Volume 1

PROPOSED MANITOBA HYDRO D.C. TRANSMISSION LINE EAST OF LAKE WINNIPEG: IDENTIFICATION OF ALTERNATIVE CORRIDORS WITH A VIEW TO MINIMIZE ADVERSE EFFECTS ON OUTDOOR RECREATION

by

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December, 1978

ABSTRACT

A regional assessment of the potential impacts of transmission facilities on the area east of Lake Winnipeg was conducted in order to identify alternative transmission corridors with the emphasis on minimizing the adverse effects on outdoor recreation. A regional resource inventory of the Biotic, Socio-cultural, and Recreational Components of the study area was assembled. Impacts of severe, high, moderate and low were defined and applied to the resource inventory.

Four possible corridor routes; --A, B, C and D -- were identified at the northern extent of the study area, converging to three just south of the fifty-second parallel; one with its associated trunk line along the east shore of Lake Winnipeg, the other with its associated trunk line along the midline of the study area and the third, along the Manitoba-Ontario border veering southeast to a common exit near the Fort Alexander Indian Reserve. Finally, the corridor on the east shore of Lake Winnipeg and the central corridor converge in the Manigotagan area and exit the study area near the Fort Alexander Indian Reserve.

ACKNOWLEDGEMENTS

The members of my Practicum Advisory Committee have been extremely helpful in guiding me through the research process. They have willingly donated their time and knowledge, and for this, I am indebted. Thank you--Mr. Dave Young, Natural Resource Institute; Dr. Wayne Everett, Manitoba Hydro and Mr. Brian Wilkie, Parks Canada. I am also grateful to Professor Thomas Henley who never failed to be supportive and to Professor Ian Gillies, Natural Resource Institute, who provided valuable criticism and corrections to my research presentation. Ms. Marie Klaus and Ms. Emilie Novotny -- thank you for the excellent typing, as well as your patience in correcting my errors. Mr. Lawrence DePape and Ms. Nancy Krahn, thank you for the superb map illustrations.

There are a number of individuals employed with the Manitoba Department of Renewable Resources and Transportation Services; Manitoba Department of Mines, Resources and Environmental Management; Manitoba Department of Tourism, Recreation and Cultural Affairs; Parks Canada, Federal Department of Indian Affairs, who have contributed willingly to the production of this practicum. These include Messrs. Carl Wall, Bill Barto, Vince Crichton and Dale Colton. To all other individuals in private consulting, including James F. MacLaren and Co., Inter-disciplinary Systems Ltd. and others who helped -- thank you.

My associate, Beth Vogel who shared the trials and tribulations of this study with me; thanks for your help and encouragement throughout the process.

Finally, I wish to thank Manitoba Hydro for providing the financial and technical assistance necessary to conduct this study.

Special thanks to Ms. Pat Haase for her invaluable help and encouragement throughout the study process.

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INTRODUCTION

1.1 Preamble

Manitoba Hydro is a crown corporation established under the Manitoba Hydro-Electric Act. This Act states that the purpose and intent of Manitoba Hydro is to provide for a continuance of a supply of power adequate for the needs of the province, and as well, promote economy and efficiency in the generation, distribution and supply of power (Manitoba Hydro 1977).

During the 1966-76 decade, power demand for the integrated Manitoba system exhibited an annual average increase of 7.6 percent. This represented a doubling period of 10 to 11 years. Consequently, expected demand led to the construction of additional generating sites on the Lower Nelson River (Fig.1), in order to meet projected load requirements.

One of the generating sites investigated was at Conawapa on the Lower Nelson (Fig.1). The original in-service date (1985) for the Conawapa Generating Site was based on an expected average annual energy growth of 6.4 to 7.4 percent from 1977-1985. Because average annual energy growth[1] has been much lower than this

[1] Independent studies by the National Energy Board (NEB), Federal Department of Energy, Mines and Resources (EMR) and the Manitoba Energy Secretariat (MES) projected average annual energy growth for Manitoba. From 1977-85, the NEB (1978) has predicted a 2.6 percent average annual energy growth, while EMR (1978) projected a rate of 2.9 percent. MES (1978) used three assumptions in their model for 1977-86; (1) low economic growth and conventional fuel usage to arrive at a value of 2.5 percent average annual energy growth, (2) high economic growth and conventional fuel usage to arrive at a value of 3.5 percent, (3) low economic growth and an energy shortage to arrive at a figure of 2.75 percent. All three studies projected figures much lower than Manitoba Hydro's (1978) 5.2 percent. It should be noted that if Manitoba Hydro estimates prove to be on the higher side, the Conawapa plant would be delayed beyond the 1990-95 period as previously indicated.

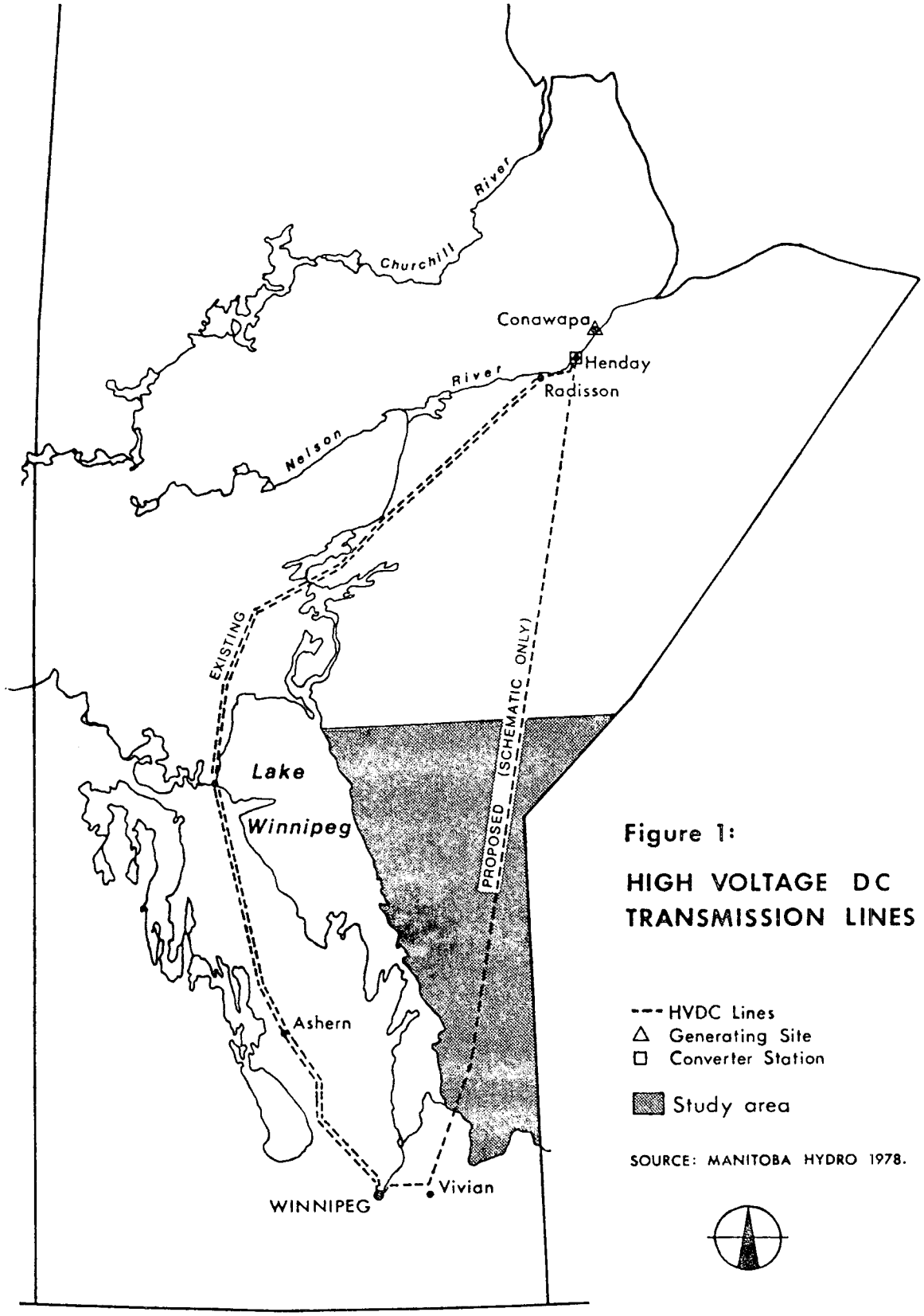

Figure 1:

HIGH VOLTAGE DC TRANSMISSION LINES

--- HVDC Lines
△ Generating Site
□ Converter Station

Study area

SOURCE: MANITOBA HYDRO 1978.

projection, averaging about 5.2 percent, the in-service date for Conawapa is currently estimated to be in the 1990-95 range (Everett pers.comm.).

Conawapa will be the generating site from which the bulk of the power for the third Direct Current (DC) transmission line will be obtained. The power generated at Conawapa will be transformed at the Henday Converter Station (Fig.1) and transmitted to Southern Manitoba via a 450 kilovolt (kv) DC transmission line. There are already two DC transmission lines from the Lower Nelson River which are routed through the Interlake to southern Manitoba (Fig.1).

One alternative to constructing a third line through the Interlake is to route the line through the area east of Lake Winnipeg and west of the Manitoba-Ontario Boundary (Fig.1). There are two reasons favoring this route. First, transmission lines can be affected by weather and other hazards and the risks from these hazards would be spread by routing the line east of Lake Winnipeg. Second, there may be cost savings in constructing a line east of Lake Winnipeg.

The study area east of Lake Winnipeg (Fig.2) is rugged and contains resources valuable to outdoor recreation. There are many tourist lodges and outcamps, picnic sites and campgrounds. Nopiming Provincial Park is entirely contained within the study area,as well as the northern portion of the Whiteshell Provincial Park. Distinctive rivers and rare woodland caribou herds are also present in the study area. Perloff and Wingo (1974) noted that the value of outdoor recreation is today tied to the broad

availability of outdoor recreation for frequent enjoyment by everyone. The characteristic need of the public is no longer the annual trip to a far-away area of unforgettable beauty by the fortunate persons who can afford it, but rather trips by moderate income urbanites to nearby areas for weekend visits. As Perloff and Wingo have stated:

> "Freedom, and wealth have made vast populations demanders after space, and sun, and air, and water and the simple grandeur of nature, and we are increasingly conscious that the supply of things--brought together in a recreation environment--is painfully limited."(Ibid: 26).

A report entitled, Park and Recreation Futures in Canada (PRFC) prepared for the Federal Provincial Parks Conference (1976) predicted that fewer Manitobans will travel to vacation destinations which are a great distance from their homes. Consequently, the development of more resorts, parks and recreation areas near to cities will become a necessity. However, for Manitoba, it was anticipated that a significantly greater number of people are expected to travel to this province from all parts of the world to participate in a "wilderness" experience.

Manitobans have increased their usage of Manitoba campgrounds by 63 percent over a five year period (1970-75), and overall usage of Manitoban campgrounds (including visitors) increased by fifty percent (PRFC 1976). This increased recreation demand is anticipated to result in access to more remote resource areas. Evidence of this is the development of Nopiming Provincial Park in 1977, and a proposed National

Park[1] east of Lake Winnipeg.

The area east of Lake Winnipeg is capable of providing diverse recreational opportunities. These attract outdoor recreation enthusiasts (camping and picnicking) and as well, cater to those enthusiasts who seek varied, or specialized activities (angling and white-water canoeing). Outdoor recreation enthusiasts may come from Manitoba, or may be attracted from out-of-province and even from out of the country.

The routing of a power transmission line through the area raises the possibility of conflict with existing or future land uses and recreational opportunities. Detrimental changes associated with transmission facilities may occur as a result of the following conditions, or activities associated with:

1. acquiring rights-of-way to accomodate transmission lines
2. clearing the right-of-way
3. installing the lines

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[1]Several organizations calling themselves the Atikaki Coalition, have also made a proposal to the Federal and Provincial Governments for the establishment of a National Park in the Bloodvein River Basin. The proposed boundaries for the Atikaki National Park are more extensive than the Bloodvein National Park. The latter park is proposed by Parks Canada and the Manitoba Department of Tourism, Recreation and Cultural Affairs. The rationale for the preservation of the area in the form of a National Park is based on wilderness character. The proposed Bloodvein National Park is recognized in this analysis as having the support of the Federal Government. It should be noted that the report recognizes the existence of the Atikaki proposal and its relationship to the Bloodvein National Park proposal.

4. operating the lines

5. maintaining the lines and rights-of-way

6. the physical presence of the lines (Ontario Hydro 1976)

It is important that the route selected for construction of a transmission line be situated so as not to cause extensive adverse environmental effects. In a recent study for Manitoba Hydro, Wardrop-London Consultants (1977), noted that the concern for the environment includes the biological component (which includes plants, animals, fish and other living organisms); the man-made component (which refers to man, his lifestyle, and his social values); and the physical component (which includes all the physical features such as weather, soils, surface waters and ground waters). The Wardrop-London Study summarized the reasons why care is necessary to protect the environment.

a. The natural environment is important to man's opportunities for recreation, health, economic prospects and standard of living. These are affected by changes in environment.

b. Other living things are totally dependent on the natural environment. All living systems should be considered important even if that importance is not readily apparent to man. Consequently, man should avoid disrupting the environment in any way that will affect the ecological balance of other life forms.

c. Repair, mitigation or artificial reversal of environmental damage could take centuries. In some cases, irreparable damage occurs.

d. Adverse environmental impacts are not always readily apparent. Thus, potential environmental changes must be carefully investigated to avoid the accumulation or magnification of any detrimental impacts, before it is too late for corrective action.

In sum, the proposed construction of transmission facilities, in any area which is of considerable importance to outdoor recreation represents a very basic form of land use conflict. Manitoba Hydro recognizes the need to perform an environmental assessment in order to make informed decisions regarding alternative transmission line routes. As an initial step towards satisfying that goal, Manitoba Hydro is primarily interested in an identification of alternative corridors with the major emphasis on minimizing the detrimental changes associated with transmission facilities which result from the following conditions or activities associated with: acquiring rights-of-way to accomodate transmission lines, clearing the right-of-way, installing the lines, operating the lines, maintaining the lines and right-of-way, and the physical presence of the lines on outdoor recreation.

1.2 Objectives

The primary objective of the study is to identify alternative transmission corridors within the study area with the major emphasis on minimizing impact on outdoor recreation. The sub-objectives are first, to prepare an inventory of the Biotic, Social and Cultural components of the environment; second, to categorize and evaluate the Outdoor Recreational component in terms of its present and potential use, and; third, to identify the alternative corridors which minimize adverse effects on outdoor recreation.

1.3 Scope of the Study

The scope of the study, as determined by the researcher and the study committee is limited by the following considerations.

1.3.1 Focus of the Study

The primary focus lies in an analysis of the potential effects of transmission facilities on outdoor recreation. The outdoor recreational setting of the study area is primarily geared to uses of the physical resources which include the Biotic, Social and Cultural components. Proposed developments which may have an effect on outdoor recreation are also considered.

1.3.2 Alternative Considerations

Current Manitoba Hydro demand estimates indicate that, a high voltage DC transmission line may be needed to deliver energy from Conawapa to southern Manitoba in the 1990-95 range. One alternative is to construct the line east of Lake Winnipeg because:

1. transmission lines can be affected by weather and other hazards, and the risk of these hazards would be spread by routing the line east of Lake Winnipeg
2. there may be cost savings in constructing a line east of Lake Winnipeg.

Other alternatives, including a route through the Interlake area, the development of larger interconnections, the use of an alternating current (AC) line, the development of non-hydraulic generation closer to Winnipeg and the no-project alternative, were not considered.

1.3.3 Limitations

The study did not consider the detailed economic and technical considerations necessary for the construction of transmission facilities. However, an assumption was made that the

routes should be linear alignments in a general north-south direction. External input was limited to discussions with the Manitoba Department of Renewable Resources and Transportation Services; Manitoba Department of Tourism, Recreation and Cultural Affairs; Parks Canada; and professional judgement of the author. Field work consisted of excursions into the southern portion of the study area by automobile.

1.4 Glossary of Terms

Avoidance areas are regional in scope and are differentially higher impact areas which should be avoided in transmission line routing (Everett pers.comm.)

Center Line is the legally surveyed right-of-way within a transmission corridor.

Corona discharge is the phenomenon which occurs when the air surrounding a conductor exceeds a critical voltage gradient resulting in ionization of air molecules and causing a luminous corona discharge. Corona activity increases with increasing voltage for a given conductor arrangement and decreases with greater conductor size. Corona levels increase during periods of precipitation, and fog. Insects and surface imperfections on the conductors (such as abrasions, and dust particles) form possible corona sources (Manitoba Hydro 1975).

Corridors are broad, linear areas within which the probability of finding acceptable locations for the transmission facilities appear greatest in light of the identified constraints.

Direct Current (DC) is electric current of constant direction having a magnitude that does not vary or varies only slightly. It is the cheapest mode of transporting electrical power over very long distances.

Edge Effect is a biological phenomenon which occurs in an ecotone. An ecotone is a zone where two or more different communities meet and integrate. This zone of intergradation may be narrow or wide, local or regional. An ecotone contains not only species common to the communities on both sides; it may also include a number of highly adaptable species that tend to colonize such transitional areas. The variety and density of life is often greatest in such areas, and this phenomenon is called the edge effect (Smith 1974:252).

Impacts are changes in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to activities of humans, or of nature (Canter 1977).

Mitigative measures is the term used to describe techniques or methods which can be used to limit or reverse the adverse impacts of a development in an area, in order to maintain the original setting of an area. These techniques are subject to the economic, environmental, technical, administrative and political limitations placed on the developer.

Outdoor recreation is recreation that is typically carried on outdoors. Enjoyment of outdoor recreation requires space and resources, often in large quantities. Some types of outdoor recreation are best carried out where the natural landscape has had minimum modification, while others require extensive investment and environmental modification. This study is mainly concerned with those activities characterized by their informality, formlessness, absence of order and pressure, as well as their spontaneity . These activities generally require undeveloped resources (Clawson and Knetsch 1966:7).

Recreation means activity or planned inactivity undertaken because one wants to do it. The distinguishing characteristic of recreation from work is not the activity itself, but the attitude with which it is undertaken (Ibid).

Recreation resources include areas of land, bodies of water, wildlife, forests, swamp and other natural features which are in demand for outdoor recreation, or are likely to become so. These natural resources become recreation resources only because they are of use for this purpose. If the natural elements have no foreseeable future value for the purpose of recreation, they cannot be considered part of the present outdoor recreation resource (Ibid).

Recreational river areas are rivers, or sections of rivers, which are readily accessible by road, but which have some impoundment along the shoreline. (Ibid).

Regional Environmental Assessment is a screening method used to assess a sizeable area under consideration for project development. The method distinguishes among zones in which the potential impact of the proposed project would vary in severity by the use of established criteria. Areas in which the potential impact is determined to be relatively low can be investigated in detail to determine an acceptable location for the proposed project. The regional environmental assessment is usually the first step in the environmental impact assessment process.

Right-of-way is the specific location or route of the transmission line within a transmission corridor.

Semi-wilderness consists of lands with interesting natural environment and land-water orientation, suitable for the development of hiking, nature trails, viewpoints, scenic reserves and parkways (Saskatchewan Nelson Basin Board 1972:333)

Transmission facilities are transmission towers, lines and the associated right-of-way.

Unmitigated detrimental changes is the term used to describe the adverse impacts of a development which cannot be reversed or limited in order to maintain the original setting of the area because of the economic, environmental, technical, administrative and political limitations placed on the developer.

Wilderness consists of woodlands and wildlife habitat that may be maintained in a pristine condition, suitable for more primitive activities, such as hiking, nature study, canoeing, angling, and hunting in season. (Ibid).

