Reconciliation of Issues Through Land and Resource Management Planning

By

John Glen-Ward Buchko

A Practicum
Submitted to the Faculty of Graduate Studies
in Partial Fulfillment of the Requirements
for the Degree of

Master of Landscape Architecture

Department of Landscape Architecture
University of Manitoba
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THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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Abstract

Land and resource managers are faced with the difficult dilemma of finding a balance between human needs and environmental integrity. In our society, management goals are directed toward satisfying human needs for resource consumption, while attempting to do so in a sustainable manner. Measuring levels of sustainability often becomes difficult, as many indicators of environmental health and prosperity present themselves at a long-term scale. Human needs, however, are ever-changing and extremely dynamic.

A current proposal for a new national park within the Manitoba Lowlands natural region of Canada has created a concern amongst interest groups in the Long Point area of Manitoba. This study provided an alternative management strategy to the development of a national park by proposing land use recommendations for a component area of this proposed national park, through a 5-year and 25-year strategy plan. This plan accommodated both current and envisioned land uses while doing so in an environmentally responsible manner. The accommodation of these uses had been represented at different spatial scales, with design impositions which may act as a template for land and resource use throughout the region. Comparing this model to that of Parks Canada management principles leads to an understanding of whether or not a national park in this area would adequately accommodate stakeholder and environmental requirements. The field of landscape architecture allows us to explore spatial solutions for responsible land use from both a social and ecological perspective, yet the process of comparing use with eçological integrity is a complex process in which collaboration between many professions would be required.

Acknowledgments

It seems as if the process of competing a practicum study can take endless turns and tangents, and perhaps attempts to measure things which even the gods themselves would be troubled with. This study was indeed a valuable lesson in understanding how much a mouthful really is, and how quickly one can bite off far more than can be chewed. I was fortunate to have been guided by an enthusiastic committee, including the leadership of my Chair, Richard Perron (*University of Manitoba*), as well as Charlie Thomsen (*University of Manitoba*) and Jim Thomas (*Hilderman Thomas Frank Cram, Winnipeg, MB*). Their patience throughout my grand lesson in realizing clear and reasonable objectives was outstanding.

I am blessed with a family which understood the value of my absence from our Arborg fortress throughout my academic career. Their support amplified the value of getting it all done.

A special thanks to Forrest, my all time partner in crime, for seeing the outdoor realm as the living, breathing being of perfection that I see. May no hunting ground be too distant to apprehend, no rapid be too intimidating to conquer.

And to the landscapes for which I hope to be a valiant protector of, I promise to establish a stand of trees to replace those sacrificed to provide a couple thousand slices of compressed pulp used in my draft documents.

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1. List of Figures

2. Introduction

The goal of this project was to propose a potential land and resource management plan for the Long Point area in Central Manitoba. This project examined the reconciliation of some issues which had arisen during consultations concerning the Manitoba Lowlands National Park, under negotiation between a variety of interest groups at the time this study was carried out. The intent of this plan was to provide a strategy which accommodates an identified set of land and resource uses while doing so in an environmentally responsible manner.

The purpose of this management plan was to explore an alternative to the development of a national park within the Long Point study area. This site is located in central Manitoba between Lake Winnipeg and Lake Winnipegosis, within the Manitoba Lowlands natural region of Canada. Over my lifetime I have acquired an understanding of what potential lies within this study area, and am concerned that a strategy determined by Parks Canada would not accommodate desired land and resource uses valued in the Long Point area.

> *"The federal government is committed to implement the concept of sustainable development. This concept holds that human economic development must be compatible with the long-term maintenance of natural ecosystems and life support processes. A strategy to implement sustainable development requires not only the careful management of those lands, waters and resources that are exploited to support our economy, but also the protection and presentation of our most important natural and cultural areas" (Parks Canada, 1997)*

I believe that economic development must continue in the Long Point area in order to sustain the economies of its local people and communities, while ensuring the integrity of the landscape so that future generations can continue to enjoy a healthy environment. The above statement (Parks Canada, 1997) clearly states that careful management of resources that are "exploited to support our economy" is required. The alternative approach carried through in this study demonstrated a method of accommodating land and resource use in an environmentally responsible manner.

The initial goal of this study was to use cooperative management as an alternative approach to a national park model. Cooperative management is a process in which a balance between experiential and analytical knowledge is applied in decision-making (Appendix A - Cooperative Management Strategy). The cooperative management process originally envisioned in this study involved public consultation with the various interest groups, and applying traditional and scientific knowledge toward land and resource management. This process was altered as a result of the sensitivity of issues between the interest groups which were involved in active negotiations regarding the Manitoba Lowlands National Park, and the difficulty experienced in attempting to acquire the necessary information. Consequently, information was acquired from previous studies, as well as those interest groups willing to directly participate in this academic exercise through consultation.

The process of this study had been separated into two parts:

Part One - Reconciliation of Issues Through Land and Resource Management Planning

Several stakeholders had been identified, each with a variety of issues and concerns related to the land and resource management of the Long Point area. The plan resulting from this study provided direction for resource development and land use, while recognizing, accommodating and protecting important environmental values in the area. As this land area was actively a candidate site for a new national park, there had become a significant increase in local interest to provide management direction for it. A wide spectrum of interest groups presented themselves, ranging from crown corporations to individual residents with varying associations with the land. The integration of these interests at a spatial level became a means of reconciling conflicting issues, while making accommodations for a reasonable representation of human use and consumption of the landscape. Identifying potential effects which these uses may have on the natural environment helped to inform environmentally responsible management recommendations.

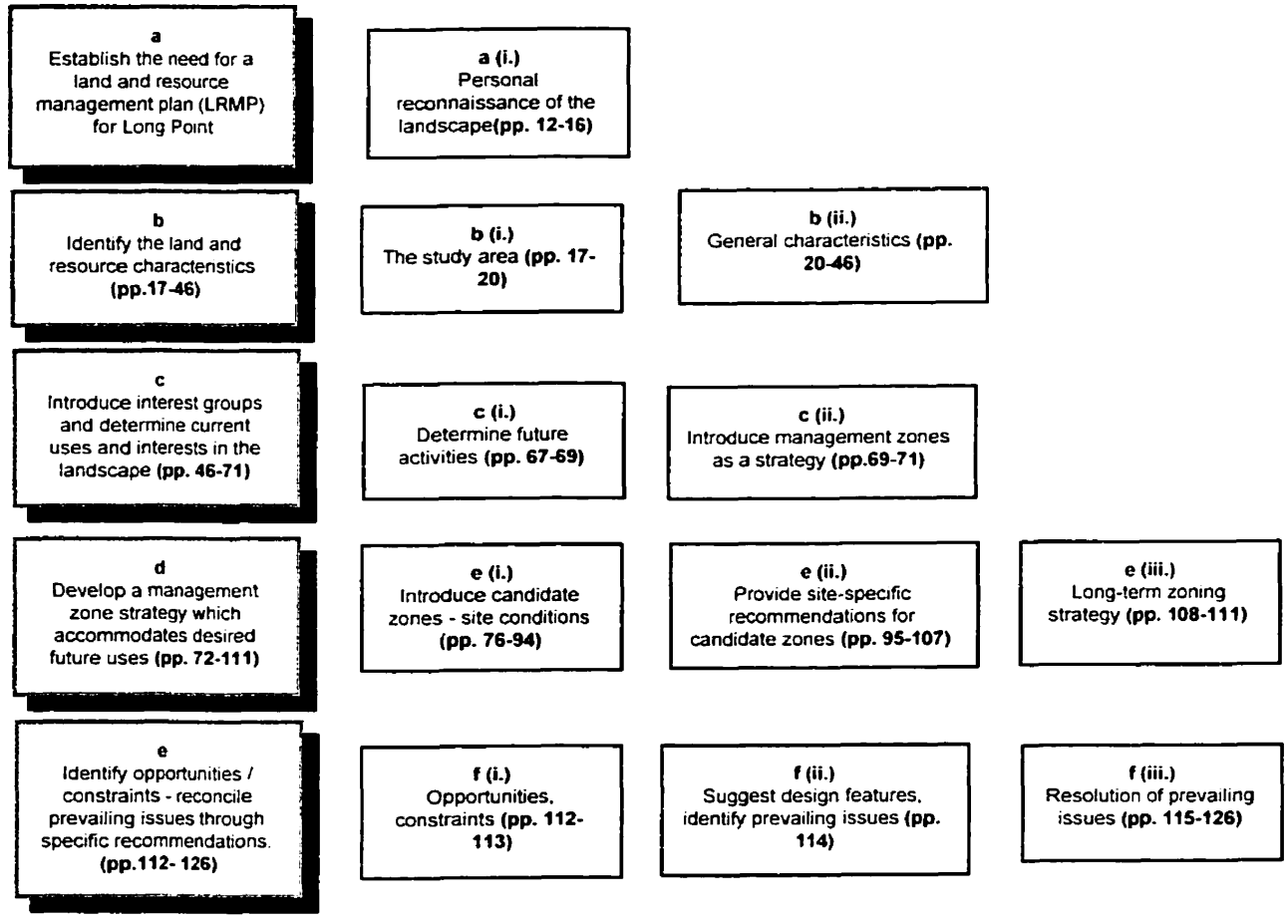
Part Two - Comparison of Management Strategies

As identified in the Parks Canada System Plan (Parks Canada, 1997), Parks Canada has been mandated to represent each of our nation's natural regions through the implementation of national parks. The results of *'Part One'* of this practicum proposed a management zoning strategy which accommodated a

variety of activities within the study area. *'Part Two'* introduced Parks Canada and its management policies, in order to identify the similarities and differences between this management plan and potential management recommendations which may be imposed on this area by Parks Canada in the establishment of the Manitoba Lowlands National Park. An understanding of a national park model was achieved through referring to current policies and legislation practiced by Parks Canada, as well as discussing the features of an existing national park. Comparing desired use patterns resulting from this study with those permitted and valued by Parks Canada helped lead to an understanding of what activities or ecological features would be jeopardized, or even discarded, by either approach.

