Member of CARC.

Zorro Bradly, Chief Anthropology and Historic Preservation. Cooperative Parks Unit. Fairbanks, Alaska.

Ed Scallen, Head Information and Public Relations. Office of Native Claims. Ottawa.

Shelagh Rea, Manpower Planning Branch, Whitehorse.

Lu Johns-Penikett, Senior Assignment Counsellor. Yukon Region. Whitehorse.

Glen Semenchuk, Biologist and President of Renewable Resources Consulting. Edmonton.

Celia Hunter, Alaska Conservation Society.

Bob Gamble, Parks Canada (native relations) Yellowknife.

Don Gamble, Canadian Arctic Resources Committee, Ottawa.

Bill Rees, Dept. of Planning, University of British Columbia.

Ian McNeil, Parks Canada, Ottawa.

Dave Morgan, Forestry DINA (Whitehorse, Yukon).

Charlie Schweger, Yukon Refugium Project. University of Alberta.

Dick Morlan, Yukon Archaeologist (Archeological Survey of Canada).

R. S. MacNeish Archaeolgist(Robert S. Peabody Foundation for Archaeology) Andover, Mass.

Dave Klein, Biologist, University of Alaska, Fairbanks. Cooperative Parks Unit

Ron Jakimchuk, Renewable Resources Consulting. Edmonton.

Dave Roseneau, Caribou biologist(LGL Consulting) Fairbanks.

Marion Ridge, Librarian, Yukon Archives, Whitehorse.

Milton Freeman, (Head Inuit Land Use and Occupancy Study) McMaster University.

Lorne Hettinger, Botanist with R.W. Hardy and Associates. Calgary (did Botanical Survey of Northern Yukon, Arctic Gas)

Ian Stirling, Biologist(marine mammals) Canadian Wildlife Service. Edmonton.

Ed Telfer, Biologist Canadian Wildlife Service. Edmonton.

Tom Hawkins, Land Use Analyst Federal State Land Use Planning Commission for Alaska. Fairbanks.

John Pollock, Archaeolgist Polar Bear Provincial Park. Edmonton.

D.G. O'Reilly, Park Planner(Polar Bear Provincial Park) Ontario

Cynthia Wentworth, North Slope Borough Planning Department Fairbanks, Alaska.

Kay Vaydik, Information Officer for N.W.T. Edmonton.

N.W.T. Fish and Game Branch, Inuvik

Sam Raddi, President Committee for the Original People's Entitlement. Inuvik.

Dr. C. Hobart, University of Alberta(Dept. of Sociology)

Nat Rutter, Surficial Geologist(Univ. of Alberta), and part of Yukon Refugium Project.

Peter Lewis, Director Inuvik Research Centre

Dr. G. Hartman, Director of Yukon Game Branch, Whitehorse

Don Hutton, Territorial Parks(Whitehorse, Yukon)

Pia Archibald(Research Assistant, Territorial Parks, Yukon)

Ken Redpath, Lands Directorate(DOE) Vancouver.

Bruce Chambers, Land Use Planner(DIAND) Whitehorse, Yukon.

Water Survey(DIAND) Whitehorse, Yukon.

Jim Morin, Geologist(DIAND) Whitehorse,Yukon.

Dr. Craig, Assistant Director of Non-Renewable Resources (DIAND) Whitehorse, Yukon.

Mining Recorder. Whitehorse, Yukon.

Cam Ogilvie, Yukon Chamber of Mines. Whitehorse.

Bob Cathrow, Archer and Cathrow Consulting Geologists. Whitehorse.

Joe Jack, Council for Yukon Indians. Whitehorse.

Jim Masyk, Superintendant of Kluane National Park. Haines Junction, Yukon.

Larry Trembley, Chief Warden Kluane National Park. Haines Junction, Yukon.

B. Lieff, Superintendant Wood Buffalo National Park.

Land Use Branch(DIAND) Whitehorse,Yukon.

Malcolm Dennington C.W.S., Whitehorse,Yukon.

Yukon Conservation Society, Whitehorse.

Bruce Downie, Park Planner(Parks Canada, Prairie Region,

Winnipeg).

J.K. Whytok, Park Planner(Parks Canada, Prairie Region, Calgary).

J.L. Barlow, Natural Resources Management Co-ordinator (Parks Canada, Prairie Region, Winnipeg).