Wild river areas are rivers, or sections of rivers that are free of impoundments, and generally inaccessible except by trail, with watersheds, or shorelines that are essentially primitive and waters that are unpolluted. (Clawson and Knetch 1966:7)

CHAPTER 2

THE STUDY AREA

2.1 Regional Setting

The study area (Fig. 2) consists of approximately 35,840 square (sq.) kilometers (km) located east of Lake Winnipeg and west of the Manitoba - Ontario border. The study area also lies north of the Winnipeg River and south of the height of land between the Belanger-Cobham River watersheds and the Gunisao - Island Lake watersheds.

Designation of the area was based on the following factors:

1. The western, northern, and southern extent of the study boundaries are natural physical landforms.
2. Land use patterns south of the Winnipeg River are quite different from the patterns characteristic of the bulk of the area. The area south of the Winnipeg river will not be evaluated in this study.
3. North of the height of land between the Belanger-Cobham River watersheds and the Gunisao - Island Lake watersheds lies a vast area that is composed mainly of marshes, swamps and bogs. The extent, difficulty of differentiation and low recreational importance of this area did not warrant its inclusion.

4. Lake Winnipeg is a natural western boundary while the eastern boundary is the Manitoba-Ontario border. Both the eastern and western limits of the study coincide with the jurisdictional boundaries of the Eastern Planning Zone, Manitoba Department of Renewable Resources and Transportation Services.

5. Agencies considering the area to be important to outdoor recreational capability included:

   a. Manitoba Department of Renewable Resources and Transportation Services (Government of Manitoba 1975).

   b. Manitoba Department of Tourism, Recreation and Cultural Affairs (Stetski pers.comm.)

   c. Manitoba Hydro (Everett pers.comm.)

   d. Federal Department of Indian and Northern Affairs - Parks Canada (Johnston pers.comm.)

2.2 Topography

The Canadian Shield was severely eroded by glaciers which carried stones and earth on their undersurfaces. The rock and soil from the shield surface was transported south and west, so that generally, land in close proximity to the Shield became very stony. This material, otherwise known as till or boulder clay forms the surface deposit of most of Manitoba today (Weir 1960).

The effect of glacial movement on the Precambrian topography varied. Old drainage courses were filled with drift deposits, and new drainage courses created where the hard rock resisted

erosion. Large areas were flooded when the ice melted, forming glacial lakes. Eskers, drumlins and moraines were formed. Linear valleys and rock basins were left after the ice removed the weaker schists and sedimentary rocks in the Canadian Shield (Ibid).

Drainage patterns in the Shield follow irregularities left by the ice. Falls and rapids are characteristic of the areas which resisted erosion. The drainage disorganization in the Shield is responsible for numerous lakes, bogs and swamps. Rivers, deep and shallow lakes, and areas of bog and muskeg occur. Many water bodies are slowly being filled in by organic matter (Hooper 1973).

The study area, which lies at the western margin of the Canadian Shield, is included in the Boreal Forest Region of Canada. Rowe (1972) subdivided the topographical features of the area into three sections (Fig. 3).

1. The Manitoba Lowlands is adjacent to the shore of Lake Winnipeg and is composed primarily of flat bogs and numerous rock outcrops. The elevation is approximately 217 meters (m).

2. The Nelson River Section is rolling terrain with many glacial sand flats and bogs. The elevation gradually increases in an easterly direction.

3. The Northern Coniferous Forest consists of rugged jackpine rock ridges often 18 - 30 m. high, cradling many lakes and stream valleys. The land at the Manitoba - Ontario boundary is approximately 335 m. above sea level.

Throughout the study area many small lakes which occur in the larger depressions between rock outcrops serve only as catchment basins because they lack both inlets and outlets. The dead level areas which have small depressions are occupied by muskegs which have Spaghnum moss overlying peat deposits and these can be as much as several meters thick (Harrison 1934).

Eleven rivers and their tributaries flow in a westerly and north-westerly direction. These are generally small but can be navigated by canoe. Numerous rapids and low falls are characteristic. The riverbanks are primarily rocky and steep, broken occasionally by small river flats where there are soils built up as result of siltation. Harrison (Ibid) noted that rock ridges roughly parallel the courses of the streams for a distance of 0.62 - 5 km inland along both banks.

2.3 Geology

Weir (1960) noted that tectonic and gradational forces acting since the Precambrian era molded the physiography of the area to its present configuration. The Precambrian Shield was formed 5,000 to 550 million years ago during the Archean and Proterozoic eras (Ehrlich et. al. 1959).

The nature and structure of rocks in eastern Manitoba indicates the occurrence of many major geological events in Precambrian time. Great masses of molten rock cooled to form the large bodies of granite and granite-like rocks which outcrop in the area. The dominant rock types are composed of granite, granodiorite and quartz diorite (Weir 1960).

Sediments and interbedded lava flows which were also laid down in the Precambrian, appear as bands in the granite. They are generally narrow, but in some cases they may cover fairly wide areas (DeLury 1920). Some of the sediments and interbedded lava flows outcrop in a narrow belt along the valley of the Wanipigow River. Volcanic and sedimentary rock can also be found in a generally horseshoe - shaped area extending along Berens River, from Night Owl Falls to Horseshoe Lake (Hooper 1973).

The end of Precambrian time was the end of the era of mountain forming movements, and of volcanic or other igneous activity in Manitoba. Subsequent glacial action resulted in granite being the most conspicuous rock in the area. (Mineral resources will be discussed later.)

2.4 Soils

Glacial scouring removed most of the surficial material in the area. Those glacial deposits that do occur were laid down during the recession of the last ice advance and can be found in ground depressions. Deposits of moraine (clay till) over which glacio-fluvial deposits were laid can be found scattered throughout the study area (Weir 1960).

With respect to soils, the area has been subdivided into the Transitional Zone and the Precambrian Drift Plain. (Fig. 4). The Transitional Zone has lacustrine clay silt deposits and peat deposits which cover much of the bedrock and drift. The southern region of the Transitional Zone is characterized by thin

deposits of boulder clay, sand and gravel. The western shoreline of Lake Winnipeg within the Transitional Zone is low and characterized by sandy deposits and rock outcrops (Ibid, Ellis 1938).

In the Precambrian Drift Plain, some of the area is covered by lacustrine deposits. Thin soils characterize the rest of the Drift Plain, except in the narrow stream valleys where soils of vegetable origin are dominant. In the southwestern extent of the Precambrian Drift Plain limestone with bog and rock outcrop is predominant (Fig. 4). On the low rock ridges, forests grow in soils only a few centimeters thick, apparently built up from a succession of plant forms beginning with terrestrial lichens, successively to mosses, flowering plants, low shrubs and finally coniferous forest (Wall 1977).

Weir (1960) and Ellis (1938) noted that the soils are primarily grey-wooded and podzolic with rock outcrop and peat. The following description of soil types was drawn from Weir (Ibid) and Ellis (Ibid).

Grey wooded soils are characterized by leaching and alluviation in the A horizon. The surface layer is a leaf-mat underlain by a thin grey-black A_1 horizon (Fig. 5). The A_2 horizon is a leached ash-grey layer. The clay and organic matter in the B horizon is brownish in colour with a nutty structure, underlain by a layer of lime carbonate. These soils are nutrient poor and are often associated with rolling to hilly drift deposits.

Podzol soils are developed on acid-parent materials. They are derived from coarse - grained crystalline rocks and usually

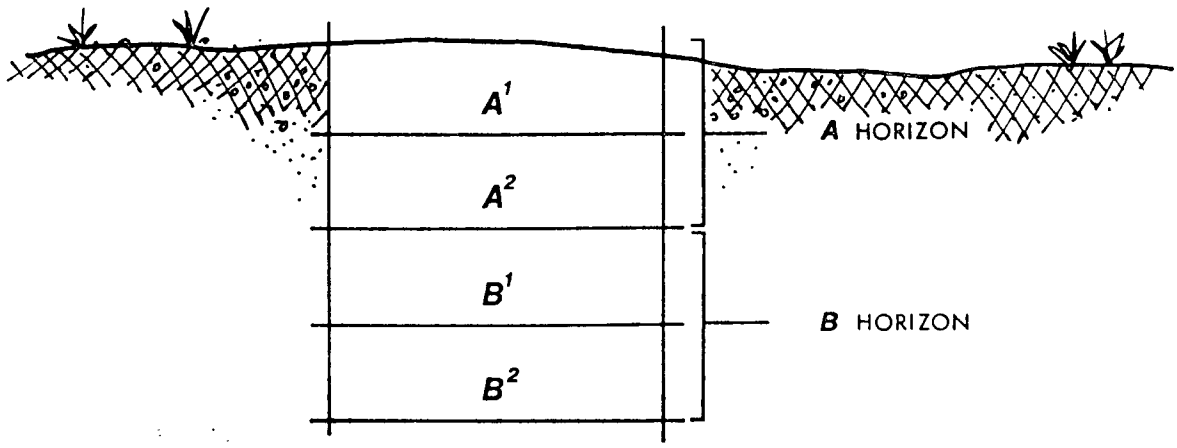

Figure 5: ILLUSTRATION OF SOIL HORIZONS

form the cover under coniferous forests. The podzol soils are characterized by a moderately deep, whitish-grey, ash-like A horizon with a platy structure. The B horizon is brownish or dark coloured, nutty structured and heavier textured. Rainfall (unless drainage is impeded) is sufficient to leach the lime from the soil resulting in an acidic soil. The podzols are developed under more humid climatic conditions than the grey-wooded soils. Sandy jackpine covered areas are typical sites for the occurrence of podzols.

Hooper (1973) noted that a gradual transition in soil type can be discerned from the eastern shore of Lake Winnipeg to the Manitoba-Ontario border. The grey-wooded and peat soils are found in a strip along the east shore of Lake Winnipeg grading to more podzolic and thin rock regoliths towards Ontario. The outstanding characteristic in the area is the predominance of rock outcrop rather than soil development.

Ellis (1938) recognized that the soils of the region were of negligible value for agricultural purposes and suggested that the logical utilization of the major portion should be for forest and wildlife production as public domain, while the innumerable lakes, streams and rapids were ideal for summer resorts.

2.5 Climate

Weather conditions are a primary factor in the attractiveness of any area for outdoor recreational activities. The direction and velocity of winds, rainfall or the lack of it,

sunshine and temperature, all have a major bearing on the nature of recreational activities at all seasons of the year (Saskatchewan Nelson Basin Board 1972).

Weir (1960) defined climate as the generalization of daily weather conditions over a period of years. Climate varies with latitude and elevation. Changes in elevation in the study area are not pronounced enough to cause measur able climatic variation. However, the proximity of a large water-body such as Lake Winnipeg tends to favor the formation of micro-climatic regimes in the vicinity of the lake shore (Young pers. comm.).

The study area experiences warm summers and cold winters. Average July temperatures range from 20.8 degrees centigrade (^{o}C) in the south to 17.8^{o}C in the north. In January, average temperatures vary from -18.3^{o}C in the south to -21.7^{o}C in the north. The annual minimum temperatures are -38.4^{o}C in the south to -40^{o}C in the north (Weir 1960).

Various workers; Stardom (1974), Crichton (1974), Weir (1960), and Ellis (1938) estimated that the average annual precipitation (meltwater and rainfall) for the area is 45 - 50 centimeters (cm) while average rainfall for May, June and July is 15 - 20 cm. Harrison (1934) also noted that there is a cyclic variation in precipitation which results in relatively dry periods, of about two to three years at eleven year intervals. Electrical storms are a common occurrence, especially in the Berens River area where such storms are usually accompanied by rain. Lightning strikes from these storms can be especially dangerous as a cause of forest fires during the summer. Average annual snowfall is approximately 150 cm (Weir 1960).

In summary, the summer climate of the area is similar to that in Southeastern Manitoba with warm, relatively dry summers and long hours of daylight. (Whiteshell Provincial Park region). This is conducive to the enjoyment of outdoor recreational activity and is evident from the number of recreation enthusiasts using the campgrounds and provincial park areas in the region as late as October. The disagreeable cold winter weather can be counteracted to some extent by the use of modern winter clothing and winter recreation equipment such as snowmobiles.

2.6 Historical Perspective

Much of the history of the area has been unrecorded. Systematic archaeological investigations commenced in 1975 (Pettipas pers. comm.). That portion of the study area north of the Wanipigow River has remained relatively undeveloped, compared to the southern region.

Human habitation was only possible after 7500 B.C. when glaciers of that period melted to form Lake Agassiz (Welch 1977). The Cree are believed to have been the earliest pre-historic inhabitants of the area. They utilized primitive tools such as bone implements, chipped and ground stone tools and also used pottery (Government of Manitoba 1975). There are no records from the time of the Cree peoples to that of the Salteaux Indians who inhabit the Berens, Bloodvein and Little Grand Rapids Reserves.

Written history began less than 200 years ago at which time it is believed that the Salteaux moved into the area as one group which eventually drifted apart (Leach 1971). Some of that group are thought to have remained where the people of Little Grand Rapids now live. Others may have wandered in a southerly direction, settling near the narrows of Lake Winnipeg, in the vicinity of Bloodvein. Others may have continued a westward journey following the Berens River and settling at its mouth. However, these are speculations which cannot be substantiated.

The written history of the fur trade is a vital source of information regarding the historical development of the study area. In 1670 King Charles II of England granted the region called Rupertsland (which includes the present study area) to the Hudson's Bay Company. However, it was still considered French territory as late as 1763. Around 1763, there was fierce competition between fur traders of rival companies.

The Northwest Company and other private Montreal traders established posts along Lake Winnipeg, especially in river mouths. The fight for the resources of the interior had begun. The Berens River, Pigeon River and Family Lake were important waterways that were used by fur traders travelling between Lake Winnipeg and Hudson's Bay. After 1880 the Hudson's Bay Company intensified their drive for the fur resources in the region (Rupertsland) by establishing trading posts. The merger of the Montreal Fur Company and the Hudson's Bay Company in 1820

gave the latter exclusive trading rights. The fur trade has continued without interruption to the present. The fur trade is the oldest modern economic activity in the area and has been carried out continuously for over 200 years, but its importance to the economy is diminishing.

In 1870, Rupertsland and the Indian Territory became part of the Dominion of Canada (Government of Manitoba 1975). In September 1875, the S.S. Colville was recorded as arriving at Berens River carrying the Lieutenant-Governor of Manitoba and other representatives of the British monarchy. The purpose of the trip was for the signing of Treaty Number Five on September 20th and 24th in 1876 at Norway House. Its jurisdiction included all natives in the areas of Berens River, Bloodvein, Little Grand Rapids, Poplar River and other groups of Indians in and around Norway House. Reserves were later surveyed based on the conditions set out in the treaty. The Poplar River reserve was not handed over officially to the Indians until the 1930's (Leach 1971).

Around 1911, mining activity began south of the Wanipigow River with the staking of claims at Rice Lake for the purpose of gold exploration. Nine years later, over 2000 claims had been staked. Mining became a major economic activity south of Wanipigow. Some of the more successful mines included the Oro Grande (1921 - 1939), Central Manitoba Mines (1927 - 1937), Gunnar Mines (1936 - 1942) and the San Antonio Mine (1932 - 1968) at Bissett which was the most successful mine. Mines were

active for many years (Welch 1977, Government of Manitoba 1975). A tantalum mine is currently producing at Bernic Lake and is expected to continue producing into the foreseeable future.

Forestry as a commercial economic activity began in 1931 when Abitibi Pulp and Paper Ltd. established cutting berths in the area. Today, it is a significant source of employment for local residents.

North of the Wanipigow River, the land is relatively undeveloped. Tourism and other seasonal work form the mainstay of the inhabitants. South of the Wanipigow, (except for Pinawa, which is an Atomic Energy Canada Limited company town) seasonal work which includes forestry, tourism, trapping and wild rice harvesting are the chief economic activities of the primarily native inhabitants. Few commercial ventures are owned by natives although this situation is slowly being changed.

More development plans are proposed for the area. The advent of Nopiming Provincial Park, a proposed National Park and many tourist facilities will attest to this. Archaeological excavations will continue to reveal information regarding the history of the study area prior to the fur trade, and eventually the gaps in the historical kaleidoscope will be filled.

CHAPTER 3

APPROACH TO THE STUDY

3.1 Sources of Information

Information was gathered from published and unpublished literature generally written by government employees and members of the University Community. Literature published by the major utility companies, predominantly Manitoba Hydro and Ontario Hydro, was used extensively for information regarding methods of regional environmental impact assessment and corridor identification. Personal communication with some commercial operators (generally tourist lodge owners) and experts within municipal and provincial government circles, who had knowledge about the study area provided further information. A field trip was undertaken south of Wanipigow River to observe the physical environment and land use developments in the area.

3.2 Review of Selected Regional Environmental Assessment Literature

The routing of transmission lines requires decisions at three different levels of concern. Gray (1975) identified these decision levels and categorized them as follows:

1. provincial or regional level
2. corridor level
3. site or centre-line level.

At the provincial or regional level, a single study area is selected from more than one possibility. At the corridor level, data and criteria are used that are appropriate for determining a number of corridors or bands within a given study area. At the

site or centre-line level, on-site inspection is used for the gathering of local information which is generally used to identify preferred routes within a corridor. Of these three decision levels, the corridor level routing decision has practical significance. Gray (Ibid) is of the opinion that routing strategies are most effective at the corridor level of decision. The selection of alternative corridors, is a step in the chain of events that will culminate in the construction and operation of a transmission line conveying electrical power from one point to another.

Many regional environmental assessment studies have been done. Some involve the identification of alternative corridors for the purpose of selecting transmission line routes, or the selection of a preferred corridor of right-of-way. Prior to the legislated requirements for environmental impact assessments,[1] most methods for selecting transmission line routes were concerned primarily with economic and technical engineering criteria. Later, other criteria which involved a concern for the environment came into common use. The following is a review of selected methods used in regional environment assessments since 1969.

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[1]There are no requirements for environmental impact assessment under Manitoba law, except by order of the Minister responsible.

3.2.1. Method I

One of the earlier methods for choosing suitable sites for development was proposed by McHarg (1969). The McHarg method involves the use of the least social cost/maximum social benefit solution. The method uses a relative value system that considers many non-price benefits, savings and costs, as well as the measure of scenic experience as a potential value. The pre-dominant assumption is that the aesthetic natural resource and social values can be ranked. McHarg (Ibid) ranks each individual value by colour. Values are arranged in a hierarchy according to suitability of land use and coloured accordingly. The darker the shade, the higher the intrinsic suitability. Factors considered include such things as climate, geology, physiography, hydrology, pedology, vegetation, wildlife habitat and land use. Each factor is mapped on transparencies. The resulting composite map, consisting of the superimposed transparencies represents a value gradient incorporating all the appropriate factors to determine the best suitability for a particular project.

This method could not be used in the study because the detailed data requirements could not be fulfilled. The McHarg method may best be applied at the On-Site level.

3.2.2 Method II

A method was developed by bhi Limited (1973) in a study to determine the routing of lines between generating stations at Nanticoke and Pickering (Ontario). The method is similar to the McHarg method. The following description and analysis of the bhi method is derived from a study entitled Location Hydro (1975).

Four steps were involved. The first, was to determine the study area boundaries. The second, was to prepare an inventory of the physical features, land-use activities and other relevant phenomena of the study areas that were of significance to the routing decision. These were mapped on transparent overlays. The third step, involved the determination of the arrangements of the new transformer/switching stations, in relation to those already existing. The fourth step, was the selection of the "best" overall route.

The environmental features were recorded on eight inventory maps:

i. present land use
ii. cultural, recreation and open space
iii. transportation land use
iv. proposed land use
v. natural resources
vi. critical natural features
vii. scenic quality, and
viii. land elevation

A ninth map was prepared, showing places and areas considered important to avoid, by residents of local communities through a questionnaire. This ninth map was used only as a check on routes determined from the other inventory maps. No attempt was made to rank any relevant features into high, medium or low impact areas for any particular map.

A set of about fifteen environmental factors was derived by a different grouping of features. For example, agricultural land use, industrial land use and wildlife habitats were three categories of environmental factors identified. Next the significance of the factors as criteria for the location of transmission facilities was ascertained by asking persons (within the communities of the study area), via a questionnaire, to rank the importance of having powerlines avoid the factors. Then by "summing the ranks", an ordering of the factors in terms of their relative importance was obtained. The features that had been previously mapped on overlays were then shaded according to weights that could now be selected which would avoid the darkest areas to the greatest extent possible.