3. Process

Part One - Reconciliation of issues Through Land And Resource Management Planning



Part Two - Comparison of Management Strategies

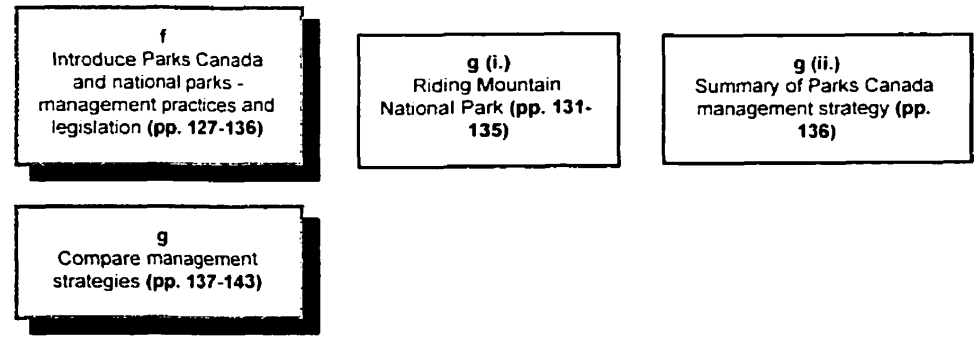


Figure 2 - Process map

a) Establish the need for a land and resource management plan (LRMP) for Long Point

Personal Reconnaissance of The Landscape

Figure 3 - Pond within a coniferous forest stand

Figure 4 - Shoreline of Lake Winnipeg

Figure 5 - Bog ecosystem

As a way of rationalizing my selection of this region as a candidate site for this study, I felt that my personal bias for this landscape could be explained through a series of images; these suggest some of the potential activities and awesome scenes which I feel bring this region of Manitoba to life. Through my academic years, as a resident of south-central Manitoba, I had the luxury of spending several months abroad, visiting many countries with an extremely diverse palette of landscape types. I can characterize these as ranging from pristine, undeveloped regions, to those overcrowded with settlement and suffering from severe ecological problems. I am a true believer that, of all these environments I

Figure 6 - Sunset along PTH #6

Figure 7 - Our personal moose hunting grounds

Figure 8 - PTH #60 ROW

Figure 9 - Forest floor of a coniferous stand

have traveled and experienced, there are none as filled with opportunity and picturesque qualities as central and northern Manitoba.

Among the many eco-regions found across Canada, the Manitoba Lowlands tends not to be considered as breathtaking as others; many people are convinced that dramatic features such as mountains and hot springs are needed to make an environment a great place to recreate. For numerous years I have had the opportunity to explore central and northern Manitoba through both work and pleasure, and I am convinced that within this region is indeed an environment much more attractive than any other accessible to us. Throughout this study I have had the opportunity to take several people to this study area, and was often faced

Figure 10 - Evening in the Manitoba Lowlands

Figure 11 - Boating back to the cabin

Figure 12 - Evening fishing from the dock

Figure 13 - Winter commercial fishing camp on Lake Winnipeg

with the challenge of convincing them that there is in fact a high aesthetic quality to this region. Our memorable experiences through recreational activities contributed to an understanding of the beauty and excitement to be found within this region.

A visitor to our north would be missing out on a great part of its potential should fishing be left out of the itinerary. Hundreds of freshwater lakes scattered throughout Manitoba are stocked with a large variety of fish species, and are accessible by water, air and roads. Numerous fishing lodges can be found on many of these pristine lakes, providing excellent accommodations and the opportunity for "serviced seclusion." Fishing is a year-round activity in Manitoba. The marginally

Figure 14 - Commercial fishing on Lake Winnipeg

Figure 15 - Overloaded boat heading back home

Figure 16 - Success after a few hours on the lake

Figure 17 - A remote Manitoba fly-in fishing lodge

frigid climate of our north finds ice fishing enthusiasts scattered about the frozen lakes, as both recreational and commercial fishermen. An exciting part of recreational fishing is to watch commercial nets being removed from the water, in satisfaction that the biggest fish have yet again favoured the patient recreational sportsman.

A variety of streams and rivers throughout our north present a wide range of water courses for canoe enthusiasts. I have only recently been introduced to this sport, and have found it both exhilarating and very peaceful; it has proved to be an extremely versatile method of gaining access to the more secluded lakes and streams of the north. Fluctuating water levels, subtle stream deception and jagged rock protrusions create extremely

Figure 18 - First nation housing along Lake Winnipeg

Figure 19 - Early morning at a fly-in fishing lodge

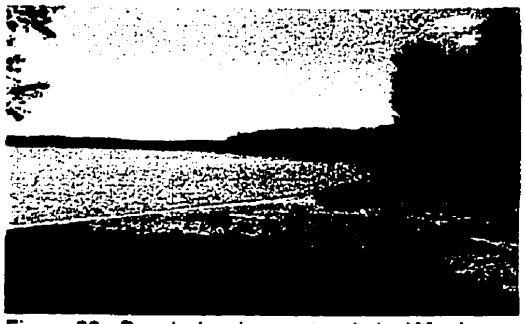


Figure 20 - Beach development on Lake Winnipeg

Figure 21 - Wildlife at the shore of Cedar Lake

challenging water courses for thrill seekers.

The wide variety of wildlife found throughout this region has attracted not only hunters, but also those who appreciate wildlife viewing. A network of informal trails scattered throughout our province created by loggers, trappers and hydro corridor development allow great accessibility to a large variety of ecosystem types. A significant feature within the Long Point study area is the presence of rare and endangered bird species which colonize within and amongst the islands of Kawina Lake.