APPENDIX II--Letter Sent to Native Groups in Northern Canada and Alaska

Dear Sir or Madam,

I am a graduate student at the University of Alberta, interested in park and wildland planning. Recently I have been involved with the Canadian Arctic Resources Committee concerning a proposed national wilderness park in the Northern Yukon (adjacent to Alaska's Arctic National Wildlife Range). This area is still very important to the lifestyles of two groups of native people that live within the proposed park area. Often it seems that native interests are ignored with the establishment of national parks or other conservation areas. It would be a step forward if there could be more co-ordination and co-operation among agencies and user groups. These parklands will be used by native people for their subsistence activities, small numbers of recreationists, and researchers. I would like to call on your experience to help address a number of questions:

1. What measures can be taken to help co-ordinate subsistence uses(including social and cultural aspects) with recreational and research uses?
2. What types of enterprises might native people initiate so as to maximize benefits from the implementation of

national parks(recreation and research)?

3. What constraints or conditions should be placed on researchers and recreationists to meet native goals?

4. What type of park organizational mechanisms might be set up to co-ordinate these types of uses and protect the resources?

I greatly appreciate your consideration of these questions, and hope their answers will help influence the current planning process.

APPENDIX III--Questionnaire and Coding Manual

The following is a list of the questions that were analysed from the 1976 ANWR Recreational Survey. Questions that were not relevant to the Northern Yukon were omitted.

Variable Name Userno
Columns 1-4
Variable Name Cardno
Column 5

Part A Introduction to the Arctic National Wildlife Range

Question 1. What first interested you in visiting the Arctic National Wildlife Range? (articles, and books friends, films)
Variable Name, Firint
Column 6
1. magazine article
2. book
3. film
4. persons
5. organizations
6. other
9. no answer

2. Were you personally aquainted with someone who had visited the Range prior to your trip?
Variable Name Persaqt
Column 7
1. yes
2. no
9. no answer

3. Have you previously worked in the Arctic?
Variable Name Worarc
column 8

1. yes

2. no

4. Have you previously visited the ANWR
variable name Previsit
Column 9

1. yes
2. no
9. no answer

5. If yes how many times? Variable Times Column 10

3. 1.
4. 2.
5. 3.
6. 4.
7. 5
8. more than 5
8. n/a
9. no answer

6. How many of those previous trips were primarily for recreation?
Variable Rectrip
Column 11

1. 1.
2. 2.
3. 3.
4. 4.
5. 5.
6. more than 5
8. n/a
9. no answer

How many were work related?
Variable Workrel
Column 12

1. 1.
2. 2.
3. 3.
4. 4.
5. 5.
6. more than 5
8. n/a
9. no answer

Part B. Trip Information Report

7. Inclusive Dates of Trip
Variable Trip
Columns 13, 14, 15, 16, 17, 18, 19, 20
(13 14)01, 02, 03, 04, etc.(15 16) 1-31 (17 18) 01-12 (19 20) 1-31

8. What was the major reason for your visit?
Variable Retrip
Column 21

1. recreaton
2. research
3. work related
4. other
8. n/a
9. no answer

9. Did you utilize a professional guide?
Variable Guide
Column 22

1. yes
2. no

Was this trip formally organized by a sponsoring group(school, outdoor club etc.)?

1. yes

2. no

10. If yes which guide or organization?
Variable Nguide
Column 23

1.
2.
3.
4.
5.
6.
7.
8.n/a

11. In what state or country did you legally reside at the time of your trip?
variable State
column 24

1.
2.
3.
4.
5.
6.
9. no answer

12. How did you travel to Alaska?
Variable Travel
Column 25

1. already in Alaska
2. Auto
3. bus
4. ferry
5. plane
6. train
7. other
9. no answer

13. Once in Fairbanks how did you travel to and from the ANWR?
Variable Plane
Column 26

1. yes
2. no
9. no answer

Variable Complane(commercial flight)
Column 27
1. yes
2. no
9. no answer

Variable Charter

1. yes
2. no
9. no answer

Variable Company(which charter company)
Column 28

1. Wein Air
2. Walt Audi
3. Air North
4. Al Wright
5. Frontier Air
6. private aircraft
7. other
8. n/a
9. no answer

14. Check each activity in which you personally participated

Var Name Boating
Column 29
1. yes 2. no
Var Name Fishing
Column 30
1. yes 2. no
Var Name Hiking
Column 31