Location Hydro (Ibid) recognizes the potential of the method. However, it is critical of the fact that there was only a crude coincidence between the factors for which weights were ascertained by questionnaire, and the mapped features that were shaded and finally used. The main criticism of the method is that it fails to discern quality differences in crucial areas of concern, for example, a river system is always a river system,

and flat farmland is never a scenic landscape no matter how varied and vital its agriculture might be, or how interesting the patterns of its hedgerows and woodlots. This critical disadvantage of the method would have made the requirements of the method impossible to maintain throughout the terms of reference of this study.

3.2.3 Method III

The method used by Ontario Hydro (1975a), was based on the assumption that the bands (corridors) were to provide for the transmission of power from one site to another. The bands (corridors) must either avoid areas which produce the greatest constraints to transmission lines, cross these areas on or adjacent to existing severances, or cross them otherwise only where necessary to fulfill system criteria. Areas of greatest constraint were to be identified according to one or more of the following criteria:

i. an officially stated and approved land use restriction or policy which would be violated by the imposition of transmission lines, and/or

ii. a relatively high probability that overhead transmission lines would cause significant detrimental changes in the area or in the activities of the people who inhabit or use the area, now or in the foreseeable future.

The following activities or conditions associated with transmission facilities were used to identify the detrimental changes which may occur in an area:

(a) acquiring rights-of-way to accomodate transmission lines

(b) installing the lines, and

(c) maintaining the lines and right-of-way.

It is recognized that areas will not all be altered in the same manner and the significance of the anticipated change will vary from one area to another.

The potential effects of transmission lines on the following families of concern were considered:

i. restrictive and institutional areas
ii. human settlement
iii. wildlife habitat
iv. timber production
v. erodibility
vi. food production
vii. mineral extraction
viii. wetlands
ix. surface water
x. forest cover
xi. recreation, and
xii. appearance of the landscape.

An inventory of the study area was conducted, and the data types were mapped. This information was manually encoded, and computer stored on the basis of a two x two km registered grid overlay.

In order to recognize constraint areas, environmental analysts with specific expertise in each family of concern were asked to prepare "avoid statements". The avoid statement for each family of concern comprised;

(a) a directive to avoid a particular type of area characterized by specific descriptions contained within the inventory, and

(b) an appended statement outlining the reasons why such areas should be avoided, in terms of the changes which might be expected as a result of locating transmission lines there, and the significance of these changes to the region.

The objective directives were then ranked on separate cards, by each environmental analyst for each family which produced twelve decks of twelve cards. These twelve decks each had an order of highest priority among the twelve number ones for each family; the twelve decks were then presented (in the order that they were previously ranked), to a group of environmental analysts representing a variety of disciplines. Only the number one cards were shown, and by group concensus the objective directive which was considered to be of prime importance, was removed to be the overall highest priority. This procedure was repeated until all objective directives were placed in order of overall priority. Therefore each family of concern had one directive associated with it that had a rank of one to twelve.

The identification of constraint areas was accomplished by applying the literal directives of the objectives to the mapped inventory, that is, if the objective for recreation had the highest priority, the study area would be searched for recreation areas (2x2 km cells) and these would be designated avoidance priority number one. This procedure was repeated for all twelve objective directives and resulted in one map.

To accommodate band identification, the objectives were grouped into five levels such that the total area to which the

objectives in each level applied was approximately equal and resulted in another map. By using both maps and applying the criteria first stated, general location of alternative bands were identified by coarse visual inspection. In order to delineate the approximate boundaries of the bands, and particularly to indicate where the bands might best traverse areas of relatively high constraint when necessary, the general band locations were checked against individual cell designations regarding the highest ranked objective applicable thereto, and against the individual factor maps.

The need for computers, large numbers of expert environmental analysts and fiscal constraints precluded the use of this method for the present study.

3.2.4 Method IV

This method, used by Manitoba Hydro (1977) recognized that transmission lines cause negative and positive impacts and consequently affect land use patterns. The identification of alternative corridors in this study is based on the following three principles:

i. that the impacts of a transmission line on economic, cultural and natural phenomena be minimized

ii. that the transmission line impact as little as possible on known future developments, and

iii. that transmission line development take advantage of the presence of features which may be compatible with, or benefit from, the development.

On the basis of the above principles and other components, the following factors were considered representative of the major resource concerns in the study area:

(a) agricultural operations

(b) the natural environment

(c) human settlement

(d) recreation-historic, and

(e) land resources.

A detailed set of impact criteria was developed and called Factor Rules. The Factor Rules give a consistent objective method of translating data that related to physical state and use, into discrete impacts. Impact ratings were scaled from "extreme" (areas where it would be most undesirable to route a transmission line) through a descending order of severe, high, moderate and low. Figure 6 is a sequential diagram of the operations required to proceed from raw data to corridor identification.

Information regarding each factor was obtained from a variety of sources, government and non-government. Information was mapped at 1:250,000. The following address concerns identified by each factor.

i. Canada Land Inventory-Capability for agriculture, outdoor recreation, wildlife and present land use

ii. agricultural productivity

iii. forest inventories

iv. historic and archaeological sites

v. future land use consideration--committments to future development for parks, housing development, wildlife management areas

vi. existing right-of-way including transmission line rights-of-way and railway lines

vii. biological features--sensitive ecological and biological areas, and sites designated by the International Biological Program

viii. a variety of other published, unpublished and manuscript sources.

In accordance with Factor Rules, data variables are assessed for impact and mapped for each factor. Using an overlay technique, Factor maps are combined to produce a Composite map. The highest impact on any land unit from any Factor appears on the Factor map. By overlaying the Factor maps to produce a Composite map, areas of extreme through low impacts appear. The lower impact area lying between areas identified as Regional Avoidance Areas (because of their higher impact status) are of varying widths and are called corridors.

This method, though comprehensive could not be applied in its entirety to the present study, primarily because Canada Land Inventory Maps were not available for the area north of the Wanipigow River.

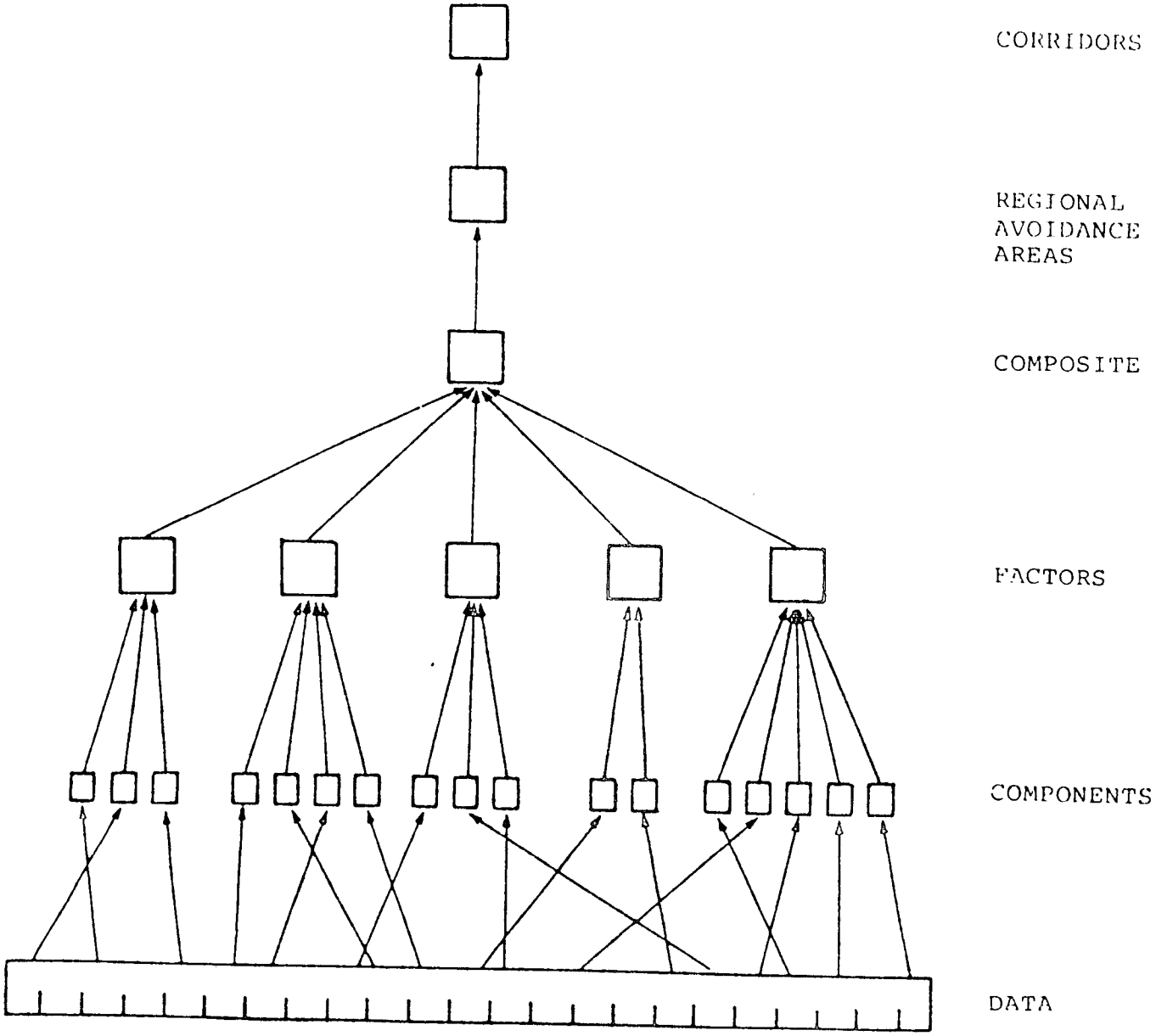

Figure 6. Environmental Impact Assessment Schema

Source: Manitoba Hydro and James F. MacLaren Limited, 1977

3.2.5 METHOD V

This approach, used by Ontario Hydro (1975), was a comprehensive one which had nine objectives:

i. endeavour to locate the facilities so that the physical substrate (terrestrial or aquatic), the natural flora and fauna thereby supported, and the ecological interrelationships among these will be changed as little as possible or in fact, be unchanged or enhanced, that is, optimize the effect on the natural systems;

ii. locate the facilities so that the adverse effect on the availability and quality of natural resources, whether for consumptive or non-consumptive use, will be minimized;

iii. minimize limitations to agriculture by attempting to locate the facilities so that food production and the viability of individual farm operations will not be reduced significantly;

iv. avoid conflicts with present land use by locating the facilities so that desirable existing uses of the land can continue with minimal interference;

v. maximize the potential for future land use by attempting to locate the facilities so that official land use plans can be pursued and as many options as the inherent capabilities of the land permit will remain available;

vi. try to locate the facilities so that the appearance of the landscape will be changed as little as possible, that is, reduce the visual impact;

vii. endeavour to locate the facilities so that the number of new property severances, particularly diagonal severances, will be kept to a minimum and follow existing severances wherever feasible and desirable;

viii. reduce engineering difficulties by attempting to locate the facilities so that the technical problems associated with their installations, design, operation and maintenance will be minimal, and,

ix. try to locate the facilities so that the total financial investment, and therefore the cost of power to the consumer will be as low as possible." (Ibid. Vol.1:13)

In order to fulfill these objectives to the greatest extent possible, a method was developed to predict and assess the nature and degree of change which would be created by Hydro's development project. A procedure to categorize and group the components of the land surface so as to facilitate analysis was developed.

For those components of agriculture, natural systems and natural resources Land Analysis Units (LAU's) defined on the basis of soil materials, relative evaluation, slope gradient, slope complexity and soil drainage condition was created, as well as Lake Units which represented any waterbody fifty acres or more, together with the land adjacent to its immediate watershed.

Impact ratings of very high, high, medium, low and very low for each LAU was determined for agriculture (using the factors of soil capability and existing land use intensity), natural systems and natural resources (using the factors of forest resources, wildlife resources, outdoor recreational resources and mineral resources). The impact ratings were mapped using different colours to represent the degree of impact.

A different system was used for present and future land use (except agriculture) and appearance of the landscape. LAU's were not used in this system. Instead, an inventory of all existing and proposed land uses was completed and impact ratings of "no-go" (to cover built-up areas such as cities or towns), high, medium and low represented by colours, were assessed and mapped. In order to assess the visual impact of transmission facilities on the appearance of the landscape, landscape units were defined on the basis of existing land use patterns (which indicated the relative degree of naturalness of the area), the

topographic form (partially representing degree of openness of the landscape) and the vegetation pattern (open space pattern and partially, degree of landscape openness). Impact ratings of high, medium and low were assigned to landscape units on the basis of a questionnaire, professional judgement and Ontario Land Inventory Maps. The following factors affecting the appearance of the landscape were considered:

(a) sensitivity

(b) public visual assets

(c) visibility frequency, and

(d) non-remedial limitations.

Finally, the impact ratings for all components of the land surface were aggregated which resulted in maps exhibiting impacts of very high (no-go), high, medium, low and very low. By a map overlay system, areas were removed from consideration as corridor routes depending on the level of impact. The final areas in which broad corridors may be delineated were those areas which did not represent areas of high impact, except that some areas of high impact were considered as corridor routes in order to maintain the criteria that the linear alignments follow a northwest to southeast direction. The rough boundaries for corridor routes were further checked, on the basis of individual and composites of impacts. Finally, the corridor boundaries were adjusted to conform with the township fabric wherever possible in order to follow lot lines in the final alignment.

This method, although comprehensive, is very complicated and requires a great deal of information, financial resources and professional expertise. It appears that continuity of method would have been superior to the changing methods of applying impact ratings used in the study. However, although this may appear to be a weakness, it may also be the strength of the method because it demonstrates flexibility. Nevertheless, by subscribing to detail, the method shows itself to be superior to many methods used in similar studies.

3.3 Method Used in Present Analysis

The method used in this study was designed to lead to identification of alternative corridors which had the least likelihood of affecting those components of the man-made or natural environment of primary importance to outdoor recreation. First, a resource inventory was compiled with three major areas of concern; Biotic, Socio-cultural and Recreational. Information concerning resources and resource use in the study area were mapped at a scale of 1:500,000. No additional field work was conducted, although areas of data deficiencies were identified.

Next, an eliminator concept was applied to the data obtained in the resource inventory. This concept has been used by Ontario Hydro and Manitoba Hydro in previous studies for identifying transmission corridors and routes by regional impact assessments. Both basically follow a process of eliminating portions of the study area from consideration as routes for the construction of transmission facilities on the basis of established criteria. For

example, one of the steps in the Ontario Hydro (1975) study was to identify major categories of environmental concern. On the basis of generalized information regarding potential impacts associated with each of these categories of concern, zones of major environmental constraint within the study area were identified. These were used as guides to define broad pathways (corridors) which would avoid those zones of environmental constraint as much as possible, yet provide reasonable opportunities to fulfill the transmission requirements. Manitoba Hydro followed a similar process in their nuclear corridor selection study (1977).

Based on the following studies Ontario Hydro--500 kv Transmission Line Right-of-Way Bradley-Georgetown (1975), and Manitoba Hydro Regional Environmental Assessment Alternative 500 kv Transmission Corridors, Nuclear Generating Station Site Selection Program (1977), four criteria were developed in this study to distinguish between areas of severe, high, moderate and low impact.[1] The criteria were applied to the data gathered under the three major areas of concern--Biotic, Socio-cultural and Recreational.

1. An area was considered to be impacted to a severe degree if the imposition of transmission facilities were to occur in an existing land use area, or in a proposed land use area which had official approval for some specified use including that of outdoor recreation.

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[1]Although a scale of severe, high, moderate and low was used in this study, it is important to note that these represent degrees of change relative to each other, rather than absolute changes. In other words, areas in which the impact of a transmission line is considered to be low does not imply that the potential for impact should be considered as so negligible, that it should be overlooked.

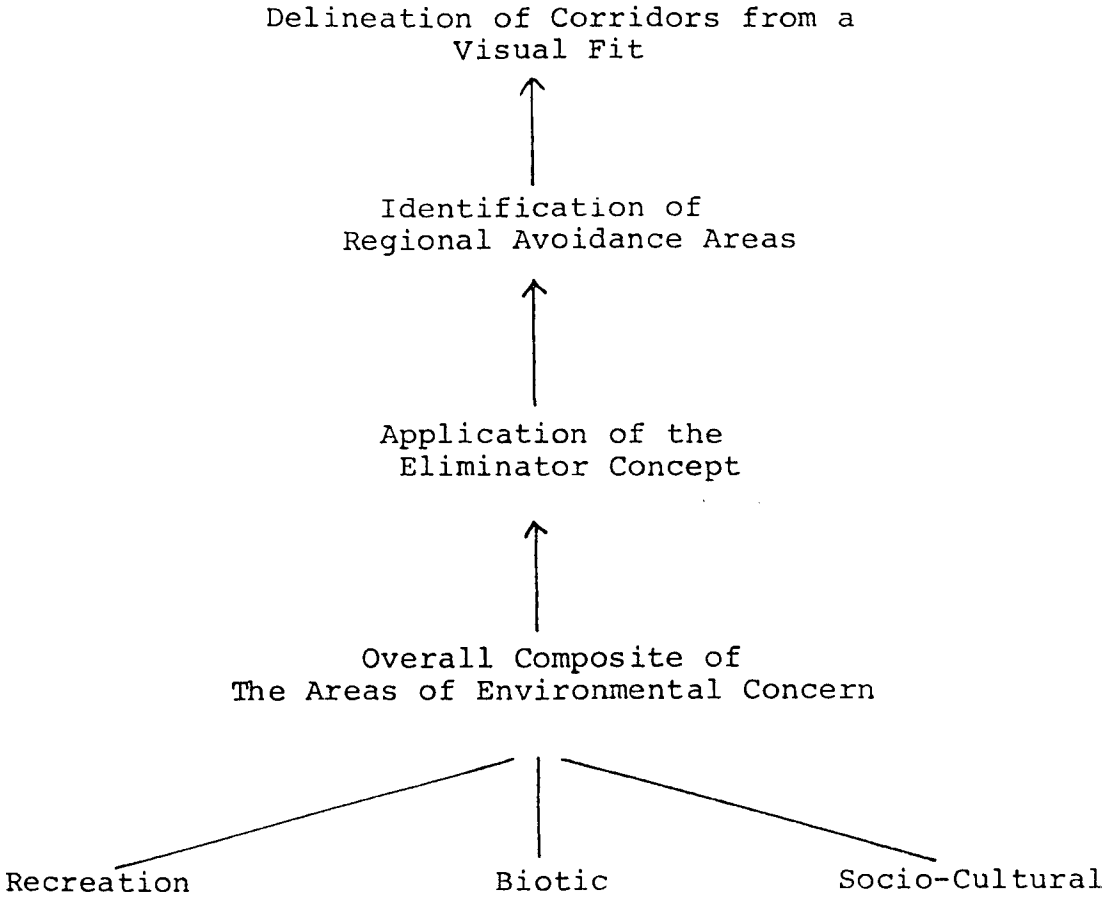
2. An area was considered to be impacted to a high degree if the imposition of transmission facilities would cause unmitigated detrimental changes to an area of environmental concern which might or might not be of demonstrable value to outdoor recreation.

3. An area was considered to be impacted to a moderate degree if mitigative measures could be applied to the detrimental changes caused by the imposition of transmission facilities in an area of environmental concern which may, or may not, be of demonstrable value to outdoor recreation.

4. An area was considered to be impacted to a low degree if it did not conform to the previous three criteria.

The application of the criteria hinged on the subjective, but professional evaluation of impacts made by the author and persons (at the field level) considered to be experts in their areas of environmental concern. The evaluations were tempered by the fact that in some instances the effect of transmission facilities may be beneficial. For example, the clearing of the right-of-way for the construction of transmission lines would create prime habitat (edge effect) for certain species of animals (such as moose, white-tailed deer and black bear), it could act as a fire break in an area subject to many fires, it would allow increased access to fires by fire-fighters, and it would allow easy accessibility for trappers to harvest areas to which access was difficult. To certain recreationists, it may provide a hiking trail in the summer and snowmobile route in the winter. These beneficial effects sometimes compensated for the adverse effects of transmission facilities and resulted in a modification of the overall impact judgement on the resource and its uses.