b) Identify the land and resource characteristics

The Study Area

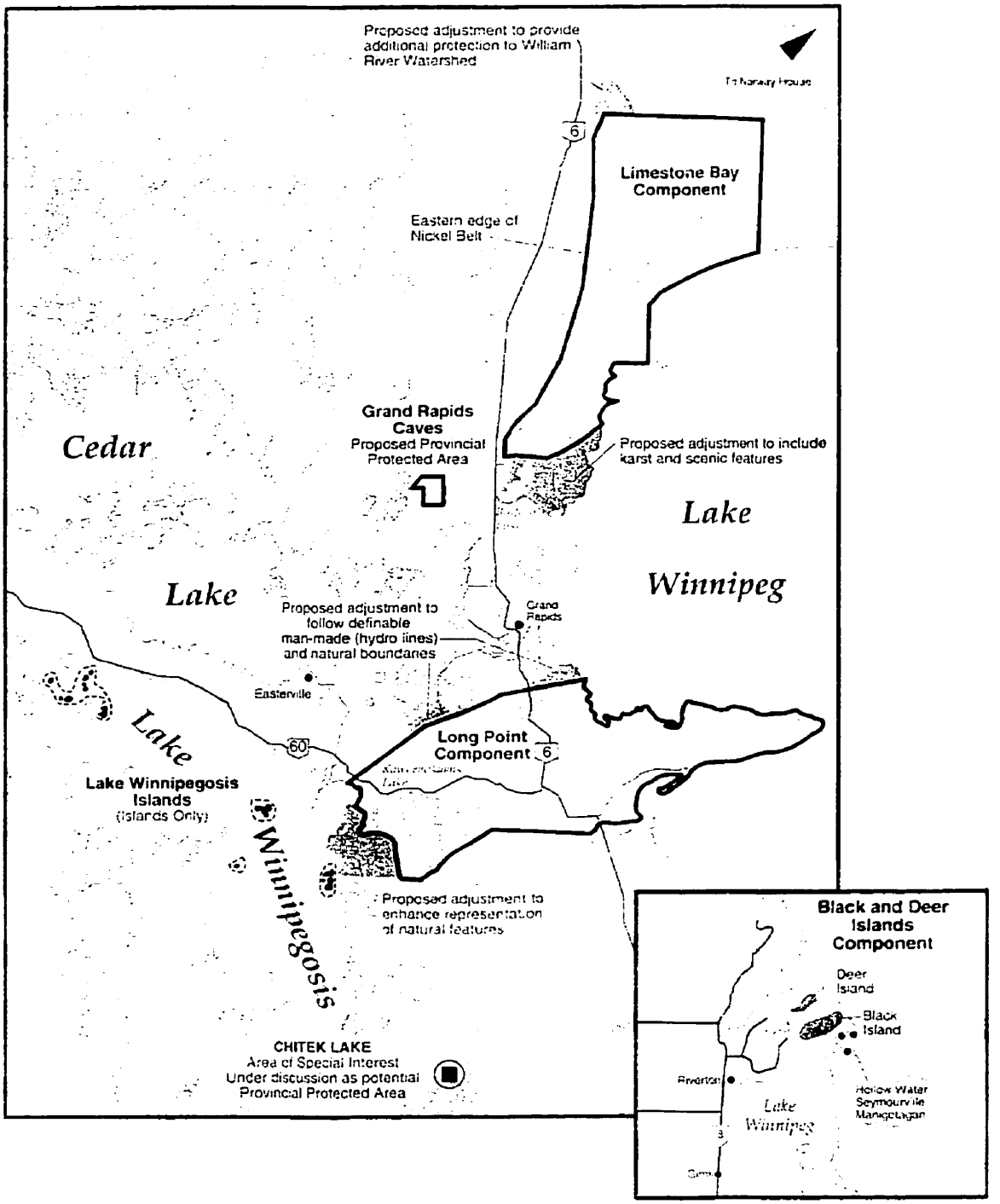


Figure 22 - Parks Canada's proposed Manitoba Lowlands National Park (Source: Manitoba Department of Conservation)

The proposed Manitoba Lowlands National Park includes three areas, including Black and Deer Islands, the Long Point area and an area of land adjacent to Limestone Bay. (Figure 22) (CHPC, 1998) These planning areas have been defined by Parks Canada to adequately represent the Manitoba Lowlands environmental zone. The designated Long Point land area is approximately 4,025 square kilometers, ultimately a land bridge located between two of the world's larger freshwater lakes, Lake Winnipeg and Lake Winnipegosis.

The focus of this project is within the Manitoba Lowlands Interlake region, specifically the Long Point area. For the purpose of this study, the Long Point area had been selected over other study areas for its natural qualities, ability to contain a true representative area within Manitoba, and complex matrix of issues held by a number of interest groups. Other potential sites included the land area adjacent to Limestone Bay - the north west basin of Lake Winnipeg - as well as the land area adjacent to the east shore of Lake Winnipeg, containing a series of heritage river and stream systems. These were are all candidate sites for the Manitoba Lowlands National Park under consideration by Parks Canada, after being identified by a feasibility study submitted to Manitoba Department of Natural Resources by TAEM Consultants. (TAEM, 1996)

The Long Point site had been previously identified by Parks Canada for its ability to represent the Manitoba Lowlands ecological typology. Developed in the early

1970's, the National Park System Plan identifies land areas which protect a representative sample of each of the natural regions of Canada. Criteria used in national park land area selection (Parks Canada, 1997) includes:

- quality of natural region representation
- potential for supporting viable populations of native wildlife species
- ecological integrity of the area's ecosystems
- exceptional natural phenomena, and rare, threatened or endangered wildlife
- significant cultural heritage features or landscapes
- opportunities for public understanding, education and enjoyment
- competing land and resource uses
- possible threats to the long-term sustainability of the area's ecosystems
- complementarity with objectives of other existing or planned protected areas
- potential for establishing an adjacent national marine conservation area

The National Park System Plan also describes how potential boundaries are established. These borders are drawn (Parks Canada, 1997) to:

- protect ecosystems and landscape features representative of the natural region
- accommodate the habitat requirements of viable populations of native species
- include an undisturbed area which is relatively unaffected by surrounding areas
- maintain the integrity of natural communities and drainage basins
- protect exceptional natural phenomena, and vulnerable, threatened or endangered wildlife and vegetation
- offer opportunities for public understanding and enjoyment
- minimize possible disruption of the social and economic life of the surrounding region
- include significant cultural heritage features or landscapes
- exclude permanent communities

A quite precise border had already been established for the Long Point area, yet an area somewhat larger and less defined had been selected for the purpose of this study. Because of its northerly location from the large population base of Manitoba, most all the land was undeveloped and under crown ownership; the land beyond the Long Point study area to the south was also undeveloped, and provided an opportunity to expand the management area. Land claimed by First

Nation communities exists adjacent to the site. In areas of private ownership, regulatory enforcement of resource consumption and regeneration becomes difficult to enforce and monitor, yet was not prevalent in the Long Point study area.

The National Parks System Plan (Parks Canada, 1997) describes a mandate to represent each of the 52 natural region types found throughout Canada. This is a regulated means of ensuring a long term opportunity to experience our natural environment in its natural state. However, within the Long Point study area are land and resource uses which are not compatible with some objectives set out by Parks Canada. Although current National Parks accommodate human use and infrastructure, such as recreational facilities, town sites and campgrounds, resource consumption and the development of new infrastructure is limited or nonexistent. An LRMP becomes a potential alternative, as this process has the prospect of ensuring long-term environmental protection while accommodating a variety of human activities within the landscape.

General Characteristics

The Long Point study region lies within the Boreal Plains terrestrial ecozone, which supports a mix of upland and lowland topography and is an excellent representation of this ecosystem type. (Figure 23) (NRC, 1995) The land is predominantly forested area, with no community development or significant

settlement within its confines; community development occurs to the north of this study area. Forested areas are mixed with a variety of species, yet predominantly jack pine; white spruce along with birch and aspen on better drained sites, black spruce with tamarack on poorly drained sites. Wetland and grassland features are also found throughout the region.

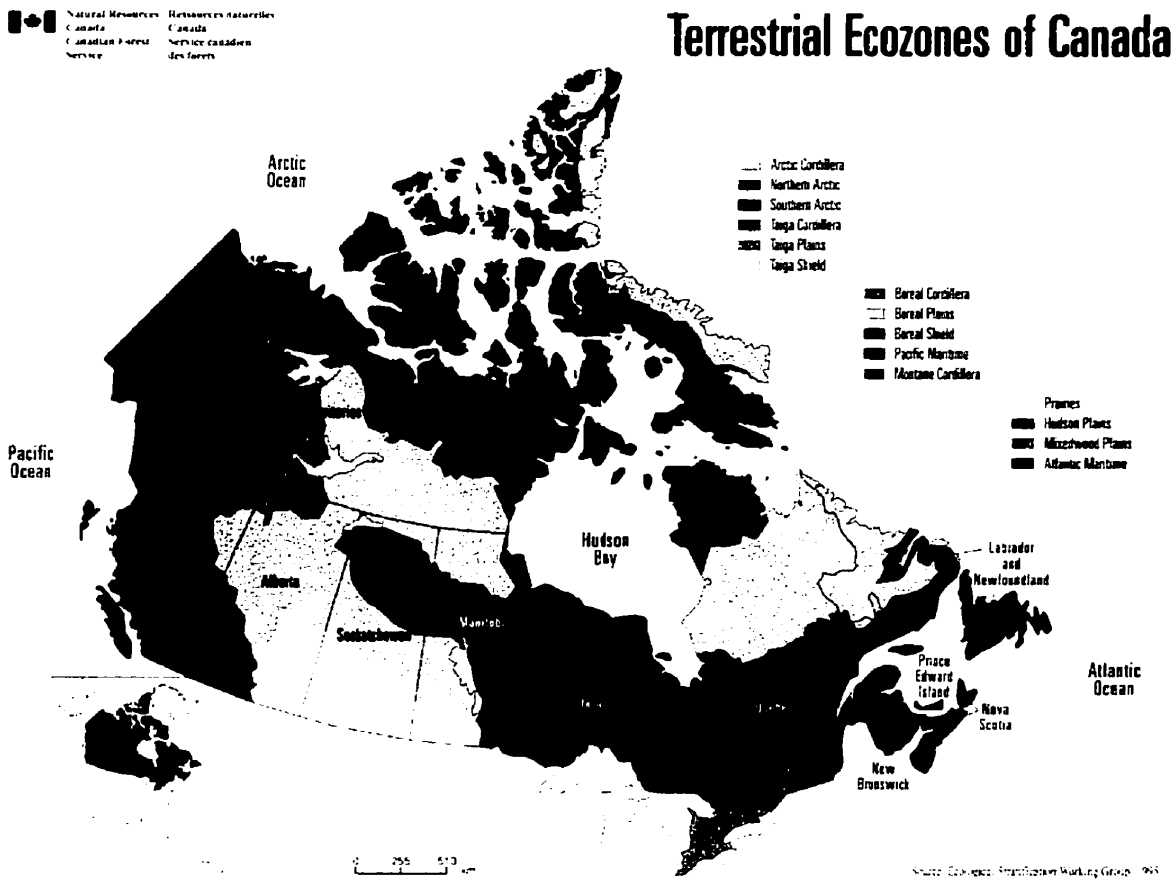


Figure 23 - Terrestrial ecozones of Canada (Source: Natural Resources Canada)

Understanding the evolution of a landscape helps to interpret why certain landscape patterns occur the way we see them today. Climatic change,

Figure 24 - Water retained by a beaver dam structure

glaciation, erosion, deposition, species extinction and introduction - these are all relevant factors in understanding a landscape. The physiography of the Manitoba Lowlands Natural Region, as described by Parks Canada, has been strongly influenced by the recent advance and retreat of the Laurentide ice sheet and glacial Lake Agassiz which covered all the Manitoba Lowlands Natural Region at one time. Consequently, lakes and wetlands are a dominant feature within this landscape; this region is more than one-half covered by water, including lakes, potholes, ponds and marshes. The selected land area contains these aquatic features which present species flow and interaction with terrestrial ecosystems.