1. yes 2. no
Var Name Hunting
Column 32
1. yes 2. no
Var Name Mtnclimb
Column 33
1. yes 2. no
Var Name Nature(study)
Column 34
1. yes 2. no
Var Name Photo(photography)
Column 35
1. yes 2. no
Var Name Plflying(Pleasure flying)
Column 36
1. yes 2. no
Var Name Scistudy(Scientific study)
Column 37
1. yes 2. no
Var Name Skiing(cross country)
Column 38
1. yes 2. no
Var Name Skidoo
Column 39
1.yes 2. no

15. In the above list, please circle what you consider to be the major activities in which you participated.
Var Name Specify

Columns 40-41
01 boating 02 fishing 03 hiking 04 hunting 05 mountain climbing 06 nature study 07 photography 08 pleasure flying 09 scientific study 10 skiing 11 skidoo

18. Why did you choose to visit this particular area?
Variable Whyarea
column 42

1.
2.
3.
4.
5.
6.
9. no answer

19. Did you see or meet any other parties while in the field?
Variable Cparty
Column 43
1. yes 2. no

Var Name Hmany(how many parties)
Column 44
1. 1 2. 2 3. 3 4. 4 8. n/a 9. no answer
Var Name size(what were the size of the parties) 1. less than 2 2. 3-4 3. 4-5 4. more than 5 8. n/a 9. no answer

Var Name Hoften(how often did you encounter other parties)
Column 45
1.
2.
3.
4.
5.
8. n/a
9. no answer

What was your reaction?(to meeting other parties)

Var React
Column 46
1. strongly adverse
2. adverse
3. indifferent
4. agree
5. strongly agree
8. n/a
9. no answer

20. Did you find evidence of previous parties, such as old campsites, litter, etc.?
Var Evidence
Column 47 1. yes 2. no

If yes what?(what types of evidence)
Var Yeswhat
Col 48

1.
2.
3.
4.
5.
6.
8. n/a
9. no answer

What was your reaction(to seeing evidence)
Var Reactev
Col 49

1. st. adverse
2. adverse
3. indifferent
4. agree
5. st. agree
8. n/a
9. no answer

21. Did you hear or see small aircraft of helicopters?
Var Seeair
Col 50

1. yes 2. no
If yes how many and how often Var Numair(how many)
Col 51
1. 1 2. 2 3. 3 4. 4. 5. 5 6. more than 5 8. n/a 9. no answer

Var Oftair(how often)
Col 51

1. more than once a day
2. once a day
3. once every 2-3 days
4. once every 3-5 days
5. 5- 7 days
6. every 10 days
7. 2 weeks
8. more than 2 weeks
9. no answer

What was your reaction?
Var Reacair

Col 52

1. st. adverse
2. adverse
3. indifferent
4. agree
5. st. agree
8. n/a
9. no answer

22. How many people were in your party, including yourself, but excluding members of a guiding service?
Var Parsize
Col 53
1. 1 2. 2 3. 3 4. 4 5. 5 6. more than 5 9. no answer

Part C. Evaluation of and Management Alternatives for the Arctic National Wildlife Range.

25. Please state some of those qualities or characteristics of this area which you value most highly.
Var quality
Col 54
(open ended)
9. no answer

26. What characteristics least appealing?
Var notapeal
Col 55
9. no answer

27. While you were planning your trip, what did you expect or hope your experience in the Range would be like?
Var Expect
Col 56
9. no answer

28. How did your actual experience compare with these expectations?
Var Exper
Col 57

9. no answer

29. Would you like to make a return visit to the ANWR?
Var Return
Col 58
1. yes 2. no 9. no answer

30. How probable is it that you will return?(circle one)?
Var Preturn
Col 59

1. definitely not
2. probably not
3. not sure
4. prob will
5. definitely will

Which of the following factors would be most likely to keep you from making a return visit?
Var cost
Col 60
1. yes 2. no
Var family
Col 61
1. yes 2. no
Var interest
Col 62
1. yes 2. no
Var otherf
Col 63

1.
2.
3.
4.
9. no answer

32. How would you feel about the following possible activities and developments within the ANWR
Developed Airstrips
Var Lstrips
Col 64

1. strongly approve
2. approve

3. neutral
4. disapprove
5. strongly disapprove

Shelters
Var Shelters
Col 65

Interpretive and Administrative centers
Var Intcent
Col 66

Trails
Var trails
Col 67

Sport Hunting
Var shunt
Col 68

Guided Hunting
Var Ghunt
Col 69

Pack animals
Var Packan
Col 70

Scientific Studies
Var Science
Col 71

Var Comments
Col 72

1.
2.
3.
4.
5.