The following flow chart (Fig. 7) illustrates the sequence of operations which results in the identification of alternative corridors.



Individual composites for each area of environmental concern using data obtained from the resource inventory.

Figure 7. Sequential Flow of Operations Towards the Identification of Alternative Corridors.

Following the assessment of the potential impacts for each area of environmental concern, the impact ratings were mapped, using differentially darker shades to represent severe, high, moderate and low impact. An overlay-technique was then used and regional avoidance areas defined with the lower impact areas preferable for transmission corridors. The overlay-technique involved the use of transparent sheets of material on which the variables of each component were mapped with the impacts; severe, high, moderate or low represented by differing shades. Next, the individual transparent sheets representing the impacts on the resources and the resource use, within each environmental component were overlaid to produce a composite map; that is, individual maps were produced for the Biotic, Socio-cultural and Recreation component. Within each composite map, areas of darker shading represented constraint zones within which the construction of transmission facilities should be avoided, while lighter areas were "better" areas for corridor routing.

In order to produce the overall composite, and to identify areas of lowest constraint; the Biotic, Socio-cultural and Recreation composite maps were then overlaid. Again, the resulting different shades represented differential degrees of impact. The overall composite map was used to identify avoidance areas within which transmission facilities would have the greatest detrimental impact, with the primary emphasis on outdoor recreation. Avoidance areas were identified with those areas generally with shadings darker than contiguous areas. Lower impact areas lying between avoidance areas were considered to be more desirable for transmission line development.

In order to provide for transmission line development in a linear form, and considering the high cost of major deviations, it was necessary that certain potentially higher impact areas running perpendicularly (east to west) to the required north-south corridors would have to be crossed. Broad corridors and trunk lines were drawn from a visual fit and were modified to provide linear alignments in a north-south direction wherever possible.

CHAPTER 4

PRESENTATION OF INVENTORY DATA

This chapter includes a presentation of inventory data compiled from published and unpublished literature, as well as personal communication with persons from government and non-government sources. The physical descriptions of the resource base are presented immediately followed by a discussion of the resource use and its value to the study area. In many cases, no quantitative value for the resource was available and qualitative judgements were substituted. Inventory data for many resources and their uses were limited.

4.1 Biotic Component

4.1.1 Flora

No comprehensive inventory of the flora in the study area has yet been attempted. Data was available on a somewhat general scale for some aspects of the flora.

The area forms part of the Boreal Forest Region (Rowe 1972) which comprises the greater part of the forested area of Canada. The Boreal Forest Region forms a continuous belt westward from Newfoundland and the Labrador Coast to the Rocky Mountains, and northwestward to Alaska (Hosie 1973). The following three subdivisions of the Manitoba section of the Boreal Forest Region occur in the study area.

The Northern Coniferous Forest is dominated by black spruce, white spruce and balsam fir (see Appendix 1 for scientific names). Jack-pine is found in recently burned areas together with balsam poplar, white birch and aspen.

The Nelson River Section is composed of mixed stands of broadleaf (chiefly aspen), and coniferous species (chiefly spruce).

The Manitoba Lowlands Section is composed primarily of peat bog and marsh. Vegetation is variable, with black spruce cover, small shrubs, such as Labrador tea, bog rosemary, dwarf cranberry and wild rice. Stretches of dense Spaghnum moss with sparse larch stands to treeless heath and sage types also occur. Fens are found where the peat is less acid than in bogs, and where mineral nutrients are present in the ground water (Weir 1960). The marshes are dominated by tall grasses, rushes and sedges. The commonest species are reed grass, cat-tail, spangle-top and bullrush. Other vegetation types occur throughout the study area, including mosses and lichens.

a. Forests

The forests of the study area are composed predominantly of conifers and some hardwoods. Kotowycz et.al. (1975) determined that there were four major tree associations:

i. jackpine group

ii. deciduous group

iii. spruce-fir group

iv. larch and cedar group

From these, it was calculated that the most productive merchantable stands lay in management units (MU) 33, 34, and 38 (Fig.8), in which the acreage of merchantable timber ranged from 8000 - 15,000 acres per township. The majority of the area ranged from 4000 - 8000 acres per township, while many townships had less than 4000 acres of merchantable timber.

Forestry provides much needed employment in the Eastern Region through pulp mill, sawmill, and associated wood harvesting activities. Currently, there are four commercial forestry operations which require the forest resources of the area; Abitibi Pulp and Paper Mill at Pine Falls, Channel Area Loggers Ltd., at Berens River, and small sawmills at Paungassi and Little Grand Rapids.

Abitibi is the largest employer in the region. People from Manigotagan, Bissett, Wanipigow and Little Black River are on the Abitibi payroll. Most of the employees in the plant and mill are residents of Pine Falls and nearby communities. The impact of Abitibi's operations on remote communities in MU 34 and 38, has been to create jobs of a seasonal nature (primarily in the winter).

Abitibi requires 150,000 cunits of pulpwood annually for its operations, of which 70,000 cunits come from its timber berths in the area, and 80,000 cunits are supplied by private contractors. (Kotowycz 1972). About 90-95 percent of 70,000 cunits, are cut in an over-utilization of spruce in the management units of that area. Operators from the Pine Falls-Manigotagan area are employed to cut the 70,000 units.

Channel Area Loggers Ltd. (CAL), is a Crown Corporation set up by the provincial government in 1973. The company provides jobs, mainly to residents of Berens River, by utilizing the pulpwood timber available in the area. CAL Ltd. cutting berths are located in MU35 and 38. Prior to its inception in 1973/74, 30 men were trained to carry on the production end of the operation. It was expected that during full production, 39 jobs would be available. The company employs personnel from the Berens River, Bloodvein River and Northern Interlake region (Kok 1978).

Paungassi had a sawmill training program from December 1976, to January 1977. The operation was limited by climatic conditions. During the first season, 36,000 foot board measure (fbm) was cut from an area adjacent to Paungassi. Wall (1977) believes that there is a local demand for 100,000 feet. Jobs can be provided at the sawmill site for six men for a three month period.

In January, February, and March of 1977, Eastern Region attempted to establish pulp cutting for Abitibi in an area adjacent to Little Grand Rapids. Wall (Ibid) estimated that by 1982, the operation would be stable. It was also estimated, that in 1978, the operation would provide jobs for 30 men, with potential for increasing production by 1,000 cords per season for the next five years to maximum production of 5,000 cords by 1980 (Ibid).

b. Wild Rice

More than ninety percent of the wild rice produced in Manitoba comes from the study area. Much of the area (shallow lakes, rivers and bays) is capable of producing wild rice (Fig.9). The Northern Coniferous Forest area has the most producing waterbodies. It has

been estimated that one million pounds of green rice can be produced annually in the study area (LaFortune pers.comm.). Lease blocks are purchased primarily by native producers (Fig.9) on a yearly basis.

Since 1966, green rice production throughout Manitoba has fluctuated from 44,450 kg to as much as 234,770 kg in 1973. After 1973, production fell to 51,192 kg and by 1976 was up to 131,101 kg. Peterson (pers.comm.) predicted that production will continue to increase, with most of the harvest coming from the study area.

The harvesting of wild rice is an important source of seasonal employment to local residents, primarily those of native ancestry. No statistics are available as to the number of jobs created. However, Young (pers.comm.) claimed that the green rice can be valued at about one dollar per kilogram. It is known that wild rice is a local food source, but the amount used is negligible.

4.1.2 Fauna

As with the flora, no comprehensive inventory of the fauna in the study area has been attempted, but some information exists for a few species. The data about population sizes are subject to error which are inherent in inventory techniques (for example, aerial surveys). The inaccessibility of the area hampers accurate research. However, it is known that many animals inhabit the area; big game, upland game birds, waterfowl, fish and other non-game species, including fur bearers (See Appendix 2 for scientific names). Among these, the faunal associations are

complex. Although the various species have numerous resource uses, the game species are further discussed under "Hunting".

a. Big Game

The big game species include woodland caribou, moose, white-tailed deer and black bear. No other big game species occur.

i. Woodland Caribou

The woodland caribou are considered a rare and endangered species (Crichton pers.comm.) and therefore, merit extensive discussion in this study.

The woodland caribou once ranged from Prince Edward Island and Nova Scotia to western Alberta, or British Columbia; south into New York, New Hampshire, Vermont and Maine in the east; and Minnesota, Wisconsin and Michigan in the Great Lakes region; north to southern Ungava in the east, and the North West Territories in the west. There has since been a drastic reduction in the range of the species, in the east and west. They are now largely confined to the provinces of Quebec, Ontario, Manitoba, Saskatchewan, Alberta and the North West Territories (Cringan 1957, Crichton pers.comm.)

The woodland caribou are close relatives of the barren ground caribou and once ranged throughout the southeastern regions of Manitoba. Since the advent and expansion of industrial civilization in the south, the timid caribou retreated to the more remote central and northern areas of Manitoba, and to the district east of Lake Winnipeg (Government of Manitoba 1961).

The demise of the caribou from their former ranges has been attributed to a number of factors including:

1. changes in forest habitat due to fire
2. new diseases introduced by white-tailed deer
3. poaching
4. man's steady encroachment onto their range
5. harvesting of mature forest stands without regard for caribou.

Prior to 1967, the caribou population on the east side of Lake Winnipeg appeared to be stable, but since that time the population may have declined although there is little supporting evidence. Precise numbers are difficult to arrive at, but Larche (1972) reported the presence of at least 360 caribou at various locations (Table 1). Stardom (pers.comm.) estimated that there may be about 500 caribou[1] in the study area. Crichton (pers.comm.) agreed with the estimate and identified the approximate ranges of the present herds (Fig.10).

Habitat

Woodland caribou require extensive acreages of mature coniferous, or mixed wood forests, in which the best growths of terrestrial and arboreal lichens occur. On the east side of Lake Winnipeg, their habitat consists primarily of mature forests (black spruce and jackpine). The mature forests are interspersed with lakes and bogs, as well as white birch, trembling aspen, willow and other assorted woody vegetation (Stardom 1972).

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[1]Although it may appear that the caribou population has increased from about 360 in 1972 to about 500 in 1977, the possible increase may be deceptive. The number of animals counted by Larche (1972) has to be accepted as a minimum number of animals because the nature of the survey (aerial), and the rugged terrain made a comprehensive inventory impossible.

Three major habitat types were evaluated by Stardom (Ibid). They include open tamarac or black spruce bogs, intermediate to mature jackpine, rock ridges and many small lakes. The open bogs were found to comprise approximately 26.0 percent of the winter range and produce the greatest amount of arboreal lichens. The major source of ground lichens were the jackpine stands which comprised about 45.0 percent of the caribou range. Lakes formed only 10 percent of the total habitat, but were important as travel routes and loafing areas. This was especially true when deep slush was absent, and snow cover in adjacent areas was greater than 60-65 cm. During a winter of thin snow cover, the caribou in the resident band tend to form smaller groups and range in a wider area in search of food. In a winter of thick snow cover, the converse occurs as the animals band together and feed in a smaller area.

Ground lichens are more important than tree lichens for winter food, since hard and deep snow conditions limit the caribou's use of tree lichens during 60 percent of the snow season, presumably due to difficulty in entering forested areas. Mature jackpine ridges, which produce large quantities of terrestrial lichens are a favorite feeding place. During early winter, the caribou feed intensively on arboreal lichens under windless, thin snow cover conditions. Under heavy snow conditions, intensive feeding shifts to ground lichens found on rock ridges because of easier accessibility, compared to arboreal lichens. During late winter the caribou obtain food from intermediate and mature jackpine ridges where the snow cover is softer due to the lack of

Table 1. Woodland Caribou Herd Locations, Estimated Size and Forest Cover Type East of Lake Winnipeg.

Herd Location	Estimated Number of animals	Forest cover type
Flintstone Lake (twp.20, rge.16E)	6-7	rocky jackpine ridges with black spruce bogs
Owl Lake (south of Manigotagan River)	min. 65	black spruce and jackpine ridges; some open tamarac bogs
Aikens Lake (twp.24 & 25, rge. 16E)	36-40	jackpine and spruce ridges with black spruce bogs
Sasaginnigak Lake	60	high jackpine ridges and islands; some black spruce bogs in area
Assinika Lake (twp.38, rge. 15E)	20	jackpine and spruce islands and ridges; moderate covering of black spruce and tamarac bogs in area
Berens River (6 twps. along river)	60	mostly open black spruce bogs except for river banks of aspen and jackpine with some large white spruce; some rock ridges with jackpine
Big Stone Point (twp.42 & 43, rge. 3 & 4E)	38	mostly open tamarac and black spruce bogs
Hudwin Lake (south shore)	min. 3	open tamarac and black spruce bogs
Gilchrist Lake	33	unknown
Viking Lake) Garner Lake)	35 unknown	jackpine rock ridges; some black spruce bogs

Source: Crichton 1975.

wind crusts and qali (snow retained on trees) formation (Stardom 1972).

Migratory Patterns

The woodland caribou, if undisturbed by man, is thought to travel only short distances during their seasonal migrations (Carbyn 1968). However, there has not been enough research in the area to determine exactly which herds migrate from a summer to a winter range, although it is known that some do.

Crichton (pers.comm.) and Stardom (pers.comm.) said that the Flintstone Lake herd and the Sasaginnigak Lake herd migrate to winter grounds (Fig.10). The Flintstone Lake herd migrates northwesterly to their winter range at Owl Lake. The Sasaginnigak Lake herd moves southwest to their staging area, prior to migrating northwesterly to their winter range in the Loon Straits area. Crichton (Ibid) also believes that an indiscrete herd (which has not yet been thoroughly identified) migrate from the area which includes Fishing Lake, Carr-Harris and Wrong Lake to a wintering range south of the Leaf River. One herd believed to range on the Ontario-Manitoba border area during the summer is thought to migrate to a winter range just east of Obukowin Lake. The Hudwin Lake herd has not yet been thoroughly identified and the extent of the winter and summer range is unknown.

Discussion

Apart from the preservation value of the caribou because of their rare status, the species are significant in that they add to the wilderness flavor of the east side. They are valuable to the outdoor recreational capability of the study area, both present (aesthetic) and potential (consumptive use).

ii. Moose

Moose are the largest members of the deer family. They thrive in areas of the forest which are recovering from fire or logging, where the growing shoots of trees and shrubs are most easily reached as browse. Moose may temporarily modify their environment if allowed to overpopulate, since they devour all suitable food.

Moose were once abundant on the east side and after facing a period of considerable decline, their numbers may be increasing (Crichton pers.comm.). The population is still low and was estimated to be about 612 animals (Table 2). This estimate can only be considered the minimum number in the area because the nature of the survey (aerial) and the factors affecting visibility make the population estimate at best, only an educated guess. Winter ranges are shown in figure 11. Moose are an important big game species. They are hunted intensively and feature in outdoor recreation capability of the area.

iii. Black Bear

No population estimates are available. Shoesmith (1977) noted that the black bear population was medium in density in the area.

b. Fur Bearers

The area provides a home for a large variety of fur bearers including beaver, coyote, ermine, fisher, red fox, lynx, marten, mink, muskrat, otter, raccoon, skunk, squirrel and timber wolf. No population estimates except for beaver, muskrat, mink and lynx are available. Grower et.al. (1977) assessed the abundance and distribution of beaver, muskrat, mink and lynx on

Table 2. Minimum Moose Population

GHA	Bulls (%)	Cows (%)	Calves %)	Unclassified Adults	Total
17	34	37	33 (16.3)	98	202
17a	5	22	25 (23.0)	56	108
26	22	48	40 (13.0)	198	302

Source: Crichton 1975 (a).

a scale of high, medium and low. The beaver was found to be the most abundant species (of commercial value) followed by mink and muskrat. Lynx were low in abundance, but due to the cyclical nature of fur bearer populations, the abundance of all the fur bearers may either increase or decrease in the future.

Manitoba is subdivided into Registered Trapline Sections (RTL). The study area encompasses Lac du Bonnet (5900 sq.km.), Hole River (3500 sq.km.), Bloodvein (4000 sq.km.), Little Grand Rapids (7537.5 sq.km.), Berens River (5250 sq.km.), Poplar River (8275 sq.km.), the southernmost portions of Norway House, Island Lake and the northern tip of Whiteshell. Figure 12 illustrates the RTL boundaries. Only holders of a registered trapline permit are allowed to trap within an RTL.

Trapping has played an important role in the economy of the study area and has served to bolster the incomes of residents in the region, which generally is subject to high levels of unemployment. However, it is not known what percentage of a trapper's income is derived from trapping. The total income per trapline has been increasing, despite a decline in pelts produced. While production has declined, individual pelt prices increased (Table 3). The total dollar value obtained from trapping for the years 1970-1971 to 1976-1977 is shown in Table 4. Although no firm trend appears to exist, it seems that the dollar value of fur will continue to increase.[1]

Mink, muskrat, beaver and lynx are the major species from which the majority of trapping income is derived. Based on a

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[1]Although not necessarily in constant dollars.

Table 3. Average Auction Value of Pelts Taken from the Wild in Manitoba during the Fur Years 1969-70 to 1975-76

	1969-1970	1970-1971	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	Average
Badger	8.00	8.10	12.77	14.05	19.76	18.03	34.50	16.45
Bear	33.00	35.00	25.00	74.19	50.55	29.97	65.00	44.67
Beaver	19.00	14.09	18.18	20.05	19.50	15.34	20.00	18.02
Coyote	13.00	12.15	14.82	28.98	38.90	36.91	56.00	28.68
Ermine	.98	.52	.74	1.03	1.20	.80	.90	.88
Fisher	23.00	31.20	27.34	37.13	43.25	45.38	97.00	43.47
Fox, Blue	16.00	10.00	10.00	27.00	24.66	20.20	45.00	21.83
Fox, Cross	18.00	21.90	19.98	43.93	67.00	48.06	85.00	43.41
Fox, Red	10.00	12.40	15.15	29.40	39.20	30.87	43.00	25.71
Fox, Silver	12.00	10.00	12.00	22.60	73.00	48.06	93.00	38.66
Fox, White	16.00	15.00	27.40	22.00	36.33	20.20	42.00	25.56
Lynx	30.00	29.50	39.31	90.15	90.00	123.01	257.00	94.13
Marten	10.00	8.15	8.46	8.66	16.60	15.34	24.00	13.03
Mink	13.00	11.20	19.32	23.40	22.00	13.13	26.00	18.29
Muskrat	1.45	1.57	2.01	2.64	2.80	2.62	3.62	2.38
Otter	33.00	31.50	37.62	39.68	37.65	36.35	60.00	39.40
Rabbit, Jack	.20	.12	.18	.18	.20	.20	--	.18
Raccoon	6.00	2.85	6.19	11.18	16.40	13.56	22.00	11.16
Skunk	.75	1.00	1.00	.50	2.00	2.00	--	1.20
Squirrel	.25	.25	.52	.50	.75	.63	.70	.51
Wolf, Timber	38.00	23.00	37.68	53.08	63.72	62.22	101.00	54.10
Wolverine	57.00	70.40	84.65	83.80	78.50	94.38	159.00	89.67

Source: Stardom pers.comm.

Table 4. Wild Fur Production Data - Total Dollar Value for Study Area

Year	1970-1971	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
Dollar Value	118,650	154,355	178,792	71,246	166,078	181,833	369,975
Total Pelts	11,743	8,811	18,593	10,796	13,391	16,123	12,828
No. of Trappers	Ø	Ø	Ø	Ø	Ø	Ø	311

Ø - Information not available

Source: Engen pers.comm.

study by Grower et.al. (1977) and dollar prices for furs in 1975-76, it was calculated that the area is potentially capable of producing beaver, muskrat, mink and lynx worth a total minimum value of 230,000 dollars and a possible maximum value of 500,000 dollars. These values do not include the catch in those portions of the study area which are in the Island Lake, Norway House and Whiteshell RTL.