Disturbances which effect the sustainability of ecosystems can include insects, diseases and fire, especially considering forest vitality. These, however, are an integral part of the natural cycle of death and renewal. Fires are a significant and acceptable type of ecological disturbance. The Province of Manitoba has mandated fire protection as a means of protecting human life and property. Forest stand dynamics within the Manitoba Lowlands Region has traditionally

relied on fire as a means of regeneration, yet the Long Point study area has experienced few fires in the past 100 years due to few naturally occurring incidents of fire, increased public awareness and efficient suppression techniques. Through examining stand status maps for the area, a large percentage of stands are of younger age classes. Old growth forests exist in areas traditionally protected by Manitoba Department of Natural Resources due to the ecological sensitivity in the area; new growth forest areas are predominantly a result of past forest harvesting.

Within the study region, cooler climatic conditions result in slow rates of decay on the ground - leaves, needles, mosses and other organic litter build up and create favourable conditions for fires. As fires pass through areas with such litter development, mineral-rich ash is created and nutrients are released. As forest patches burn, sunlight exposures on the ground warms soils and stimulates growth from seeds and roots which, under normal conditions, do not get adequate sunlight for growth. Fires occurring in patches create a vegetation mosaic of different ages and types, allowing for a variety of habitat for a diverse community of insects, mammals, birds, etc. This is biodiversity - a thriving ecosystem that is likely to persist in the future. Fire not only renews and recycles, but rearranges vegetation in a continual cycle of change. (Parks Canada, 1998)

Many plants and animals have adapted to disease and fire. For example, woodpeckers thrive in newly burned areas, as a result of increased beetle and insect populations. Aspen and raspberry roots which remain undisturbed beneath the surface sprout after fire passes. Within a short period of time this growth becomes excellent food for moose and elk. The resin-sealed cones produced by jack pine can remain on the trees until heat pops them open; seeds scatter on the ground and produce dense stands of new growth.

As mentioned above, many years of fire suppression has resulted in a thick development of forest litter. As fire develops, it becomes much more intensive with increased fuel available. Removing trees through timber harvesting offers few of the ecological benefits of fire. This process takes potential nutrients out of the system, while fire and disease would recycle them. Fires seldom take the lives of large animals, while some smaller animals and birds do not survive its passing. The above stated ecological conditions which result from natural disturbance promote diverse habitats.

Ecosystem Matrix

Figure 25 displays coverage of various size, depicting land use / land cover features, which were compiled based on Landsat Thematic Mapper imagery. The pixel resolution of this data is 30 meters. Upon classification, sixteen land classes can be mapped, including agricultural crop land, forage crops, grassland, open deciduous, deciduous, coniferous, mixedwood forests, treed rock, bogs, marshes and fens, bare rock, burnt areas, forest cutovers, open water, cultural features, roads and trails. This information is useful in displaying land use / land cover features, and can be used by earth resources management agencies and for environmental monitoring. The following is a description of each potential cover type as indicated on Figure 26 (RSC, 2000):

1. Agricultural Cropland; All lands dedicated to the production of annual cereal, oil seed and other speciality crops. This class can be further sub-divided into three crops 0% - 33%, 34% - 66%, and 67% - 100%.

2. Deciduous Forest;75% - 100% of the forest canopy is deciduous. Dominant species include trembling aspen (Populus tremuloides), balsam poplar (Populus balsamifera), and white birch (Betula papyrifera). May include small patches of grassland, marsh or fens less than two hectares in size.

3. Water Bodies; All open water - lakes, rivers, streams, ponds and lagoons.

4. Grassland/Rangeland; Mixed native and/or tame prairie grasses and herbs. May also include scattered stands of willow (Salix L.), choke cherry (Prunus virginiana), pin cherry (Prunus pensylvanica) and saskatoon (Amelanchier alnifolia). Many of these areas are used for cutting of hay and grazing. Both upland and lowland meadows fall into this class. There is normally less than 10% shrub or tree cover.

5. Mixedwood Forest; 25% - 75% of the canopy is coniferous. May include patches of treed bog, marsh or fens less than two hectares in size.

6. Marsh and Fens; Wet areas with standing or slow moving water. Vegetation consists of grasses and/or sedge. Marshes will include common hydrophytic vegetation such as cattail and rushes. Fens will be formed on minerotrophic sites. Areas are frequently interspersed with channels or pools of open water.

7. Treed and Open Bogs; Peat covered or peat filled depressions with a high water table. The bogs are covered with a carpet of Spagnum spp. and ericaceous shrubs and may be treeless or treed with black spruce (Picea mariana) and/or tamarack (Larix laricina).

8. Treed Rock; Exposed bedrock with less than 50% tree cover.

9. Coniferous Forest; 75% - 100% of the canopy are coniferous. Pine (Pinus spp.) and spruce (Picea spp.) are dominant species. May include patches of treed bog, marsh or fens less than two hectares in size.

10. Burnt Areas; Burned forested areas with sporadic regeneration and can include patches of unburnt trees.

11. Open Deciduous; Lands characterized by rough topography, shallow soil, or poor drainage. Supports a growth of shrubs such as willow (Salix spp.), alder (Alnus spp.) saskatoon (Amalanchier spp.) and/or stunted deciduous (Populus spp.) tree cover. An area could have up to 50% scattered tree or shrub cover.

12. Forage Crops; Consists of perennial forage such as alflafa, and clover or blends of these with tame species of grass. Fall seeded crops such as winter wheat or fall rye are included here.

13. Cultural Features; Built-up areas such as cities and towns, peat farms, golf courses, cemeteries, shopping centres, large recreation sites, auto wreck yards, airports, cottage areas, race tracks.

14. Forest Cutover; Areas where commercial logging operations have clearcut or partially removed a standing forest. Includes areas which have been recently replanted.

15. Bare Rock, Gravel and Sand; Exposed areas of bedrock, sand dunes, and beaches, gravel quarry/pit operations, mine tailings, borrow pits, and rock quarries.

16. Roads and Trails; All highways, secondary roads, trails, cut survey lines, right-of-ways, railway lines and transmission lines.

Patches can occur at a variety of scales, dependent upon the type of system studied (ie. micro-organisms vs. animals). Corridors, typically lineal in nature, are areas which facilitate flow between patches; these are essential to maintain in promoting a sustainable ecological state as patches are typically interdependent. Matrix characteristics such as connectivity, fragmentation and patchiness help identify the relationship between ecoregions. Ultimately, the study of flows within the region helped to understand the relationship of component parts and their

greater whole. Some major landscape flows in this region include human travel routes and access roads, surficial water movement, wildlife migration routes, etc.

Figure 26 - Sand ridge deposit on Long Point

Soil Structure

Factors which affect soil formation include climate, wildlife, vegetation, parent material, relief and drainage. Their formation can be a result of many, if not all, of these factors, as well as time and effects of human use. The Manitoba Lowlands Region contains 11 different types of parent material, which results in a range of ground conditions, ie. drainage, vegetation, texture, etc. These soils have developed since the last glacial retreat, occurring about 8500 years ago.

The composition of surficial soils and water fluctuate. These changes can be a result of natural disturbance, including fire, heavy rainfall or spring melt, insects and diseases. Human disturbance also plays a part in this fluctuation, for example the implementation of hydro dams in the Long Point area and the regulation of water levels. Further, forest harvesting may cause changes in soil condition due to compaction, increased runoff, erosion, nutrient depletion and

higher water temperatures from siltation. Permanent soil disturbance is found along road right-of-way areas and in developed areas. Compaction due to poor harvesting techniques can permanently damage roots of self-generating species dependent on flexible soil conditions.