9. no answer

How would you react to the following occurences during a visit to the ANWR?

41. Ocassionally seeing or meeting other parties
Var Parmeet
col 72

1. strongly favorable
2. favorable
3. neutral
4. unfavorable
5. strongly unfavorable
9. no answer

seeing light aircraft once every day
Var Plane1
Col 73

seeing light aircraft once a week
Var Planewk
Col 74

periodically having a Fish and Wildlife plane check on your party
Var F&W
Col 75

hearing distant mechanical noise from aircraft, boats or other sources
Var Noise
Col 76

Comments(open ended)
Var Com
Col 77

1.
2.
3.
4.
9. no answer

How would you respond to restricted use of the ANWR such as:
46. Regulating the timing of your trip
Var Regtime
Col 78

Regulating the area of your trip
Var Regarea
Col 79

Mandatory filing of trip plan
Var Mandplan
Col 80

Col 1-4 users number(new card, 2 cards/case)
Col 5 Card Number

Restricting aircraft in specific areas of the range
Var Restair
col 6

Restricting recreational hunting in protions of the range
Var Reshunt
Col 7

Restricting group size
Var Resgroup
Col 8

Comments
Var Rescom(on restrictions)
Col 9

1.
2.
3.
4.

9. no answer

52. If group size were to be restricted, how large a group do you think should be allowed?
Var Groupsiz
Col 10

1. less than 2
2. 2-4
3. 4-6
4. 6-8
5. more than 8
9. no answer

53. Additional comments regarding management or other aspects
Var Addcom
Col 11

1.
2.
3.
4.
5.

9. no answer

Part D. Personal Profile

54. Var Age
Col 12 13

55. Var Sex
Col 14
1. male 2. female

Var marry(are you married?)
Col 15
1. yes 2. no 9. no answer

Any dependent children
Var child
Col 16,
1. yes 2. no 3. no answer

Var childno(number of children)
Col 17

58. family income
var income
col 18

1. less than 5000
2. 5000-10000
3. 10,000 to 15,000
4. 15,000 to 20,000

5. 20,000 to 25,000
6. over 25,000
9. no answer

highest education
var educ
Col 19

1. 1-6 (grades)
2. 7-9
3. 10- 12
4. high school graduate
5. 1-4 years University
6. degree
7. post graduate work
9. no answer

occupation
Var Occup
Col 20

1. professional
2. white colar
3. blue colar
4. subsistence
5. own business
6. unemployed
7. other
9. no answer

61. Which best describes your environment of upbringing
Var Backgnd
Col 21
1. rural 2. small town 3. suburban 4. city

62. Please list outdoor related or conservation organizations to which you belong
Var Conserv
Col 22

1.
2.
3.
4.
5.

8. n/a
9. no answer

63. How often do you visit primitive areas for recreation?
var Primit
Col 23

1. once a year
2. twice a year
3. 3-4 times a year
4. 5-6 times a year
5. 7-10
6. more than 10
9. no answer

APPENDIX IV--List of Scientific and Common Names of Mammals Mentioned in the Text

Arctic ground squirrel	*Spermophilis parryi*
Muskrat	*Ondatra zibethicus*
Snowshoe hare	*Lepus americanus*
Beaver	*Castor canadensis*
Wolf	*Canis lupus*
Arctic fox	*Alopex lagopus*
Red fox	*Vulpes vulpes*
Marten	*Martes americana*
Ermine	*Mustela erminea*
Least weasel	*Mustela nivalis*
Mink	*Mustela vison*
Wolverine	*Gulo gulo*
Lynx	*Lynx lynx*
Ringed seal	*Phoca hispida*
Bearded seal	*Erignathus barbatus*
Beluga whale	*Delphinapterus leucas*
Moose	*Alces alces*
Caribou	*Rangifer tarandus*
Dall sheep	*Ovis dalli*
Black bear	*Ursus americanus*
Grizzly bear	*Ursus arctos*
Polar bear	*Ursus maritimus*
Muskox	*Ovibos moschatus*