Based on the percentage catch of other species besides beaver, mink, muskrat and lynx, it was calculated that the total production for the area could be as much as eighteen to thirty-seven percent higher than the maximum value of 500,000 dollars. The average income for a trapper in the area ranges from 572 dollars in Berens River, to 1,143 dollars at Lac du Bonnet. Given the potential dollar value of the fur bearer population, the trappers could raise their income substantially above these average values.

c. Birds

There are many species in the area including upland game, waterfowl and other miscellaneous species. Their value to hunter activity is discussed under "Hunting".

i. Upland Game Birds

Of the upland game birds, sharp-tailed grouse, spruce grouse and ruffed grouse are known to occur. However, no information exists on species abundance and it is difficult to assess their value to the present and potential outdoor recreational capability of the study area.

ii. Waterfowl

The occurrence of waterfowl in the study area is not considered to be significant due to a lack of suitable habitat (Nero pers.comm). Their value to outdoor recreation (consumptive use) is generally negligible. However, their value to the wilderness flavor of the area cannot be measured.

iii. Other Birds

There are more than fifty-eight species of birds to be found in the area. No statistics regarding distribution and abundance is available. As with other aspects of the Biotic component, they are aesthetically pleasing and contribute to the wilderness flavor of the area.

d. Fish

The fishery resource although very valuable to the outdoor recreation capability of the area has never been assessed, either qualitatively or quantitatively.

i. Sport Fish

There are three predominant sport species that are harvested in the area; pickerel or walleye, northern pike or jack, and trout. All sport species except trout, are abundant. Trout can be found in about six waterbodies (Fig.13), and stocking had been carried out at a few sites prior to 1976 (Hagenson pers.comm.). The results of the stocking program have not been documented.

The presence of seventeen successful lodges and seventeen outcamps (Fig.13) based primarily on fishing indicates the value of the fishery resource (see Tourist Lodges and Outcamps). Indirectly, the fishery resource provides employment and is of some nutritional significance, although Young (1975) said that

domestic consumption of fish as a local food source was negligible.

The fishery is vital to the recreational potential of the area, but commercial fishing has consistently declined. The only lakes that have recently been fished are Charron Lake, Fishing Lake and Family Lake. Young (Ibid) had predicted the demise of commercial fishing in the foreseeable future because of increased transportation costs, outfitting costs, higher processing costs, decreasing effort and initiative on the part of the fishermen. However, Eastern Region planners are attempting to revitalize the commercial fishing industry in the area by training programs and incentive grants. It is not known exactly how many jobs are provided through commercial fishing because the numbers fluctuate from year to year. In 1978, no more than eight fishermen applied for licences. This is still significant because of the high unemployment in the area.

ii. Other Fish

Other significant fish species include whitefish, yellow perch, burbot, suckers, white bass, goldeye and catfish. They are generally of negligible value as a local food source, but play an important role in the food web.

e. Reptiles, Amphibians and Other Species

No detailed study of the reptile and amphibian population has been done. Carbyn (1968) observed leopard frogs, painted turtles and snapping turtles in the Bloodvein River region. Other species which exist in the study area, include invertebrates and insects. No inventory has been done on the abundance of these

species. The value of reptiles, amphibians and other species cannot be assessed. They are important to the wilderness aspect and no doubt play an important role in the local food web.

4.2 Socio-cultural Component

4.2.1 Infrastructure

Wall (1977) noted that power, transportation and communication provides the means for natural resource development. The infrastructure has direct and indirect effects on recreational resources and activities. Changes in regional infrastructure caused by transmission facilities may therefore affect recreation.

a. Regional Transportation

The area has all-weather road access by Highway 304, which runs north from Pine Falls to Manigotagan, then east through Bissett to Long and Beresford Lakes (Fig.14). Quesnel Lake is connected with Highway 304, several kilometers west of Bissett by a spur road. Since the inception of Nopiming Provincial Park, a road through the park (PR 314) joining Highway 304 has been completed (Fig.14). This road will provide the means for a round trip through the park in any direction, north or south.

North of Wanipigow, the larger communities; Bloodvein, Berens River, Poplar River and Little Grand Rapids-Paungassi, are serviced by winter roads (Fig.14), which are normally operational from late December to March. Within each community, a few kilometers of all-weather road exists.

The area is serviced by charter and scheduled airlines, which provide a means of transportation for people, to and from remote communities (Government of Manitoba 1975). Communities on the Lake Winnipeg shore, are serviced by waterway during the summer. The Department of Northern Affairs is currently attempting to provide airstrips for the remote communities, as well as improving existing airstrips. Most of the communities have float plane bases.

b. Power

Communities south of the Wanipigow River, are serviced by Manitoba Hydro transmission lines (Fig.15). Those communities north of the Wanipigow River are serviced by diesel run generators. One man is hired to maintain and operate the generator in each community.

c. Communication

Communities south of the Wanipigow River receive daily mail delivery and regular service by Manitoba Telephone System (MTS). Communities north of the Wanipigow River have regular mail delivery, but generally on a weekly basis. Although telephone service is provided by MTS, it is generally a single community phone or radiotelephone with restricted time access (certain hours of the day and night, or day of the week).

4.2.2 Communities

a. Indian Reserves

There are nine Indian reserves in the study area (Fig.14). They are; Fort Alexander Indian Reserve, Little Black River Indian

Reserve, Hollow Water Indian Reserve, Bloodvein River Indian Reserve, Little Grand Rapids Indian Reserve, Paungassi Indian Reserve, Berens River Indian Reserve and the Poplar (Negginan) River Indian Reserve.

b. Other Communities

The other communities (Fig.14) include Bissett, Manigotagan, Seymourville and Pinawa, as well as lesser communities such as Princess Harbour and Pointe du Bois.

4.2.3 Archaeological Resources

a. Indian Rock Pictographs

One of the largest collections of Indian Rock paintings (Plate 1) in North America can be found on the east side of Lake Winnipeg (Fig.16) However, only thirteen of the twenty-eight pictographs are located in Manitoba. The others are found east of the Manitoba-Ontario border in Northern Ontario. The pictographs may be 700-1000 years old (Hooper 1973).

The paintings were apparently done with a mixture of fish oil and iron oxide. Their cultural meaning has not yet been determined, but it has been speculated they had either a general religious significance, or were painted as an appeasement to the particular spirits which lived in the region (Atikaki Bulletin--unpublished).

b. Archaeological Digs

Excavations on the east side of Lake Winnipeg have been carried out at Wanipigow Lake and at Manigotagan by the Manitoba Department of Tourism, Recreation and Cultural Affairs (Fig.16).

Plate 1: EXAMPLES OF INDIAN ROCK PICTOGRAPHS IN THE STUDY AREA

SOURCE: HOOPER 1973.

Numerous artifacts have been recovered in the two years (1975 and 1976) of excavations at Wanipigow. Although excavation was carried out in the summer of 1977, the results have not yet been interpreted. Artifacts recovered from previous digs include rim shards of the Blackduck/Selkirk interface, lithic material (e.g. quartz scrapers), Laurel pottery and projection points, Selkirk rim shards, Selkirk and Blackduck ceramics. The recovery of these artifacts indicates the rich history surrounding the site.

c. Historic Sites

A number of rivers have been identified as having historic interest (Fig.16). These are Wanipigow, Manigotagan, Bloodvein, Pigeon and Berens River (Government of Manitoba 1975). These waterways were used as transportation routes during the fur trade. The Manigotagan and Wanipigow rivers also played a major role in the development of the mines in the Nopiming Provincial Park area. However, none have been given official approval as historic sites.

d. Miscellaneous

i. Mineral Resources and Mining Activity

Manitoba's metalliferous prospects are confined mainly to the province's Precambrian formations. The Rice Lake and Oiseau River districts (Fig.17) have mineral deposits, although these are not currently economic. The Rice Lake district lies between the south end of Lake Winnipeg and the Manitoba-Ontario boundary, in the basins of the Wanipigow and Manigotagan rivers.

Gold-bearing rocks are predominant (DeLury 1920). Gold

deposits are found in practically all the prominent rock formations of the district; in the schists of igneous origin, in granites, diorities and their associated prophyries. They are described as being gneissic in places, but generally are more massive than schists. DeLury (Ibid) noted that the uniformity in the materials of the ore deposits throughout the district, was indicative of only one period of metallization. Therefore, it can be connected to a single igneous invasion.

The Oiseau River district includes the land adjacent to the river, north and south. Nickel and copper-bearing sulphide bodies are the prominent types of mineral deposits found in this area. They are associated with gabbro, peridotite, and lithium bearing pegmatites, which Delury (Ibid) believed were associated with intrusions of the youngest granite magmas of the region.

There are numerous mineral deposits in the two districts. Gold is the primary deposit. Bamburak (1977) documented those mineral deposits which are considered "important", because they exhibit one or more of the following criteria:

1. a past producer (dormant and exhausted)
2. a present producer
3. a developed prospect with tonnage and grade
4. an area in which an explored area lease has been issued or applied for, and
5. an area in which a production lease has been issued or applied for.

Thirty-three deposits were assessed as important (Fig.17), all located within the Rice Lake and Oiseau River districts. Although these districts have had a rich history of mines and claims, no significant economic gold deposits have emerged since the 1950's.

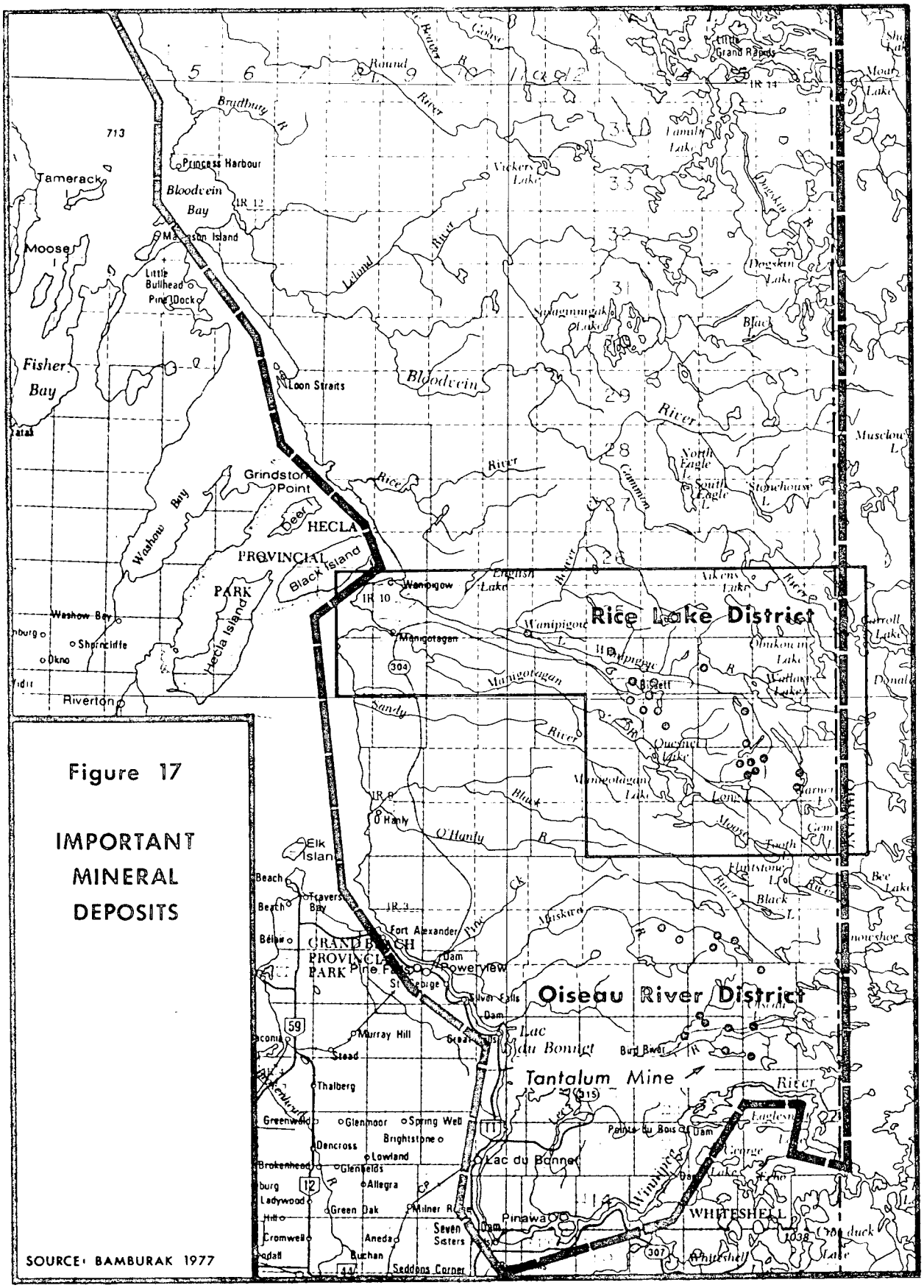


Figure 17

IMPORTANT MINERAL DEPOSITS

SOURCE: BAMBURAK 1977

The Eastern Region planners have assessed the mineral potential for future gold production as low.

Mining activity is practically non-existent except for the tantalum mine at Bernic Lake (Fig.17), which is the most important economic deposit. This ore is mined, milled and concentrated at the deposit site and the concentrate is trucked out to Winnipeg in barrels via PR314. During 1976, 133,397 tonnes of ore were milled and 125,234 kg of Ta_2O_5 were produced. Production costs were 2.31 million dollars and the concentrated ore was worth 3.5 million dollars. A three-month long strike reduced the potential earnings significantly. The deposit is expected to be exhausted by 1982 (Bamburak pers.comm.) at which time, production of lithium may commence. The Bernic Lake lithium deposit ranks among the world's largest. Cesium and gallium ores are also present in potential economic deposits.

ii. Miscellaneous Mineral Resources

Sand and Gravel

Sand and gravel deposits can be found in the area. They are generally small, and are inaccessible for commercial exploitation.

Uranium

Wall (1977) and Barchyn et.al. (1975) said that uranium exploration had been carried out in some sedimentary formations and pegmatites of the region. The possibility of further discoveries of uranium deposits are unlikely.

4.3 Recreation Component

The study area lies a short distance away from Winnipeg (approximately 130 km). The rugged terrain, numerous lakes, distinctive rivers, abundant forms of wildlife which include woodland caribou, moose, white-tailed deer and sport fish, make the area very attractive to outdoor recreation (see Plates 2-11). The cultural history of the area, enhances its value to recreation.

The area south of Wanipigow River, is easily accessible by PR314, which is a relatively scenic route. The growth in demand for outdoor recreation areas, will probably accentuate the popularity of this region for enthusiasts of outdoor activities generally related to wilderness use. The number of successful tourist lodges and outcamps in the area is evidence of this.

4.3.1 Existing Recreation Land Uses

a. Wanipigow Lake Cottages

Cottages are located at the south-eastern corner of the Wanipigow Lake area (Fig.18). These are in a cluster-type subdivision in the area of present archaeological excavations (Wall 1977). There are 42 lots available for development, or already developed.

b. Existing Parks

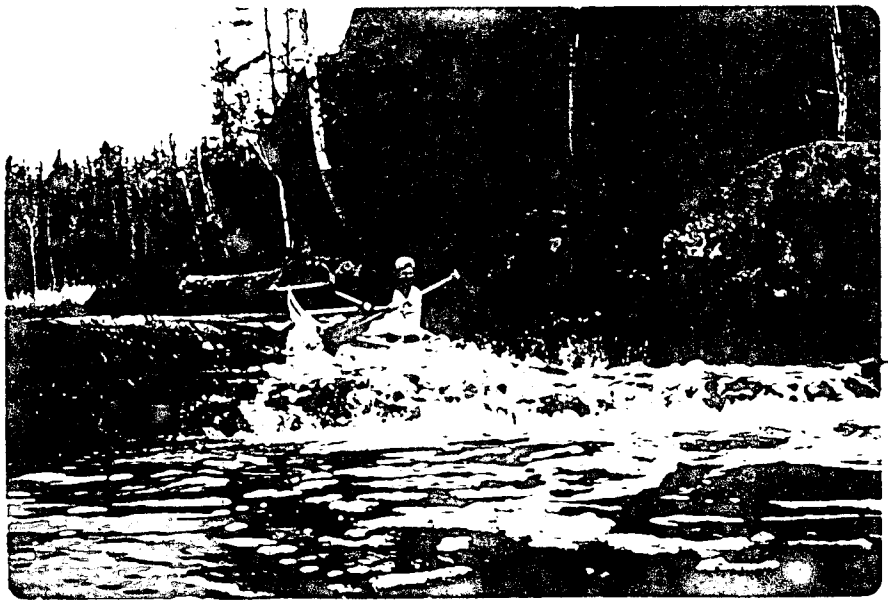
i. Nopiming Provincial Park

Nopiming Provincial Park is located approximately 190.5 km northeast of Winnipeg, and encompasses about 1387.5 sq.km of rugged Precambrian wilderness. To the east it is bounded by the Manitoba-Ontario border, to the north by the course of the Manigotagan River, to the south by the Whiteshell Provincial Park, and to the west by an irregular line running southeast to northeast from the Winnipeg River in the Whiteshell to Big Clearwater

Plates 2 & 3 Diverse Scenic Vistas of a Recreational River Area

Plate 4 Example of Bog and Marsh in Manitoba Lowlands Section

Plate 5 View Along a Canoe Route



Plates 6 & 7 Small Rapids Provide Exciting Canoeing

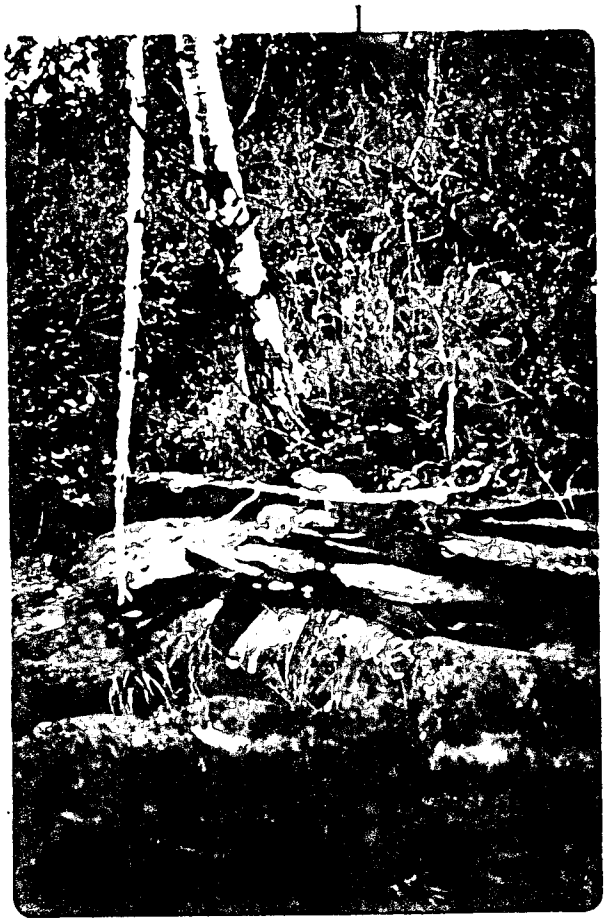


Plate 8 Wildlife Seen on Rocky River Bank

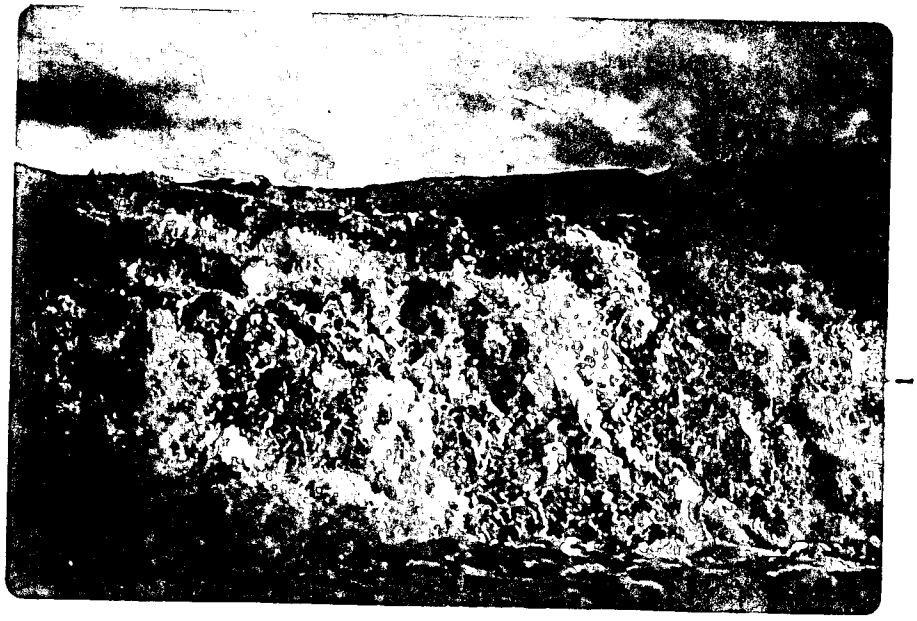


Plate 11 Rushing Waterfall on a Recreational River

Lake. Figure 19 illustrates the boundaries of the park, and the legend indicates proposed and present developments, as well as the road through the park. This park came into existence with the completion of Provincial Road (PR) 314, which was extended northward joining PR 304 at Beresford Lake. Public road 304 runs from Pine Falls, north to Manigotagan on Lake Winnipeg, straight east to Bissett and Wallace Lake; a distance of a little over 160 km to the junction with PR 314. This allows for a circular route through the park back to Winnipeg.