Topography


Figure 27 - View looking south of PTH #60

The Long Point area is part of the Nelson River principal drainage area of Canada. One of the most prominent landscape features is The Pas Moraine, which is an end moraine forming a south-facing escarpment reaching an elevation of 305 m above sea level. It can be found to the north of Kawina and Katamik Lake, and runs in an east - west orientation. Internal drainage patterns and depressions at a more site-specific scale result in impeded drainage; local drainage depends highly upon evapotranspiration, containing several swales and marsh areas. Topographical conditions of the Long Point study area can be seen in Figure 28. Potential issues may arise should development and other human disturbance occur on steeper slopes, particularly along the southern shore of Long Point, as well as land immediately south of PTH #60. As a result of the glacial formation of this landscape, gravel and sand ridges are dispersed throughout the region,

resulting in poor slope stability. Further, as surficial water drains into one of many water systems, detrimental runoff becomes apparent in areas with more significant changes in relief.

Riparian Ecosystems

An ecosystem is a community of plants and animals and the environment in which they live; a riparian ecosystem describes such a community which exists adjacent to or near water. The area of transition between terrestrial and aquatic environments contains plants and wildlife which is dependent upon conditions much more moist than those of inland conditions. Lake, stream and river ecosystems are associated with riparian zones, but are not limited to them; wetlands occur on mainland areas, and are due to poorly drained soils and hydrophilic vegetation - both of which are abundant throughout the Long Point study area. Marshes, land areas covered by herbaceous vegetation and high soil microbial activity are also common throughout the Long Point area. Bogs, fens, and swamps are found in various locations, and identified on remote sensing information provided in this study.

Figure 29 - Bridge crossing along PTH #6

Riparian ecosystems are essential in, for example, sustaining the nutrient exchange cycles of soil and water. Further, these ecosystems provide basic filtration for

sediment-rich water caused by the erosion of shorelines - sediments are filtered out as water moves through vegetation. These ecosystems also reduce flooding by absorbing water along its route. The major role of these areas in Long Point is to act as a flood plain and dissipate stream energies associated with high flows before they reach high value fisheries or wildlife resources. (Training Unlimited, 1997).

The removal of vegetation is of the most common interference within riparian ecosystems due to human development, and has evident effects. Excess nutrients from eroded soils flow along edges, and algae blooms can potentially develop; sunlight levels are altered and photosynthetic processes are changed. As dying plants decompose, dissolved oxygen levels drop abruptly, causing high levels of hydrogen sulfide and methane thus affecting fish habitat. The decrease of species population disrupts the food chain, making the environment more vulnerable to further destruction. This is a simplistic representation of the indirect effect which a disturbance can have on an ecosystem, yet at a highly visible scale.

> *Scientific surveys of the lake undertaken by the Freshwater Institute are showing Lake Winnipeg drainage system is suffering from increased eutrophication . . . elevated levels of phosphate are creating massive blue-green algae blooms, particularly in the north basin of Lake Winnipeg . . . this algae can be toxic to fish and animals, and when the algae sinks it uses up oxygen for decomposition, which also destroys fish stocks (Rance, 2000)*

Managing for certain functions of human intervention within a riparian ecosystem requires an understanding of the adverse and beneficial effects of development.

Notable Features

Along the north shore of Long Point is a stratified formation of limestone, dating back approximately 450 million years ago. Found within these layers are many invertebrate fossils, such as cephalopods, snails, sea lilies and corals. Within formations in the Lake Winnipegosis area, dating back about 175 million years ago, are many well preserved specimens of both invertebrate and fish species. Other significant occurrences in the Long Point region (TAEM, 1996) include:

- wildlife ranges for moose, deer, elk, woodland caribou
- active piping plover nesting area
- northern range limit for turtles
- woodland caribou wintering habitats
- heavy waterfowl use and staging areas
- wide variety of shorebird and colonial bird nesting areas in Kawina and Katamik Lakes
- bald eagle nesting sites
- significant lynx production area
- unique vegetation features (gradation upon slopes)
- interesting vegetation transition area (Pas Moraine)
- karst topography associated with sink holes
- fossil beds

Climate

As a result of its central location within Canada, this area has very little climatic influence from any of our surrounding oceans. Its location within the mid-northern latitudes results in a continental climate with shorter, cool summers, and long cold winters. The climate is influenced by three factors, including cold, dry air from the polar regions, cool and moist air from the west, and occasionally warm and moist air from the Gulf of Mexico. The nearest meteorological station to the Long Point study area is in Grand Rapids.

From a macro- to micro-climate scale, climate influences the range of specific species and the rate at which growth continues. Climate change is an importance factor in the sustainability of ecosystems. A warming climate has the effect of allowing larger and more intense fires, and increased species mortality due to drought. Over the past century the climate in the Long Point area has increased by approximately 1.4°C. (CCFM, 1997) Various climatic information relevant to this study area has been compiled in Appendix B.

Vegetation

The Long Point study region lies within Manitoba Forest Management Units 46 and 47, as seen on Figure 30. This area has a diverse selection of vegetation, with over 250 species located within its confines (Museum, 1995). According to standards set out by COSEWIC, there are no vulnerable, threatened or endangered species within the Long Point area. There are, however, several plant species considered rare (TAEM, 1996), and are listed in Appendix C - Significant Species Assessment.

In Canada, 60% of the forest lands harvested regenerate naturally, and the remainder are either planted or seeded. (CCFM, 1997) Much genetically distinct and locally adapted clones are found as a result of their ability to sprout from roots after major disturbance (ie. fire, harvesting). To study genetic conservation strategies, resource managers can allocate parks, protected areas, genetic

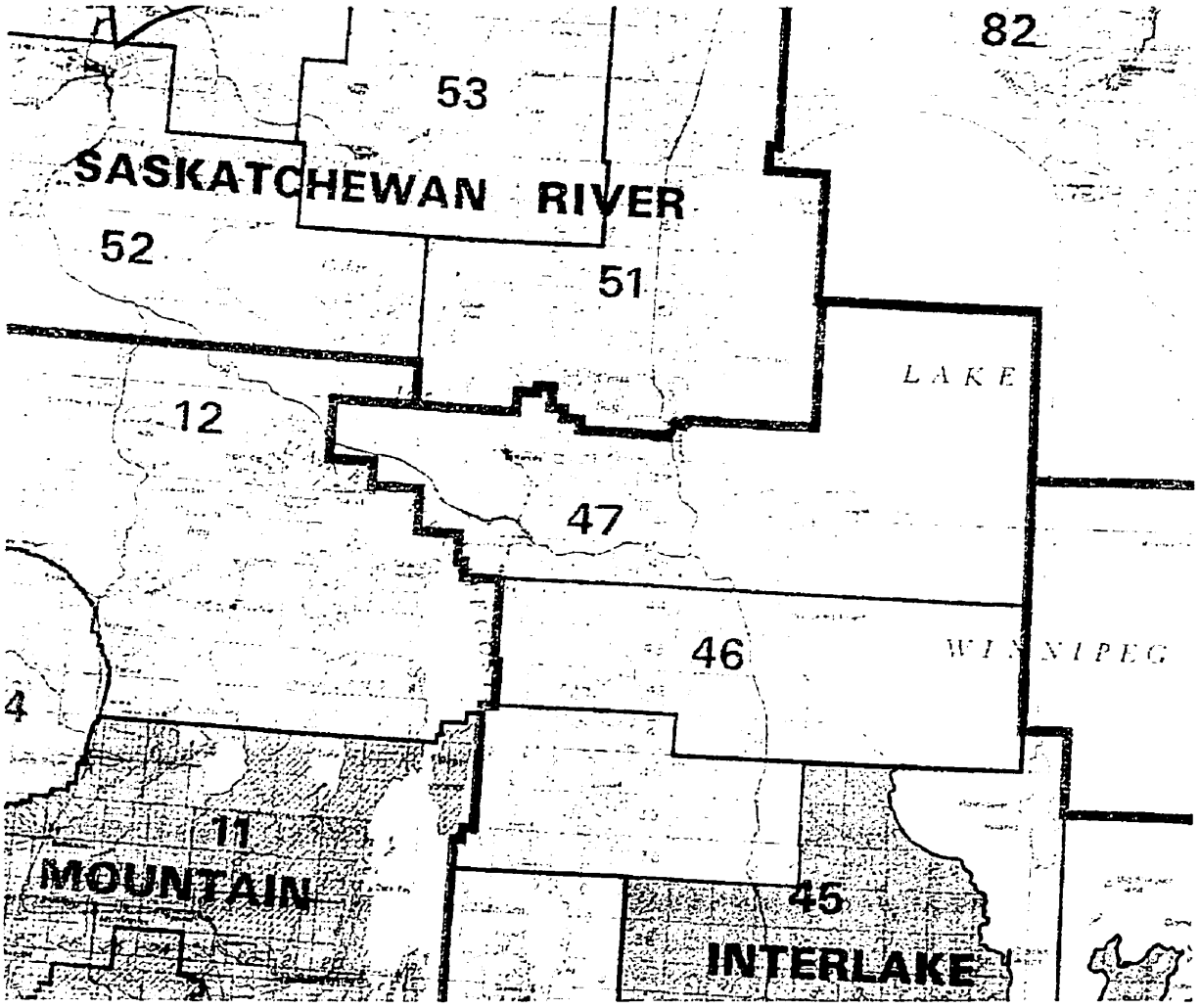


Figure 30 - Manitoba forest management unit areas (Source: Province of Manitoba Department of Conservation)

conservation areas, reserve stands, seed orchards, tree seed banks or perform provenance tests. Much of the central and northern region of Manitoba is covered by forested areas. The Long Point study area is approximately 60% covered in forest, and has a wider variety of cutting classes within its stands. Cutting class is based on size, vigor, state of development and maturity of a stand for harvesting purposes, and are represented numerically from 0 to 5 (Natural Resources 1998):