Nopiming Park lies in Precambrian country. There are numerous rock outcrops arising from 6 to 36 meters above their surroundings. The thin soil on the rock outcrops harbours a number of tree species, including jackpine, white spruce, trembling aspen and white birch. The depressions surrounding the rock outcrops generally have more fertile soil and harbour such species as balsam poplar, balsam fir, alder, chokecherry and pin cherry. The bogs and margins of the lakes are home to black spruce, willow and tamarack. The park has abundant flora and fauna, potential canoe waters, wilderness charm, and historical significance. Some of the species of wildlife found in the park are woodland caribou, moose, white-tailed deer, beaver, muskrat, mink, river otter, weasel, fisher, coyote, black bear, red and cross fox, red squirrel and skunk.

The park area is famous for its gold mining history. Ruins of two of the three major mines are visible from the road. Located 3 to 4 miles northeast of Long Lake (off PR 304) are the ruins of Central Manitoba Mines which operated from 1927 to 1937.

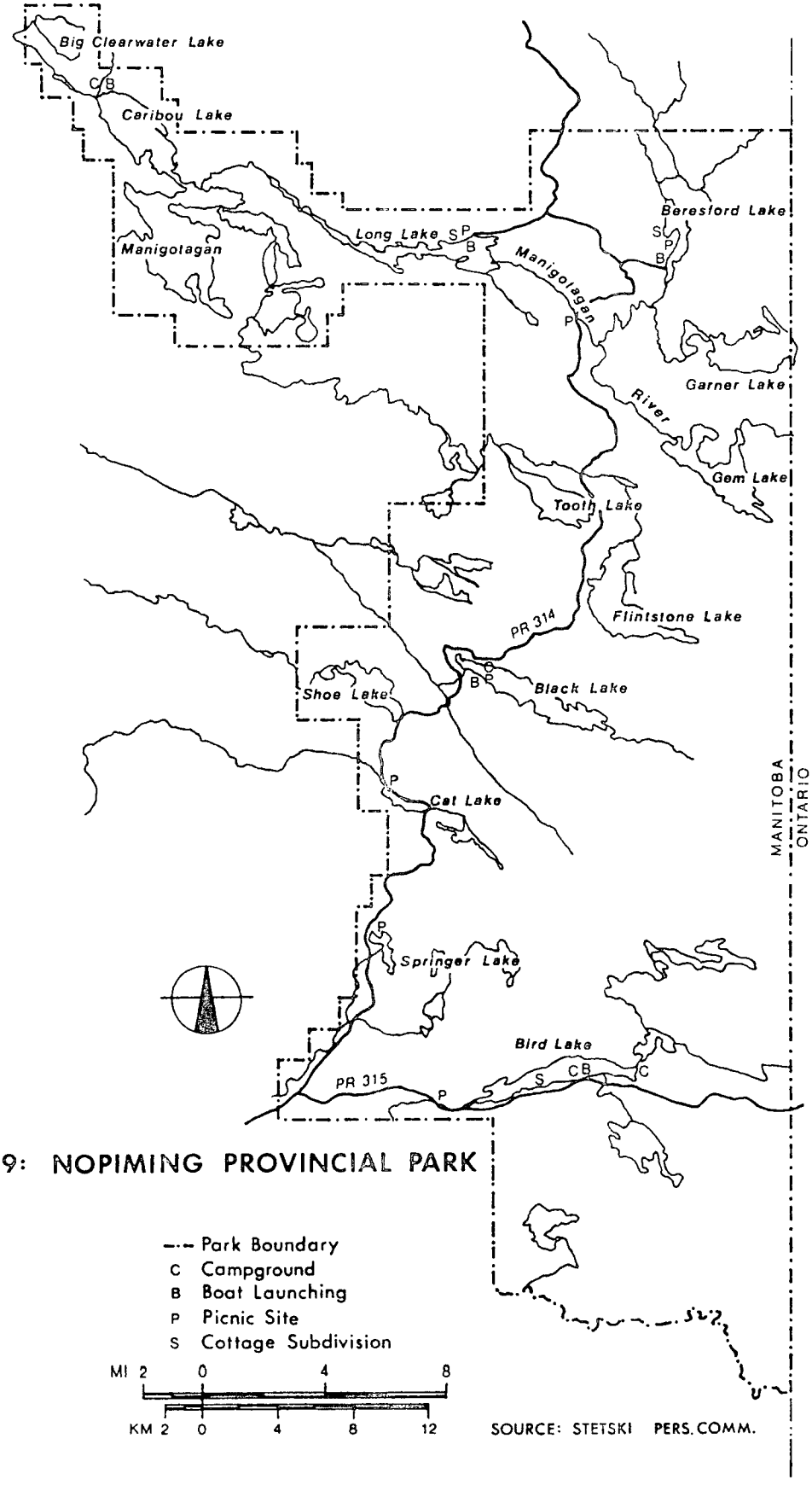


Figure 19: NOPIMING PROVINCIAL PARK

The Ogama-Rockland Mine in operation during the late 1940's and 1950's is visible from the road northeast of Long Lake. Weathering and scavenging has removed most traces of the Gunner-Beresford Lake Mine which was operational in the late 1930's to mid-forties.

The primitive character of Nopiming is its chief feature. There is little of the development found in Whiteshell Provincial Park. Campsites are scattered throughout the park and there is no electricity, plumbing, gas stations or grocery stores. Stetski and Ogrodnik (1977) noted that Nopiming, due to its relative inaccessibility, offers a chance for the Department of Tourism, Recreation and Cultural Affairs to take a philosophical stand on what flavour and character the area should have. Residents of the area are in favour of Nopiming being planned with a wilderness and preservation flavour, over-riding other development considerations. They apparently do not want another Whiteshell, and they are concerned about the decline in wildlife numbers as a result of hunting and trapping.

Residents of the Nopiming area, want people to be educated about the value of wilderness; the healthful recreation of canoeing and hiking, and the inner peace that can be obtained by experiencing wilderness. Consequently, the interpretive plans of Nopiming are being designed to maintain a "near" wilderness flavour (Ibid).

The road through Nopiming was designed to influence motorists' perceptions regarding the aesthetic value of wilderness. Campgrounds are to be kept "fairly" primitive, except in established areas such as Caribou Lake and Bird Lake. Black Lake, which has

no historical significance and is not considered part of a wilderness canoe route, may be the site of a major campsite development. Some areas shall be designated to restrict further development. Cottage leases in non-development areas are expected to be phased out over a period of 5 years.

Any cottage development is expected to be of the cluster type, designed to preserve the natural qualities of the shoreland to the maximum extent. Logging rights will be restricted to areas at least one mile back from all lakes, rivers and main roads. Survey lines and an old transmission right-of-way are being designed as hiking routes. Road development in the park is expected to be restricted to mining claims which are economically viable and have a one-generation lifespan of 35 years (Ibid).

Plans call for the development of more picnic sites at Spring Lake, Cat Lake and Shoe Lake. Boat launches are already available at Black Lake, Long Lake, Beresford Lake and Bird Lake.

Although there is some development, the park is designed primarily on a wilderness theme. However, even before the road was completeley developed, the park was being utilized quite intensively. Koonz (pers. comm.) counted at least ninety vehicles in the park on one weekend. Despite this intensive use pattern, the park is treated as a wilderness area in its interpretive plan.

ii. Whiteshell Provincial Park

The northern edge of the Whiteshell Provincial Park (Fig. 20) extends into the study area along the Winnipeg River. Unlike Nopiming, the Whiteshell was developed on an intensive use pattern. There are many tourist and visitor facilities in that portion of the Whiteshell which lies in the study area. The resources con-

tained in the Whiteshell are similar to that of Nopiming.

c. Campgrounds and Waysides

There are both public (provincial) and private campgrounds in the study area. There are also waysides which provide toilet facilities, usually drinking water and sometimes picnic tables. Manitoba Vacation Guide 1977 - 78, lists the campgrounds and waysides found in the study area (Fig. 18).

i. Bissett

Birch Falls Wayside, located 10 km east on PR 304 and Currie Landing Site 2, located 12 km west on PR 304, as well as, Silver Falls Wayside, located 13 km west on PR 304. All are Provincial Government facilities.

ii. Manigotagan

Currie's Landing Wayside Park (37 km west of Bissett) and O'Hanly Tent and Trailer Park are located at Little Black River Indian Reserve, 40 km south on PR 304. The latter is privately owned.

iii. Pinawa

Awanipark Campground and Pinawa Wayside Park are located 10km ewst of Pinawa on PR 211. The former is privately owned.

iv. Pine Falls

Black River Wayside (50 km north on PR 304 - 15 sites) is a provincial government facility.

v. Other Campgrounds

There is a campground at Wallace Lake (20 km northeast on PR 304) and Wanipigow Lake Campground (20 km west on PR 304). There is also a campground at Caribou Lake. All are provincial government facilities. Both public and provincial campgrounds

are used fairly intensively as can be seen from the number of vehicles visiting each campground and wayside (Table 5). Statistics indicated that there has been an overall increase in the number of permits sold between 1973-76. At Wallace Lake, Wanipigow Lake and Caribou Lake, the average length of stay has been stable since 1973. From 1975 to 1976, total revenues at Wallace Lake and Wanipigow Lake increased by forty-five percent (from 4,545 dollars to 5,765 dollars and 3,375 dollars to 4,367.50 dollars respectively). Revenue for Caribou Lake increased by thirty percent from 2,170 dollars to 3,253 dollars (Government of Manitoba 1976). It is unknown how much of this increase was due to inflation.

Use of campgrounds and waysides is expected to increase because of Nopiming Provincial Park. Both types of facilities may be used either as overflow campgrounds from Nopiming, or as rest spots on the way to Nopiming. Consequently their importance and use is expected to escalate.

d. Tourist Lodges and Outcamps

The location of tourist lodges and outcamps are illustrated in Figure 18. There are nine "Fly-in" lodges (some of which have outcamp facilities conducive to a wilderness experience) and eight lodges which have road access (Table 6). Most of the lodges operate on a seasonal basis, generally May to October.

Tourist lodges and outcamps are an important contributor to the local economy. No income value is available, but seasonal employment (Table 6) is generated which accrues mainly to local

Table 5. 1976 Attendance Statistics for Campgrounds and Waysides

Traffic Counts (# of cars)	Location
2,000	Caribou Lake
2,162	Wanipigow Lake
1,541	Bird River
514	Black Lake
475	Currie Landing
685	Lee River
2,249	Wallace Lake

Source: Government of Manitoba 1976a

Table 6. Number of Permanent and Casual Employees per Lodge

Lodge	*Employees Permanent	Casual	Operating Season	Location	Capacity	Outcamps
Aikens Lake Lodge	5	2	May to October	Aikens Lake	30	2
North Country Trailers Ltd.	6	4	Year Round	Berens River	28	0
Dogskin Lake Lodge	12	12	May to October	Dogskin Lake	40	5
Fishing Lake Lodge	6	8	May to November	Fishing Lake	38	2
Harrop Lake Lodge	4	2	May to October	Harrop Lake	16	3
Norse Lodge	8	12	May to October	Moar Lake	24	0
Sasa-Ginni-Gak Lodge	4	0	May to September	Sasaginnigak Lake	45	2
Thunderbird Lodge	16	2	Year Round (placed in receivership by Manitoba Government)	Wrong Lake	24	0
Little Grand Rapids Lodge	0	0	Not Operating	Family Lake		
Advent's Lodge	2	0	May to October	Quesnel Lake	38	0
Oiseau Lodge	1	1	May to September	Bird Lake	20	0
Wallace Lake Lodge	8	0	May to October	Wallace Lake	28	3
Windsock Lodge	0	0		Long Lake	8	0
Eagle Nest Lodge	2	4	May to October	Eagle Nest Lake	18	0
Pine Island Lodge	2	18	May to October	Pointe du Bois	30	0
Trail End Lodge	2	0	May to October	Eagle Nest Lake	24	0
Tall Timber Lodge				Bird River	76	0

Source: Rayner pers. comm.

residents. In an area of high umemployment, any jobs are significant. Clients from all over Canada and the United States visit the area. Actual statistics are not available

4.3.2 Proposed Recreation Land Uses

a. Manigotagan - Seymourville Cottages

The area south of the Hole River Indian Reserve (Fig.20) in the Manigotagan - Seymourville area has potential for a resort subdivision (Colton pers. comm.) It is an area of high development capability, where cottages can be built -- one cottage to every three gross acres.

Provision is to be made for public open space and adequate shoreline reserves. Cottage construction would be permitted only where the shoreline and land is suitable.

b. Proposed Land Reservation for Recreational Usage

A natural reserve is also proposed for the area south of the potential resort subdivision at Manigotagan - Seymourville (Fig. 20). The reserve is an area unsuitable or not required for domestic settlement, resort settlement or highway commercial development. The area may be preserved in its existing natural state, but land uses such as hunting, trapping, forestry and quarrying can still occur. Limited development for hiking trails, picnic areas, skiing and camping may be allowed (Ibid).

c. Proposed National Park

Parks Canada has proposed that the Bloodvein National Park be established in the area of the Bloodvein River Basin (Fig. 20). A second proposal for a park in the Bloodvein Basin was advanced by a group of citizens belonging to diverse organizations

calling themselves the "Atikaki Coalition". The geographic boundaries for the two proposals differ somewhat. The Parks Canada proposal is under consideration by the provincial government.

There has been no detailed inventory of the resources within the proposed National Park area. There are a number of wild rice producing areas, tourist lodges, tourist outcamps, caribou ranges, trout lakes, trapper cabins, forestry stands, miscellaneous mineral deposits, Indian rock pictographs and wild rivers, most of which have already been described in previous sections of this study. The general recreational value of the area lies in its potential for "recreational" wilderness users.

Parks Canada and the Atikaki Coalition are interested in the proposed park for similar reasons. The following is drawn largely from personal communication with Jim Johnston, the Parks planner involved in the Bloodvein National Park Proposal.

Parks Canada's interest in the area of Bloodvein Basin (2875 sq. km. east of Lake Winnipeg) arises from the agency's goal of including a representation of each of the forty-eight Natural Regions in the systems of National Parks. There are currently twenty-eight National Parks scattered throughout Canada.

The area proposed for Bloodvein National Park, includes representative features from two natural regions; the Central Boreal Uplands of the Canadian Shield and the Manitoba Lowlands, and the Transition Zone between these two natural regions.

The park area is still in a relatively unaltered state. The fact is, true wilderness areas within 150 air kilometers of any major city in Canada are rare. The Bloodvein Basin area is relatively close to the City of Winnipeg which increases its value for a National Park.

The park contains a number of wildlife species indigenous to the Boreal Forest life zone including the rare woodland caribou. The scenic resources of the proposed park area are aesthetically pleasing, and contain a series of challenging white water rivers which provide good quality canoeing. Some of these waterways have been desribed as wild rivers (Hooper 1973), due to their unaltered state. Together with a number of Canadian Shield Lakes in the vicinity of the Manitoba-Ontario border, they provide numerous recreational opportunities.

The rivers have acted as main transportation routes for generations of native people living in the area. Numerous rock paintings (pictographs) and other evidence of habitation in the region attest to this. As already stated, the Bloodvein area is one of the richest areas for pictographs in North America. National Park status for the area would, depending on the design of an appropriate park plan, ensure that this cultural treasure is preserved unimpaired for future generations.

The area is rich in natural resources such as wild rice, wild fur animals, and other cultural resources which are suitable for inclusion in a National Park. Parks Canada believes that the resources are generally not economical for commercial exploitations. For example, the forest resources are not of mechantable quantities and the mineral resources are as yet insignificant.

This opinion may be true for mineral resources, but the same is not necessarily applicable to the wild rice, wild fur potential and other recreational concerns such as tourist lodges. It can be argued then that the area proposed for the National Park does have some commercial significance.

However, Parks Canada claims that creation of a National Park in the area would not present any serious resource allocation conflicts. No industries or communities are expected to be economically disadvantaged because of establishment of the park. It is believed that development of park infrastructure, roads and visitor facilities would likely result in an economic boost to the area.

d. Joint Planning Area

A joint planning area (JPA) adjacent to the boundary of the proposed Bloodvein National Park at its southern end (Fig. 20) is to be under the joint jurisdiction of Parks Canada and the Provincial Parks Branch. The JPA provides a developmental zone and access region for both the proposed Bloodvein National Park and Nopiming Provincial Park. The park planners hope that by restricting development to an area outside the proposed national park and Nopiming Provincial Park, the wilderness features on which both parks are based may be maintained. (Wall and Johnston pers. comm.)

4.3.3 Recreational Activities

The wildlife resources which give rise to such recreational activities as hunting and angling have already been discussed under the section entitled, Biotic Component. This section deals only with activities which are a function of the resource base.

a. Hunting

This sub-section deals with hunter regulations, hunter numbers and hunter success.

The east side is divided into a number of Game Hunting Areas (Fig. 11). North of the Winnipeg River, are Game Hunting Areas (GHA) 26, 17A, 3A and 3. A portion of the study area lies in 3A and 3. It is difficult to interpret the statistics for these GHA's with reference to the study area.

Hunter pressure for GHA 17A and 17, was documented by the Wildlife Progress Branch (Department of Renewable Resources and Transportation Services) in 1974. This information dealt only with licensed hunters, consequently, native hunter success is unknown.

i. Caribou

Although the woodland Caribou is considered a rare and endangered species, hunting was allowed prior to 1976, but little or no hunter success had been realized. The caribou were hunted only in GHA 17 during 1974-75, after which no licenses have been sold.

ii. Moose

GHA 26 and 17A

More moose licenses were sold in GHA 26 and 17A than in 17, because of the greater accessibility of the former GHA's. Data obtained through questionnaires indicated that at least 152 licenses of the 1,330 sold in 1974 were used. The moose harvest may have been in the range of 127 -261.