Class 0	*Forested land not restocked after fire, cutting, major disturbance, etc. Sparse trees may be located within the site*
Class 1	*Stands which have been restocked either naturally of artificially. Average height of stand must be less than 3 m*
Class 2	*Advanced young growth of fence post size, with some merchantable volume; average height of over 3 m*
Class 3	*Immature stands with merchantable volume growing at or near their maximum rate, which definitely should not be cut. Average height of over 10 m and an average diameter over 9.0 cm dbh (1.3 m)*
Class 4	*Mature stands which may be cut as they have reached rotation age, approx. 20 years.*
Class 5	*Overmature stands, which should be given priority in cutting.*

Approximating areas from a 1:100 000 forest inventory map, the following proportions of forested areas are present in the study area: Class 0 - 3%; Class 1 - 7%; Class 2 - 15%; Class 3 - 40%; Class 4 - 25%; Class 5 - 10%. For the purpose of this study, two maps have been compiled which identify suitable forest stands available for cutting in 5 years, and 25 years. These areas have been designated by approximating the rate of growth and time of maturity for each of the five tree species identified, as seen on Figure 31 and Figure 32.

The discussion of old growth forest presents an interesting dilemma. On one side, people tend to believe that a stand of old trees can carry a more diverse ecological community and will in time regenerate itself - have forests not existed for centuries before settlement and harvesting? It is also important to recognize the potential of young, second growth forests. Many valuable species such as ruffled grouse, moose, deer, and songbirds thrive in these types of environments. Examining forests implemented through active management proves that second growth forests can be even more diverse, more attractive, and that active management can indeed be ecologically responsible; they still deliver ecological services but they're just not the type of forest that wilderness advocates value. (Sopuck, 2000)


Figure 33 - Bald eagle

Wildlife

Endangered species are those facing imminent extinction or extirpation. Threatened species could become endangered if limiting factors are not reversed, while vulnerable species are those that are highly sensitive to human activity or natural disturbance. (CCFM, 1997) Significant species which have been declared rare, endangered or threatened are listed in Appendix C. Although introduced many years ago, a free roaming range of bison exists within the study area, yet are currently listed as threatened species and should be recognized in any management plan. Pelican and cormorant colonies have been declining in number within Manitoba, apparently because of human disturbance; protection is urged for at least the major breeding colonies at Kawina Lake. (Vermeer, 1969) Other rare, endangered and threatened species exist in the area and would also benefit from an enforced management plan.

Two ecological reserves have been identified and designated by Manitoba Department of Natural Resources. The first, Kaweenakumik (Kawina) Islands Ecological Reserve, is located amongst the Kawina Lake islands in Townships 44 and 45, Ranges 14 and 15W. (Figure 34) This 20 ha area provides nesting

grounds for colonial nesting birds, and the land area is generally flat with little relief except for low, localized ridges. Major plant species include Reed Bentgrass, Burning Nettle, Squirrel Tail Grass, Red Osier Dogwood, Balsam Poplar, White Spruce, Paper Birch and Gooseberry. Major fauna include White-Winged Scoter, American White Pelican, Common Tern, Double-crested Cormorant, Great Blue Herron, Ring-billed Gull, Herring and American Avocet.

A second ecological reserve in this study area is the Long Point Ecological Reserve, located within Township 46, Ranges 9 and 10 W. This 1600 ha area contains beach ridges and bogs, within which is a stand of mature white cedar at the northwest fringe of its natural range. A mesic peat layer, up to one meter deep, lies over clay, sand and gravel in longitudinal strips. This is a noticeably elevated area above Lake Winnipeg that is generally flat. Black spruce and treed muskeg dominate the landscape. The current management strategy is classified as "non-management", and permitted uses are passive and non-consumptive. Current use of this management area includes a long term study of regeneration of eastern white cedar and jack pine following a 1988 fire, as conducted by the Petawawa National Forestry Institute of Chalk River, Ontario. Established in April of 1987, the Ecological Reserves Act, Manitoba Natural Resources, protects this ecological reserve by legislation.

One significant change in recent years is the introduction of white-tailed deer which have effectively invaded Long Point; in the late 1970's these populations were nearly absent, yet now have become considered overpopulated. (Sopuck, 2000) Such populations, however, are not necessarily detrimental to the environment, and the term "overpopulated" merely describes our assumption that the carrying capacity of the land cannot sustain current populations. Data on deer populations may not necessarily represent a true cycle of sustainable numbers over a significant period of time. Therefore, we must reconsider what overpopulation really means, and consider the effect which these populations have on the entire ecosystem.

Fish and Fish Habitat

The waters adjacent to the Long Point study area provide diverse conditions to allow excellent fish habitat. Species found in this area include carp, lake cisco, lake whitefish, longnose and white suckers, northern pike, yellow perch and walleye. As seen in Figure 35, the various conditions present in this area promoting spawning include (TAEM, 1996):

- several islands, points, and limestone shorelines adequate for spawning grounds for walleye and whitefish
- shallow water areas appropriate for pike, sucker, perch and carp spawning
- local bays protected from wave action providing refuge for various species
- Gull Bay, of the most significant walleye spawning grounds on Lake Winnipeg

Cultural Sites

No archaeological or historic sites have been identified by Manitoba Department of Natural Resources within the Long Point area. It is apparent that, should this area become withdrawn as a protected area, further investigation of The Pas Moraine may potentially discover archaeological sites. Manitoba Department of Culture and Heritage has recognized one historic site, the 1881 northern boundary of the Province of Manitoba. This is currently recognized by a commemorative plaque and interpretive panel. Outside the study area near the Town of Grand Rapids is potentially three historic and ten archaeological sites (TAEM, 1996).

Figure 36 - Navigation light structure along Lake Winnipeg

Access Routes and Infrastructure

PTH #6 provides the main access through the centre of the site in a north to south orientation. This is an all-weather road leading from the City of Winnipeg and is a part of the northern-most reaching route in Manitoba. Stemming from this highway within the study area is a gravel road leading past an MTS communications tower to the sand spit east of Gull Bay. This road provides access to Lake Winnipeg for the Grand Rapids Fishermen's Cooperative, as well as other users of the docking facilities located there. Within the study area is the intersection between PTH #6 and #60; PTH #60 leads westward and accesses the northern shore of

Lake Winnipegosis, as well as PR #327 which leads north to Chemawawin First Nation and the Community of Easterville. Providing winter access for timber harvesting, a seasonal road leads from PTH #60, south between Katamik and Kawina Lakes; a less established road leads from the Town of Grand Rapids along the hydro generation station to provide access to its facilities, yet is outside the management area.


Figure 37 - Gravel roadway leading off PTH #60

Access by air is limited, as the only airstrip near the site in Grand Rapids is not certified for passenger service transportation; there is very little demand for this service as Grand Rapids is central to both Winnipeg and the northern communities. This runway, owned and operated by Manitoba Hydro, is certified for emergency use only. Manitoba Department of Natural Resources built a medium-duty helicopter pad in Grand Rapids for fire protection purposes. Suitable water conditions allow float plane access upon various sites, and numerous community-based docking facilities provide boating access to most community centres. A 45 foot high navigation light structure can be found at Kiche Point, the eastern most tip of Long Point. This structure provides safety lighting for night time boaters on Lake Winnipeg, and is maintained by Transport Canada.

c) Introduce interest groups and determine current uses and interests in the landscape

Figure 38 - Having difficulty steering through the rapids

Introduction

As talks of a potential national park in the area have occurred since the mid-1990's, many individuals as well as government departments had considerable time to establish a point of view. According to standard policy published by Parks Canada, interest groups are consulted in order to gain interest and consent for such a development. Throughout the information gathering process, it was found from officials at both the local and provincial level that levels of consultation to date had been limited, to non-existent. It was strongly evident that the planning of this park was well underway, while some outside interests had not even been discussed - for example the request for future land allocations for infrastructure development. (Munroe, 1999)

Limitations and Constraints

As stated in the introduction, not all interest groups were willing to participate in this study. Specifically, local community councils were not willing to respond to questions related to land and resource management issues and the Manitoba Lowlands National Park negotiations. Government interest groups had been cooperative in providing information relating to the Long Point area. A portion of

the information used to develop this management plan had been derived from other sources, including a feasibility submitted to Manitoba Department of Natural Resources by TAEM. (TAEM, 1996) This information helped fill missing links and gaps of information withheld by community members and councils. It is felt that sufficient information had been collected to provide a realistic representation of existing social values and concerns.