GHA 17

Data obtained through questionnaires indicated that at least

44 licenses of the 176 sold in 1974. The moose harvest may have been in the range of 15 - 41.

iii. Deer Hunting

White-tailed deer had a closed season in the last three years, but a limited season was allowed in 1977. No statistics on hunter success are available.

iv. Black Bears

No records are kept on hunter success with black bears in the study area.

v. Upland Game

The province is divided into upland game units (Fig.13). Game unit 1 and part of unit 8, lie within the study area. The number of birds shot in the study area, cannot be determined. At best, an estimate would only be an educated guess with a large degree of error (Page pers.comm.).

b. Angling

Angling is a major attraction, luring recreationists to the study area. There is no information on angling success in the area. Young (1975:18) stated that, "the nature of the activity itself, with relatively few controls on the actions of the fishermen, their freedom to travel over a large fishing area including secondary waterbodies in the course of a day's fishing, and the variable success associated with sports fishing contribute to the difficulty of estimating averages to apply to sport harvest calculation." However, assumptions have been made concerning the length of the operating season, occupancy rates

and the average daily catch. The average maximum and minimum sport harvest catch can then be calculated. The values obtained are fraught with potential error. The length of the operating season was assumed to be 120 days, occupancy rates for outcamps were estimated at 20 percent and 15 percent while average daily catch was assumed to be 10 kg per person per day (Ibid).

The total catch at 60 percent occupancy for the lodges would be 366,416 kg and 244,230 kg respectively. The total catch for outcamps at 20 percent and 15 percent capacities would be 37,897 kg and 28,422 kg respectively. The annual sport fishing harvest could range from 272,652 kg to 404,313 kg. Local sport harvest is negligible (Ibid). No species breakdown is available, but it is assumed that the majority of the catch is composed of walleye, northern pike and trout, in that order.

c. Canoeing

i. Recreational River Areas

The waterways are used extensively for canoeing. Many lakes can be canoed in a leisurely fashion, but the rivers are the courses which most canoeists find challenging. The O'Hanly, Black, Sandy, Manigotagan and Wanipigow Rivers (Fig. 21) are some of the recreational river areas used by canoeists interested in short, relatively easy outings. Sherwood (pers. comm.) said that the Sandy River which is representative of the rivers south of the Wanipigow has many aesthetically appealing rapids and treed shorelines interspersed with rocky outcrops. An inexperienced canoeist can easily navigate these rivers.

The number of canoeists who use the rivers is not known, however with the opening of Nopiming Provincial Park, more canoeists may use these rivers.

ii. Other Canoe Routes

It was noted that the rivers north of the Wanipigow provide excellent opportunities for experienced canoeists. Some of these potential canoe routes are depicted in Figure 21. Of these, the Pigeon, Berens and Poplar-Assinika Rivers have been labelled as wild rivers, and unique to the area (Hooper 1973). Other canoe routes include the Bloodvein, Leyond, Dogskin, Etomami, North Etomami and associated tributaries. These potential canoe routes were identified by Wall (1977) who used the following criteria to assess the potential of the waterways for canoe routes:

1. No less than one week minimum visitation time, due to limited access to the area with maximum visitation time--approximately 4 weeks;
2. Rate of travel by each party of approximately 16-23 km per day;
3. All routes have to be navigable for a loaded canoe for a minimum period of 2 months after spring break-up in a normal year;
4. Routes consist of rivers, lakes, navigable swamps, and portages of reasonable length and ease of transport;
5. Routes may be one-way, circular or reversible.

The Manitoba Department of Tourism, Recreation and Cultural Affairs have approved the Sasaginnigak, Little Grand Rapids, and the Kautunigan canoe routes for canoeists. Rock Kettles crosses at the old cemetery on an island west of the Bloodvein Reserve (because of their unique adornments), old Indian graves, Indian rock pictographs and trappers cabins can be seen on the Sasaginnigak

Canoe Country Route. This route also has a large number of scenic rapids and portages.

The Little Grand Rapids Canoe Routes include:

1. Little Grand Rapids to Berens River Settlement via Pigeon River and Lake Winnipeg, a distance of 201 km;

2. Little Grand Rapids to Berens River Settlement via Berens River, a distance of 177 km;

3. Little Grand Rapids to Poplar River Settlement via Assinika and Poplar Rivers, a distance of 266 km;

and highlight rapids, portages, trapline camps, trapline shacks, and wild rice production areas. The Kautunigan Route displays the aesthetic properties of the waterways along a 486 km route which extends from Wallace Lake, down the Wanipigow and Broadleaf River to Aikens Lake, down to Gammon River and Bloodvein River, up the Sasaginnigak through Sasaginnigak Lake to Shining Falls and through Family Lake and Little Grand Rapids down the Berens River to Lake Winnipeg.

iii. Wild Rivers

Berens River

The Berens River from Little Grand Rapids on Family Lake to Lake Winnipeg is 200 km long, and drops 72.3 m with a gradient of 0.45 m per km. The average river width is 53.4 m, but variations from 12 m to 91.5 m exist. Stream bed materials are mainly granite, with a thin layer of clay and silt. One of the most scenic and challenging stretches of the river lies between Wolf Falls to Short Lake. The stretch contains numerous channels, high granite cliffs and gorges, waterfalls and rapids (Hooper 1973).

The Berens River is a stimulating and attractive river for wilderness canoeing. There are no extensive areas of swamp along the river and the recreational capability includes, "opportunities for fishing, hiking, swimming, informal education and to a lesser degree, hunting and viewing wildlife " (Ibid). There is less variety and quantity of wildlife along the Berens, as compared to the Pigeon and Bloodvein, probably because the river is travelled more extensively and is a frequently used hunting area. Fishing is good all along the river, particularly below some of the rapids and waterfalls. Few areas along the river provide good habitat for such species as moose and beaver.

Dr. Karen Johnson (pers.comm.) said that there are stands of large white spruce and other trees of interest along the Berens River. There is also a typical cross-section of the Boreal Forest Communities along the river from jackpine-lichen communities on the shelf upland, to wild rice marshes on the lower, slower stretches. There is an abundance of birds, mammals, reptiles and fish.

Pigeon River

The Pigeon River from Shining Falls just below Family Lake, to the mouth of Lake Winnipeg is about 184 km. The river channel, upstream down to the falls, cuts through relatively low granitic rock, while large jackpine and poplar grows on both shores. The scenery is varied, with small swamps, creeks, deep pools and dry channels. Downstream from Shining Falls, is a large vertical cliff and a small sand beach framed by vegetation. The river

channel can be seen for a few hundred meters downstream from Shining Falls, before disappearing as the water winds through a deep gorge (Hooper 1973).

There are opportunities for hunting, fishing, hiking, swimming, informal education, and viewing wildlife. Sightings of bald eagles, osprey and great blue herons have been reported. Moose and beaver are abundant. Native trappers' cabins and equipment can be seen along the river. Activities such as hiking, can only occur along the granite outcrops and ridges where the ground is well drained, and vegetation is not too dense.

Physically, the river is a very demanding one to the canoeist. There are treacherous currents, fast water and the numerous rapids vary in size and difficulty. There are suitable camping sites[1] all along the river, although it should be noted that insects are numerous during the late spring and summer. Hooper (Ibid) said that "the scenery along this river, though diverse is not inspirational or spectacular. There are stretches of extremely fast water with numerous rapids and falls, long lonely reaches of swamp, marsh, lakes, and high rocky gorges."

Assinika-Poplar Rivers

The Assinika River is 112 km long, with an average width of 30.5 meters, but is only 1 meter wide in some places. The Poplar River, measured upstream of Wrong Lake, is 135 km long with average widths of 61 m to 91.5 m. At waterfalls, it can be 2.5 meters wide, but as wide as 136 meters at other places. The Poplar River contains more sediment than other rivers because of the

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[1]Hooper (Ibid) used the following criteria to assess the suitability of camping sites: "level ground with good drainage, firewood, drinking water, wind exposure, canoe docking, fishing and scenery."

extensive glacial drift through which it flows (Ibid).

The Assinika-Poplar River Canoe Route is 154 miles long from Little Grand Rapids to the Poplar River Indian Reserve. It is not regarded to be as scenic, or spectacular as the Berens River. However, waterfalls 6 to 9 m. high can rival any of those found on the other rivers. Wilderness canoeists can achieve the greatest diversity of canoeing experience along this route, primarily because of "small shallow rapids, narrow channels winding through acres of wild rice, large lakes, deep narrow gorges, large waterfalls and the large Poplar River" (Ibid). Hunting, wildlife viewing, swimming, hiking and fishing are excellent along this route. There are many swimming areas at sand beaches on the larger lakes.

The Assinika-Poplar route is not as physically exhausing as the Pigeon. Hooper (Ibid), noted that even an inexperienced canoeist could safely canoe the Poplar River because it is large, but not as fast as the Pigeon. Of the Berens, Pigeon and Assinika-Poplar, the latter is best able to support a wide variety of recreational activities.

e. Other Recreational Activities

Other recreational activities are a function of the previously described primary activities, and will not be considered further except for "rock hounding", which is the term used to describe the search for precious, semi-precious, interesting rocks, and/or minerals which may or may not be polished, made into jewellry or added to a rock or mineral collection. The activity is relatively popular, and there are many sites on the east side of Lake Winnipeg, which are good rock hounding areas. (Manitoba Vacation Guide 1978/79)

CHAPTER 5

EFFECTS OF TRANSMISSION FACILITIES

This chapter includes a discussion of the inventory data in light of the potential impact of transmission facilities. The criteria developed in Chapter 3, are applied to determine the degree of impact that transmission facilities would have on each aspect of the Biotic, Socio-cultural and Recreation components of the study area. The professional opinion of persons knowledgeable about the study area and the professional judgement of the author are used to determine the level of overall impact of transmission facilities.

5.1 Biotic Component

5.1.1 Flora

a. Forests

The construction of transmission facilities would result in a portion of the forest capability being removed from production for the life of the facilities, but some measure of access through the area would be provided. The acreage removed from productivity would not be significant. For a right-of-way approximately 150 m (500 ft) wide, the loss to forestry would be approximately[1] 36.6 acres per kilometer. In the more productive MU is 33, 34 and 38, this loss of 36.6 acres per km would be significant enough to warrant an impact rating of moderate, because commercial forestry operations would be affected by this

[1]Barto (1977) used a value of 15 acres of lost land for a right-of-way approximately 35 m.wide (120 ft.). This value was extrapolated for a right-of-way 150 m. wide (500 ft.)

loss. However, in other MU's where the forestry potential is low, the acreage loss would result in a low impact from transmission facilities.

Another factor which has to be considered is the hazard of fires[1] resulting from the presence of men and heavy equipment. However, this hazard would be low if standard operating procedures are observed as per Ontario Hydro (1976). As previously stated, MU33, 34 and 38 would be moderately affected, but all other MU's would have a low impact rating.

b. Wild Rice

The possible adverse effect of trespass on lease areas as a result of increased assessibility is considered negligible, and neither is it expected that increased access would result in higher levels of production (Peterson pers.comm.) Most shallow lakes, rivers, and bays, are capable of producing wild rice. The impact of transmission facilities on such an abundant resource is expected to be negligible. A rating of low impact is assigned.

c. Other Vegetation

The lack of information regarding other vegetation types in the area makes it difficult to determine potential impact. Although some aspects of the vegetation types are relatively fragile, for example, lichens, it is considered that the overall impact of transmission facilities would be low.

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[1]The risk of fires from corona discharges is a possibility. However, the development of better conductors has minimized this risk under fair weather conditions. Foul weather increases the risk, but it is still negligible.

5.1.2. Fauna

i. Woodland Caribou

The woodland caribou are a relatively rare species in Manitoba, and are an integral component of the wildlife mosaic of the Precambrian Shield area, east of Lake Winnipeg (Crichton 1974). Woodland caribou require extensive acreages of mature coniferous, or mixed wood forests in which the best growths of terrestrial and arboreal lichens occur. Transmission facilities pose dangers to the caribou herds in the form of fire, increased accessibility and environmental disruption due to construction.

Fire is one of the deadliest agents of destruction to the food supply of the caribou. Large acreages have been burnt which resulted in extermination of terrestrial and arboreal lichens in some areas. Lichens are slow growing, and as many as 90-120 years may be needed for an area to be restored to its former abundance. Fires not only convert mature forest to early successional stage forest unsuitable for caribou, but also reduce the abundance of caribou forage.

Caribou herds generally avoid burnt-over areas, unless they are crossing one during the winter months. The caribou will only use burned ares in the spring, summer and fall if forb and browse production is high. Some fires in black spruce bogs may enhance the caribou range provided that the fire only burns part of the vegetation and opens the canopy cover. This is beneficial to lichen growth. However, if jackpine stands are burnt, habitat features required by woodland caribou are destroyed. Fire hazards may increase with the presence of construction workers and equipment. Movement of heavy equipment across lichen beds

would be severely detrimental to caribou habitat. Such movement would lead to destruction of various food sources, espcially in wintering areas (Crichton 1974).

Crichton (pers.comm.) expressed concern over the fact that a right-of-way would increase accessibility to the caribou herds, expecially in winter. This raises the possibility of increased hunter pressure from natives and non-natives. The hunting pressure from natives (who are not legally bound to any season) may be especially detrimental to the present stability of the caribou population. However, this opinion cannot be substantiated. Paradoxically, one of the values of preserving the woodland caribou population is their potential for sport harvest. If the herds stabilize, and if the Government believed that hunting is necessary to control the population, they may be hunted for sport.

The habitat requirements of caribou must be considered in corridor identification. Trespass by men and heavy equipment may lead to environmental damage of soils and lichen beds that may permanently endanger the small herds of caribou on the east side. Manitoba's woodland caribou are rare in status. Transmission facilities impinging on the herd ranges could be extremely detrimental to the already precarious stability and viability of the caribou. Consequently, the ranges are classed as areas of high impact.

ii. Moose

Fire, as well as logging operations create favourable habitat for moose because they open up the forest to succession. Transmission facilities would result in the creation of prime

habitat for the moose population, but it would also lead to increased accessibility through the area. The increased accessibility may result in greater hunter pressure on the moose from both Indian and non-Indian hunters. The hunter success rate indicates that seventy-five percent of the moose taken are within the age group of maximum reproductive potential.

Despite this, Crichton (Ibid) believes that the moose population is showing signs of increasing. Consequently, the construction of transmission facilities need not be detrimental. In fact, it could be beneficial because it would create much needed habitat. This mitigative effect of the creation of habitat and the signs of an increasing moose population indicate that transmission facilities would have a low impact on the moose.

iii. White-tailed Deer

White-tailed deer are the big game animals most important to Manitoba hunters (Crichton 1974). In 1961, the Manitoban deer population was estimated at 200,000 (Government of Manitoba 1961), but since then the population has declined. A winter kill in 1974 resulted in such a drastic decline that a closed season was imposed in 1975 and 1976. A limited season was permitted in 1977. No population estimates are available for the study area. Shoesmith (pers.comm.) claimed that the population of white-tailed deer in the area is insignificantly small, although Crichton (pers. comm.) said that sightings of white-tailed deer in the southern portion of the study area are fairly common in areas where the forest has been cleared, as a result of logging or forest fires (see Hunting). Transmission facilities would have generally similar effects on the deer population as it would the moose

population. The impact is expected to be low.

iv. Black Bear

The black bear easily adapts to encroachment by man. No foreseeable detrimental impacts are expected to accrue to the black bear as a result of transmission facilities. The right-of-way may provide ideal habitat because of the edge effect. The impact is expected to be low.

Fur Bearers

Engen (pers.comm.) believes that transmission facilities may provide the incentive for trappers to increase the scope of their trapping range because of increased accessibility provided by the right-of-way, may also lead to increased populations of fur bearers in the area of the right-of-way.

Timber wolves, for example, are abundant in the study area (Crichton pers.comm.), but they are not being harvested. It is known that wolves in Riding Mountain National Park utilize the transmission line right-of-way like a trail. Should a similar pattern of use develop in the study area, it may be easier for trappers to tap the economic potential, and at a pelt price exceeding 100 dollars this could prove to be lucrative.

In light of the beneficial aspects of transmission facilities through increased access and the edge effect, and considering the adverse effects provided by increased fire hazards and environmental disruption; the overall adverse impact of transmission facilities is expected to be low.

Birds

i. Upland Game

It is assumed that the impact of transmission facilities would be low. However, there is no available information on populations, so the accuracy of the assumption cannot be verified.

ii. Waterfowl

Impact of transmission facilities is expected to be low.

iii. Other Birds

Impact of transmission facilities is expected to be low.

d. Fish

The impact on the fishery resource is varied.

i. Sport Fish

Sport fish are valuable to the local economy. However, all sport species except trout are abundant. The impact of transmission facilities which may disrupt the terrestrial environment would not have a significant effect on the aquatic environment, providing care is taken to follow the guidelines laid out by Ontario Hydro (1976) with regard to water crossings. Consequently, the impact on all sport fish species except trout is expected to be low.

Trout are relatively scarce in comparison with other species. No information is available as to spawning habits and other habitat requirements. Any disruption of trout waterbodies may affect the stability of the trout population, regardless of mitigating measures as per Ontario Hydro (Ibid). The impact is difficult to assess qualitatively, but it is expected it will be moderate in nature. However, the indirect effects on the outdoor

recreational capability may be higher if the tourist lodges and outcamp are affected.[1]

ii. Other fish

They are abundant, and although they are valuable to the food web, the impact of transmission facilities is expected to be low.

5.2 Socio-Cultural Component

5.2.1 Infrastructure

As a result of its nature, the infrastructure of the area is vital to the local economy. The imposition of transmission facilities on[2] the rights-of-way of existing transmission lines and transportation routes would be severe because it would violate the status of an existing land use.

5.2.2 Communities

All communities including Indian Reserves constitute existing land uses. The impact of transmission facilities through these is considered severe because of their existing land-use status.

5.2.3 Archaeological Resources

a. Indian Rock Pictographs

Indian rock paintings are part of our cultural heritage. Destruction of these pictograph sites would result in a severe loss to the culture and history of the native people, and Manitobans at large. From a cultural and aesthetic viewpoint, preservation of these sites is a necessity. The impact of transmission facilities, for example, towers, if constructed on these sites is considered

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[1] See--Tourist Lodges and Outcamps.

[2] However, it would be beneficial to construct a right-of-way adjacent to an existing one, since this would minimize the adverse impact.

severe, because of the possible destruction of a cultural artifact.

b. Archaeological Digs

Like Indian rock paintings, information obtained from excavation sites often proves to be a valuable source of cultural history. The potential impact of constructing transmission facilities such as towers on an archaeological dig site would be severe, because of the possible destruction of artifacts valuable to our culture and history.

c. Historic Sites

Although there are no officially designated historic sites, the five rivers, Manigotagan, Pigeon, Wanipigow, Bloodvein, and Berens all have other value to outdoor recreation. However, the impact of transmission facilities regarding their historic value would be low, because no actually proven historic sites will be affected.

d. Miscellaneous

i. Mineral Resources and Mining Activity

Since the Bernic Lake mine and deposit are located within Nopiming Provincial Park, no attempt will be made to rate the potential impact of transmission facilities on the mine and future mining activity. The history of mining in the area and the geological environments indicate that the mineral potential of the area should be noted at the preferred route level. Mineral deposits will not be considered at the corridor level.

ii. Miscellaneous Mineral Resources

The impact on miscellaneous mineral resources will be low because of the small size of deposits and relative inaccessibility.

However, Manitoba Hydro may be able to use the small sand and gravel deposits for line construction if the effort proves to be feasible. For this case, the impact rating may change. Such a possibility will not be considered in this study.