Government Organizations

A number of government organizations had provided excellent information which supported this study. As a result of political control over these departments, their ideologies and issues tend to be based on a scientific model.

Province of Manitoba, Department of Highways and Transportation

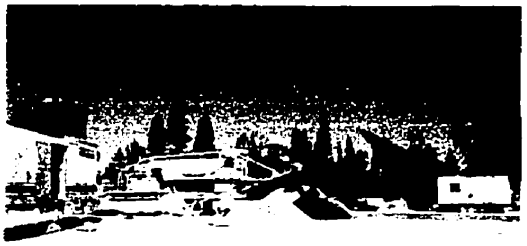


Figure 39 - Aggregate crushing spread near Long Point

Major right-of-way access roads, including PTH #6 and #60, are currently maintained by Manitoba Department of Highways and Transportation. Other roads are of municipal jurisdiction, yet limited in number and insignificant to residential access. Negotiations between the Province of Manitoba and Parks Canada had indicated a mutual desire to qualify PTH #6 as a permanent responsibility of Manitoba Department of Highways. This scenario is favorable to the Province of Manitoba, as federal jurisdiction over such a significant transport route may lead to changes to speed limits, load restrictions, and flow volumes. This responsibility, however, causes great concern in regards to future aggregate resource availability. Information related to the interest of this government department was acquired through telephone and personal interviews with Mr. Irvin Hiller. (Hiller, 1999) Manitoba Department of Highways had completed a study which identified potential locations and required resources for long-term maintenance of both

highways and municipal roads within the area, as seen in Figure 40. Corresponding data related to each deposit can be found in Appendix D - Aggregate Deposits. Long term resource dispositions (to private corporations) had been suspended by Manitoba Energy and Mines several years ago, due to uncertainties in the process of designating the land toward a national park. Considering the need for periodic maintenance and rebuilding of provincial roads, significant amounts of aggregate material will be needed. Resources are indeed available just outside the park boundaries, yet the cost of transport of aggregate material would be a significant financial burden on provincial taxpayers.

Although national park principles do not allow resource takings within its boundaries, Manitoba Department of Highways had indicated a strong desire to assume the resource rights to an undisclosed quantity of aggregate material in two or more locations, strategic in placement within future park boundaries. (Hiller, 1999) This process of resource extraction, however, remains unprecedented in Canadian national park planning. In the case of Riding Mountain National Park, for example, aggregate materials are delivered from sources outside the park boundaries. Within Manitoba provincial parks, however, aggregate consumption has been permitted, for example in Duck Mountain Provincial Park.

Ultimately, the main issue of Manitoba Department of Highways was to secure strategic aggregate resources within the land area to lower future costs of maintaining #6 highway and other roads within their jurisdiction. Manitoba Department of Natural Resources (renamed Manitoba Conservation in 2000), the regulatory authority of natural resources in Manitoba, had suspended all long term resource dispositions within the Manitoba Lowlands National Park proposed area. As construction activity had been slow in that area for many years, there had been an insignificant amount of private resource holdings. This recent decrease in maintenance means an increase in work in the near future is imminent. As trucking rates are approximately $0.10 / tonne / km, road maintenance over a period of time will result in significantly higher tender bids, having to truck materials over a much greater distance to the confines of the park reserve from outside aggregate deposits. Over a 25-year period, estimated aggregate resource requirements delivered from outside the proposed national park area would be an unnecessary financial burden to taxpayers in excess of two millions of dollars, and drastically more should an update in infrastructure be implemented to accommodate a national park. (Buchko, D., 2000) An estimated aggregate requirement for this area over a 25-year period has been included in Appendix E - Aggregate Requirements.

Province of Manitoba, Department of Natural Resources

The Manitoba Department of Natural Resources is the regulatory authority over

activities relating to forestry, fishing, hunting, park use, etc. within the province. The mandate of this department favors environmental integrity. A special concern within the Long Point area included such issues as water quality of water systems, wildlife and fisheries habitat, the disposition of active forest management licenses (FML), potential historic sites or significant features, as well as efforts to retain rare and endangered species. The information compiled in this section had been acquired through personal interviews with Mr. Ken Schykulski. (Schykulski, 1999)

Because the land currently owned by the province would ultimately be surrendered to the federal government, the Province of Manitoba was concerned with the amount of land area lost from its ownership. Although parks are favorable features to maintain within the province, economic gains are directed to Parks Canada. Land area which traditionally generated money through leases, taxes and resource exploitation would no longer provide such revenue. Surrendering an unnecessarily large land area in providing adequate representation is not desirable. As the park boundaries may exist adjacent to several lakes, there is also concern of the future borders which distinguish the park. Lake Winnipeg, for example, fluctuates in elevation thus defining an ever-changing shoreline. Manitoba Department of Natural Resources felt that the amount of lake consumed into federal jurisdiction would best be minimal, and ideally nonexistent. (Schykulski, 1999)

West of PTH #6 is Kawina Lake, wherein islands are nesting grounds for a diverse abundance of shore birds and waterfowl, many being rare and endangered species. This is a significant area for migrant waterfowl, known as The Walter J. Cook Conservation Area, which is a piping plummer reserve. The integrity of these sanctuaries were of significant interest to Manitoba Department of Natural Resources.

Figure 41 - Small scale hydro line development

Manitoba Hydro

Data and other information pertaining to the interests of Manitoba Hydro was acquired from Mr. Wade Munroe. (Munroe, 1999) Acting as a separate entity from the Province of Manitoba, Manitoba Hydro claimed that their interests are the same as 386000 customers - the economical sustainability of hydro production and distribution. Hydro had spent over two years analyzing its corporate interests in relation to the upcoming development in the Long Point area. Simply stated, power is generated in the north, and the demand is in the south; the Long Point area has been the most strategic location for corridor placement. (Munroe, 1999) As revealed by (Munroe, 1999), two specific concerns held by Hydro included the fate of both existing and future transmission lines throughout Long

Point, as well as riparian conditions affected by corridor development. Manitoba Hydro will have a continuing interest in this area which, unfortunately, is not compatible with national parks, as a result of discrepancies between Manitoba Hydro and Parks Canada policies; "Manitoba Hydro considers it imperative to the future of this Province that any Federal / Provincial agreement to transfer lands to control under the National Parks Act protect Manitoba Hydro's ability to maintain existing transmission lines and to develop and operate new transmission facilities in the future." (Munroe, 1999)