5.3 Recreation

5.3.1 Existing Recreation Land Uses

a. Wanipigow Lake Cottages

It is judged that construction of transmission facilities through the cottage area near Wanipigow would have a severe impact. Impacts would result from disruption of the environment, the reduced aesthetic value of the area, the social impact of human disturbance and the possible reduction in the economic value of the cottages. No foreseeable beneficial effect will accrue to cottagers as a result of transmission line construction on cottage sites.

b. Existing Parks

i. Nopiming Provincial Park

The primitive character of Nopiming Provincial Park is its chief attraction. The potential impact of transmission facilities with its associated disruption, as a result of construction and maintenance of the lines would reduce the near-wilderness theme of the park. Increased fire hazards from the line, the presence of men and heavy equipment, and the fact that the park encompasses the range of a caribou herd emphasizes the severe impact, should transmission facilities be imposed on this existing land use.

ii. Whiteshell Provincial Park

Only the northern tip of Whiteshell Provincial Park lies in the study area. Unlike Nopiming, it is intensively used and there are as many as fifteen tourist facilities (including campgrounds and waysides) which could be disrupted, or affected by the presence of transmission facilities. The intensive use pattern of this park indicates that the potential impact of transmission facilities would be severe, although it is recognized that most users of the park do not expect pristine wilderness. However, the park is an existing land use.

c. Campgrounds and Waysides

The use pattern of campgrounds and waysides is expected to increase. As with the Whiteshell Provincial Park, it is true that transient users of campgrounds and waysides do not expect the facilities to be maintained in a state of pristine wilderness; it is also true that construction of transmission facilities through one of these sites would be severely disruptive. It may remove the facility from general use. In view of these facts and the existing land-use status of campgrounds and waysides, the impact of transmission facilities would be severe.

d. Tourist Lodges and Outcamps

The wilderness aspect of tourist lodges and outcamps is vital to the overall operation and success of the facilities. Rayner (pers.comm.) said that lodge operators believe many clients visit just for the wilderness experience. Many others come for the thrill of catching trophy fish armed with the knowledge that catches of smaller sizes would be abundant (Young 1975).

Transmission facilities would deter from the wilderness flavour of the lodges and outcamps and may even result in a closure of facilities if customers do not return, which would be harmful to the local economy. The increased fire hazard coupled with the other unfavourable aspects of transmission facilities (primarily aesthetic) on the lodges and outcamps indicate that the impact of such facilities on these existing land uses would be severe.

5.3.2 Proposed Recreation Land Uses

a. Manigotagan-Seymourville Proposed Cottage Subdivisions

This development site is a proposed one and the capability of the area for cottage construction is limited. Transmission facilities would disrupt the environment, reduce the capability for cottage construction, and the economic value. However, the fact that the plan does not have official approval means that the impact on cottag ing must be judged, at present, moderate in nature.

b. Proposed Land Reservation for Recreational Usage

The development site at Manigotagan-Seymourville does not have official approval. The plans call for an allowance of commercial development such as quarrying or mining. In light of these, the potential impact of transmission facilities would be low.

c. Proposed National Park

As previously stated, the recreational value of the proposed park lies chiefly in its potential for recreational wilderness uses. The construction of transmission facilities through the proposed park may have a disruptive influence on some of the features or

characteristics in the park, such as tourist lodges and outcamps, caribou ranges, trout lakes, Indian rock pictographs and wild rivers.

The potential impact of transmission facilities on the above factors range from high to severe. There are other aspects of the park area such as the wild rice producing areas, forestry stands, miscellaneous mineral deposts and sport fishing areas on which the potential impact ranges from low to moderate. Mitigative measures which may be observed in the imposition of transmission facilities within the park boundary, include avoidance of those areas in which the impact ranges from high to severe and the general adherence to guidelines specified in the report by Ontario Hydro (1976).

Bearing these guidelines in mind and allowing for the fact that there are significant features of environmental concern in the park boundaries, the impact of transmission facilities in all other areas are moderate in status. The impacts stem from disruption of the environment resulting in aesthetic losses, increased fire hazard and increased accessibility among others, which accrue as a result of construction and maintenance of transmission facilities.

d. Joint Planning Area

This area is restricted to development. The potential impact of transmission facilities is expected to be low because of the development oriented status of the area. However, the range of a caribou herd overlaps the area and the impact of this overlapped area will be high, considering the rare and endangered

status of the species. Areas that are excluded from this range will only be impacted to a low degree.

5.3.3 Recreational Activities

a. Hunting

i. Caribou

Transmission facilities would be detrimental to the caribou herd in that increased accessibility through the area would be provided. Consequently, the caribou herds may be subject to added native hunter pressure from persons outside the study area (Crichton pers.comm.), which may further diminish the stability of the present population.

ii. Moose and White-tailed Deer

Both moose and white-tailed deer thrive in open areas. The construction of transmission facilities would open up some of the area converting it to prime moose and deer habitat. The increased hazard of fire works in a beneficial manner to moose and deer in that it would also open up the forest and create habitat provided that the fire doesn't destroy the species. Increased access may be the only adverse effect, but the benefits may outweigh this. It is expected that the overall adverse impact to deer and moose would be low.

iii. Black Bears

Impact on black bears is expected to be low. Their abundance would more than offset the detrimental effects of hunter pressure and fire hazards, as a result of transmission facilities.

iv. Upland Game

Impact on upland game cannot be determined without further research into abundance and habitat requirements of the species

that exist in the area.

v. Waterfowl

Impact is expected to be low since waterfowl are rarely hunted in the area.

b. Angling

The impact on angling in the area if a transmission line is constructed, is a function of the proximity of the line to the tourist lodges and outcamps. If the line is built so that it affects the aesthetic value of a lodge or outcamp, it is possible that the lodge or outcamp would lose clients interested in the wilderness experience and the total angling success may decrease because of fewer visitors. However, regardless of the effect of transmission facilities on the aesthetic value of the lodge or outcamp, no change in individual angling success may occur if the lodge loses clients as a result of the aesthetic effect of the facilities.

c. Canoeing

i. Recreational River Areas

The recreational river areas are used generally by inexperienced canoeists. The rivers include the O'Hanly, Black, Sandy, Manigotagan and Wanipigow rivers. An increasing number of canoeists are expected to canoe these rivers in the future. Although there may be some environmental disruption as a result of construction activities, the impact on these intensively used rivers can be reduced,if mitigative measures as per Ontario Hydro (1976) are employed. These rivers are found in areas that already have some development. The existing developments would detract from the unattractiveness

of transmission facilities. The impact on recreational river areas would be a moderate one.

ii. Other Canoe Routes

Canoe routes north of the Wanipigow River are generally used by more experienced canoeists who specifically canoe the area for the challenge of those difficult rivers, and the wilderness experience. The impact of a transmission line on the canoeist would be high, regardless of mitigative measures, because the very presence of the lines would downplay the wilderness experience. The lines would detract significantly from the aesthetic value of the area, and the impact would be high.

iii. Wild Rivers

The wild rivers include the Berens, Pigeon and Poplar-Assinika. All are in a relatively unaltered state and offer the ultimate challenge to canoeists who are looking to test their skill. The rivers are unique to the area (Hooper 1973) and each have characteristics that render them significant to the total wilderness flavour of that region. Because of this, the impact is expected to be severe.

d. Other Recreational Activities

Other recreational activities which are a function of the previously described activities and resources are assumed to be impacted to a degree equal to that of the associated primary activity. For example, rock hounding is basically a hobbyist activity which is not greatly affected by the aesthetic quality of the environment. The potential impact on rock hounding and other such activities would be low.

CHAPTER 6

SYNTHESIS OF EFFECTS AND IDENTIFICATION OF CORRIDORS

6.1 Synthesis of Effects

The potential impacts of the transmission facilities vary in degree of intensity within, and among the Biotic, Socio-Cultural, and Recreation components of the environment. Within the Biotic component (Table 7), there are no factors that have been given a ranking of severe primarily because no factors met the established criteria for a severe impact. The woodland caribou would be subject to a high impact, because of their rare and endangered status. Most of the factors of the Biotic component, would be impacted to a low degree. Forestry management units 33, 34 and 38 as well as the relatively scarce trout waterbodies would be impacted to a moderate degree (Fig. 22).

The Socio-cultural component faces potential impacts, primarily of a severe nature, because of the many existing land use areas which constitute this component of the environment. As can be seen from Table 8, these land uses include communities, archaeological resources and the infrastructure of the area. No areas would be impacted to a high or moderate degree. Historic rivers and sites (of which there are none officially designated), as well as mining activity, are assessed as being impacted to a low degree (Fig. 23).

Table 7: Summary of Potential Impact Ratings on the Biotic Component

Biotic Component	Impact			
	Severe	High	Moderate	Low
Flora			Forests (Management Units 33, 34 and 38) (Fig. 8)	Wild Rice (Fig.9) Other Management Units(Fig.8) Other Vegetation
Fauna		Woodland Caribou (Fig.10)	Trout (Fig.13)	Moose (Fig.11) White-tailed Deer Black Bear Fur Bearers Upland Game Waterfowl Other Birds Other Fish Reptiles Amphibians Other Species

Table 8: Summary of Potential Impact Ratings on the Socio-Cultural Component

Socio-Cultural Component	Impact			
	Severe	High	Moderate	Low
Communities	Indian Reserves (Fig.14) Other Communities (Fig.14)			
Archaeological Resources	Indian Rock Pictographs (Fig. 16) Archaeological Digs (Fig. 16)			Historic Rivers and Historic Sites (Fig.16)
Infrastructure	[1] Power Routes (Transmission Line Right-of-Way) (Fig.15) [2] Transportation Routes (Fig.14)			
Miscellaneous				Mining Activity (Fig.17)

[1,2] Power routes and transportation routes are given a severe impact because of their existing land use status. However it should be noted that it is generally a good idea to maximize the use of existing rights-of-way.

The Recreational component of the environment shows a cross-section of potential impacts from severe to low. Most of the potential impacts on recreation areas were assessed as severe, generally because of their existing land-use status (Table 9). These include cottage subdivisions, parks, campgrounds, waysides, tourist lodges, tourist outcamps, and wild rivers. Areas of high impact, are those canoe routes which lie north of Wanipigow River, and are of a wilderness nature. Areas of moderate impact included a proposed National Park, except those high environmental resource value areas within the proposed National Park, and some recreational river areas (south of the Wanipigow River). A proposed natural reserve, and a proposed Joint Planning Area, were assessed as being impacted to a low degree (Fig.24).

6.2 Identification of Corridors

In order to identify the possible corridor routes, the overlay technique described in Chapter 3 was used. The overall factor maps for the Biotic (Fig.22), Socio-Cultural (Fig.23) and Recreation (Fig.24) components were overlaid to form a total (Fig.25) composite map. From this map, avoidance areas were visually delineated by removing those areas with shadings darker than contiguous areas from consideration as possible corridor routes. The lower impact areas lying between and among those of avoidance status were considered to be more desireable for corridor definition. Care was taken to avoid routing corridors through space occupied by an avoidance area. Corridors were drawn by a visual fit to take advantage of the lower impact areas. Four corridor routes A, B, C and D were defined from a common point at the

Table 9: Summary of Potential Impact Ratings on the Recreation Component

Recreation Component	Impact			
	Severe	High	Moderate	Low
Existing Recreational Land Uses	Wanipigow Lake Cottage Subdivisions(Fig.18) Nopiming Provincial Park(Fig.20) Whiteshell Provincial Park(Fig.20) Campgrounds(Fig.18) Waysides (Fig.18) Tourist Lodges and Tourist Outcamps (Fig. 18)			Joint Planning Area (Fig.20)
Proposed Recreational Land Uses			Manigotagan-Seymourville Cottage Sites (Fig.20) Bloodvein National Park (Fig.20)	Manigotagan-Seymourville Natural Reserve (Fig.20)
Other Recreation Resources	Wild Rivers (Fig.21)	Other Canoe Routes (Fig.21)	Recreation River Areas (Fig.21)	
Recreation Activities (a) Hunting (b) Canoeing (c) Angling (d) Other Recreational Activities	The impact of recreational activities varies as a function of impact on existing land uses, proposed land uses and other recreation resources.			

northern boundary of the study area (Fig.26). A, B, C and D converge just south of the fifty-second parallel to form three main corridors. A, B, and C again converge in the Manigotagan region to form an exit corridor (Fig.26).

Corridor A orients away from the northern entry point towards Lake Winnipeg in a south-easterly direction. It then follows the east shore from the Poplar River Indian Reserve towards the Berens River Indian Reserve at which point it is joined by a trunk of Corridor B, and continues along the east shore to the Manigotagan area, from where it exists the study area via a trunk common to A, B and C (near the Fort Alexander Indian Reserve)

Corridor B splits into two trunks, one of which joins Corridor A. The other trunk continues along the centre of the study area on a linear north-south path to the Manigotagan area, at which point it exits via the trunk common to A, B and C.

Corridor C orients away from the northern boundary toward the centre of the area. It joins Corridor B south of Berens River and follows a linear north-south path to the Manigotagan area. It exits via the trunk common to A, B and C.

Corridor D follows a linear path from the northern boundary, along the Manitoba-Ontario border to a point just south of Fishing Lake. From Fishing Lake, Corridor D veers away from the border in a south-easterly direction to the exit point near Fort Alexander Indian Reserve.

CHAPTER 7

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

7.1 Summary

The primary objective of the study was to identify alternative transmission corridors with the major emphasis on minimizing adverse effects on outdoor recreation. This required an inventory of the region's Biotic, Social and Cultural components, and also, a categorization and evaluation of the outdoor Recreation component in terms of its present and potential usage.

Chapter 1 - included an introduction to the study, the objectives and a discussion of the scope of the program.

Chapter 2 - involved a description of the study area and the physical environment which included the topography, geology, soils and climate.

Chapter 3 - described the approach used in the regional analysis. A discussion of the sources of information, a review of regional environmental assessment literature and the method used in the analysis of information was included.

Chapter 4 - contained a detailed presentation of inventory data. This included the Biotic and Socio-cultural components and the present and potential uses of the study area for outdoor recreation.

Chapter 5 - dealt with the effects of conditions and activities associated with transmission facilities on the various factors of the Biotic and Socio-cultural components, and their potential effects on present and future land uses for outdoor recreation. These effects were categorized into four degrees of impact; severe, high, moderate and low according to criteria established in Chapter 2.

Chapter 6 - included a synthesis of the effects of transmission facilities on the Biotic, Socio-cultural and Recreation components. The alternative corridors were identified by the use of an overlay-technique described in Chapter 3, and a brief description of the corridors concludes the chapter.

7.2 Recommendations

i. Biotic Component

There was a paucity of information concerning the wildlife resource, especially the woodland caribou. Further research should be done to assess the geographic extent of the summer and winter ranges, staging areas and calving grounds of the caribou. In light of the unique value of the woodland caribou, further research is necessary to identify and assess the impact of transmission facilities on the status of the species prior to preferred route selection. The potential impact of the transmission facilities on the sport fish in the region, and ultimately the impact this would have on the tourist lodges and outcamps which are a vital segment of the local economy, should also be documented. There is no information regarding upland game. Their abundance and value to the region should be studied prior to line definition.

ii. Socio-cultural Component

With regard to the Socio-cultural environment, the archaeological resources have not been adequately documented. Prior to line definition, the preferred corridor should be studied to identify any areas of archaeological or historic value. The right-of-way should then be selected, bearing this information in mind.

iii. Recreation Component

Manitoba Hydro should consider that the proposed Bloodvein National Park may become an officially designated park, which would have a significant effect on the geographic boundaries of

the alternative corridors, especially Corridor D, which may be eliminated entirely. Mitigating measures should be applied wherever possible, bearing in mind the Biotic and Socio-cultural constraints and the demonstrated demand for outdoor recreation in the area. The increasing demand for dwindling resources to provide outdoor recreation should be carefully weighed in the final analysis for a preferred route.

Manitoba Hydro should note the importance of recreational expenditure to the local economy. Any activity which jeopardizes this expenditure could result in economic losses to the region and may contribute to higher unemployment. It is therefore recommended that a study be undertaken to assess the actual value of outdoor recreation to the local economy, and the choice of a preferred corridor should attempt to minimize the losses from recreational expenditures to the local economy wherever possible.

7.3 Conclusions

The impacts of activities and conditions associated with transmission facilities were mapped for the Biotic, Socio-cultural and Recreation components. The overlay technique was used to highlight those areas of darker shading which were assessed as avoidance areas. The resulting lighter regions lying between, and among the avoidance areas were considered as possible corridor routes.

Four possible corridor routes; A, B, C and D were visually defined from the northern region of the study area. Just south of the fifty second parallel, A, B, C and D converge to form three corridors; one of which follows the

east shore of Lake Winnipeg, another runs along the north-south centreline of the area, and the last follows the Manitoba-Ontario border before veering south-east towards the exit point near the Fort Alexander Indian Reserve. Corridors A, B and C converge near Manigotagan to exit the area via a common trunk which also joins Corridor D near the Fort Alexander Indian Reserve. It should be noted that areas which lie among and between avoidance areas in Figure 26, and which were not included in corridor routes have not been removed from consideration as possible corridor routes. They were not considered for the proposed corridor routes because they did not contribute to the linear configuration of the corridors. Further study may justify their use for corridors because of engineering, economic or even environmental constraints.

In order to allow for linear north-south routes, it was necessary for the corridors to cross areas of higher impacts such as wild rivers, canoe routes, infrastructure network, forest management units and the proposed National park. The corridor located along the east shore of Lake Winnipeg has numerous bends, primarily to avoid Indian Reserves and caribou winter ranges. The corridor and trunk lines located approximately along the midline of the area is constrained primarily by caribou winter and summer ranges. The corridor on the Manitoba-Ontario border is also constrained by caribou ranges, Nopiming Provincial Park and other existing land uses. The boundaries of the corridors may change if the proposed National Park becomes official and if some of the recommendations for the Biotic [illegible]io-cultural and Recreation components are implemented.

The data base for the study could possibly have been more detailed, but it is doubtful whether this would have resulted in significantly different corridors. Public participation was limited to persons knowledgeable about the study area at the field level. Future studies by Manitoba Hydro regarding this area must consider further public participation as it could easily affect corridor boundary definition and impact understanding. Finally, for all intents and purposes, the corridors that were identified fulfill the criteria that alternative corridors be identified with the major emphasis on minimizing adverse effects on outdoor recreation. [1]

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[1] Corridor evaluation and identification of a preferred corridor will be the prime responsibility of Vogel (1978).

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APPENDICES

APPENDIX I

FLORA - SCIENTIFIC NAMES

Common Name	Scientific Name
Black spruce	*Picea mariana*
White spruce	*Picea glauca*
Balsam fir	*Abies balsamea*
Balsam poplar	*Populus balsamifera*
White birch	*Betula papyrifera*
Jackpine	*Pinus banksiana*
Aspen	*Populus tremuloides*
Labrador tea	*Ledum sp.*
Bog rosemary	*Andromeda sp.*
Dwarf cranberry	*Oxycoccus sp.*
Spaghnum moss	*Sphaghnum sp.*
Larch	*Larix lariciana*
Reed grass	*Calamagrostis sp.*
Cat-tail	*Typha latifolia*
Sprangle top	*Fluminia sp.*
Bulrush	*Scirpus sp.*
Lichen	*Cladonia sp.*
Wild rice	*Zizania aquatica sp.*

APPENDIX II

FAUNA - SCIENTIFIC NAMES

Common Name	Scientific Name
Woodland caribou	*Rangifer tarandus*
Moose	*Alces alces*
White-tailed deer	*Odocoileus virginianus*
Black bear	*Ursus americanus*
Beaver	*Castor canadensis*
Coyote	*Canis latrans*
Ermine	*Mustela erminea*
Fisher	*Martes pennanti*
Red fox	*Vulpes sp.*
Lynx	*Lynx canadensis*
Marten	*Martes americana*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethica*
Otter	*Lutra canadensis*
Raccoon	*Procyon lotor*
Skunk	*Mephitis mephitis*
Squirrel	*Tamiasciurus hudsonicus*
Timber wolf	*Canis lupus*

Fauna cont'd.

Common Name	Scientific Name
Sharp-tailed grouse	Pedioecetes phasianellus
Spruce grouse	Canachites canadensis
Ruffed grouse	Bonasa umbellus
Pickerel (or walleye)	Stizostedion vitreum canadensis
Whitefish	Coregonus sp.
Northern Pike (or jackfish)	Esox lucius
Lake trout	Salvelinus namaycush
Yellow Perch	Perca flavescens
Goldeye	Hiodon alosoides
Suckers	Catastomus sp.
White Bass	Morone chrysops
Catfish	Ictalurus sp.
Burbot	Lota Iota
Leopard frog	Rana pipiens
Painted turtle	Chrysemys picta
Snapping turtle	Chelydra serpentina