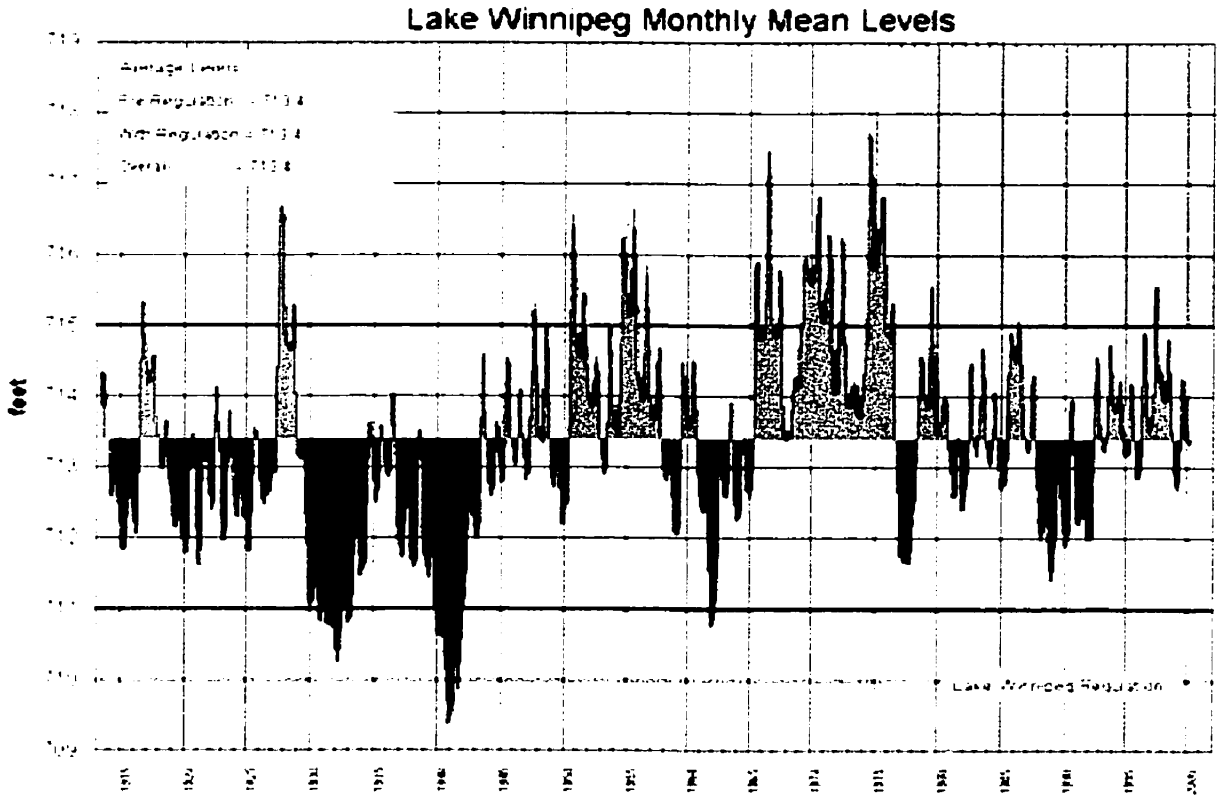


Figure 42 - Lake Winnipeg monthly mean levels (Source: Manitoba Hydro)

The elevation of Lake Winnipeg is monitored and controlled by Manitoba Hydro, specifically by a hydroelectric generating station located toward the north basin

of Lake Winnipeg at Jenpeg. Figure 42 indicates a historic range of water levels, as recorded and compiled by Manitoba Hydro. Within the past five years, shoreline damage due to high water conditions has been an intense environmental issue along the shoreline of Lake Winnipeg for both residents and landowners; a coalition has been organized to pursue legal action against Manitoba Hydro, believing that the recorded levels are inaccurate and excessively high water levels have severely damaged property. (Gerrard, 1999) High water levels ensure improved efficiency of dam structures in the north basin of Lake Winnipeg. Manitoba Hydro was concerned that a national park may constrain future regulation, thus dictating the economic efficiency of a highly technological system.

Because existing corridors run through the middle of the proposed land area, talks of moving these lines had occurred; Manitoba Hydro was not interested in moving them, however. (Munroe, 1999) For ease of maintenance and safety regulation, Manitoba Hydro requested the exclusion of existing and future corridor land area from the park. The placement of future transmission lines would best occur some distance from existing structures, providing more diversity of location. Manitoba Hydro desired significant separation to minimize the possibility of grey-outs or black-outs, taking as an example the recent Quebec ice storms. 80% of Manitoba's hydro runs through the single Grand Rapids right-of-way. (Munroe, 1999) As the choke point of land area at Grand

Rapids is becoming congested with high voltage transmission lines, Manitoba Hydro had undertaken the search for alternative routes. Potential future hydroelectric generation sites had also been pinpointed on a schematic map, yet the sequence of occurrence was far from determined (Figure 43). Most sites, however, are not conducive to sending lines east of Lake Winnipeg, thus Grand Rapids being the most probable location for future lines. (Munroe, 1999) Hydro and Manitoba Department of Natural Resources were jointly looking at the west end of the long point land area to place additional corridors, indicating that this is the most strategic alternative location.

Non-Government Organizations

Figure 44 - Abandoned commercial fishing dock on Lake Winnipeg

Acquiring information from local communities was found to be extremely challenging. Several surveys and various attempts to perform telephone or personal interviews failed to produce information which could be referenced to an authority representing local groups. This was found to be a result of the active status of negotiations between government and non-government groups, and it was felt amongst these local groups that even an academic study could negatively effect the end result of these negotiations by prematurely revealing issues and potential solutions. As a result, this study relied on information provided by a feasibility study provided by TAEM Consultants to Manitoba Department of Natural Resources in 1996. This study (TAEM, 1996) assessed the current value of various candidate sites for the Manitoba Lowlands National Park, and provided recommendations for candidate sites. The background information related to the interests of local groups was found to be quite detailed, and was deemed sufficiently accurate for the purpose of this academic study.

A common resource interest of non-government groups in the Long Point area was the opportunity to harvest timber. The majority of productive harvesting

areas existed between Kawina and Katamik Lakes, where approximately 128,000 hectares of productive land is found. The Province of Manitoba had permitted on average 111,000 cubic meters as an annual allowable cut, which at a local, community-based level provided about 22 full time jobs and $1 million in annual wages. (TAEM, 1996) These employment figures did not include the potential forest activities of TOLKO.

Town of Grand Rapids

Adjacent to the specified land area, Grand Rapids' residents had historically used the land and its resources. These uses include fishing, hunting and trapping, as well as small scale timber harvesting for residential and commercial use. No significant planning initiatives were projected by either the LGD or Town of Grand Rapids, such as a regional management plan. This was partially due to the large proportion of available land which was not suitable for development; a need for commercial and residential expansion had been indicated yet a lack of quality land had become a barrier.

Grand Rapids First Nation

As part of 1875's Treaty 5, Grand Rapids First Nation is located 426 kilometers north of Winnipeg on PTH No. 6 at the mouth of the Saskatchewan River on Lake Winnipeg. This community is located on the east and south banks of the Saskatchewan River, immediately adjacent to the Town of Grand Rapids. A 1996

census provides an on-reserve population of 461 and off reserve population of 635. A central well system provides potable water for the community, with treatment and chlorination facilities. Underground piping distributes this water to buildings and fire hydrants. Sewage is piped throughout the community to a lagoon system. A private airstrip and dock facilities are available for community access.

In 1962 the Grand Rapids Forebay Agreement was signed to reconcile issues related to the flooding of land due to hydroelectric dam developments. This agreement has already recognized the interests of First Nation groups in the Long Point study region. Grand Rapids First Nation has no outstanding treaty land entitlements, and none are anticipated.

Band members actively use the land as part of their everyday life for both recreation and economic growth. Recreational activities include hunting and fishing, off-road trail riding, etc. Hunting, trapping and fishing are also important activities which help provide both food for the community as well as a financial input to families. Timber harvesting is a significant activity of First Nation communities for both personal use and marketing. These activities are permitted as part of the rights and privileges given to a member of a First Nation community. Traditional values and a legacy of their dependence on the land as a means of survival has proven that Aboriginal culture has managed the land and

its resources in a sustainable manner.


Figure 45 - Gas station on PTH #60 at intersection leading north to Easterville

Chemawawin (Easterville) First Nation

First Nation peoples adjacent to the land area practice traditional use of resources throughout Long Point, thus holding a legitimate concern over future decision-making processes. The community of Easterville, located to the northwest of the plan area aside Cedar Lake, has also expressed concerns over potential land management strategies for the Manitoba Lowlands National Park. (Sopuck, 2000) Chemawawin is accessible via PR No. 327; a small gravel airstrip operated by the Province of Manitoba, as well as dock facilities can accommodate wheeled and float planes. According to a 1996 census, the First Nation has an on reserve population of 760 and an off reserve population of 344. (IAND, 1997)

Chemawawin First Nation is signatory to Treaty 5, signed in 1875. Chemawawin First Nation was relocated to this area in 1963 when the Grand Rapids hydro station was built and a large area of Chemawawin First Nation was flooded. This move of Chemawawin First Nation from Reserve No. 1 to Reserve No. 2 has led to further dispersing to Reserve No. 3, located at Denbeigh Point on Lake Winnipegosis as a land entitlement under the Grand Rapids Forebay Agreement.

(IAND, 1997) In discussions relating to renegotiating this agreement, Chemawawin First Nation had stated an interest in several component areas within the Long Point proposed area, yet was not approved. Approximately 11,115 acres, the land entitlement under the Grand Rapids Forebay Agreement had been the last outstanding treaty land entitlement. Currently, Chemawawin First Nation has no outstanding land claims. The activities as described in a description of Grand Rapids First Nation apply equally to those of Chemawawin First Nation.


Figure 46 - Ice fishing on lake Winnipeg

Local and non-local residents

These interest groups were represented by permanent residents outside the community of Grand Rapids adjacent to the Long Point area, as well as nonpermanent residents. The issues and interests discussed here had been provided through personal interviews with Mr. Ken Schykulski of the Department of Natural Resources (Schylukski, 1999), resulting from his many years of involvement with local residents in a variety of settings throughout Manitoba. Nonpermanent residents, including seasonal tourists, cottagers and other users of this land area had participated in land use through hunting, fishing, hiking and other recreational

activities. Common concerns include maintaining access to hunting grounds, docking locations for fishing, potential cottage development, camping facilities near shorelines, as well as interpretive facilities and hiking trail networks. (Schykulski, 1999)

Figure 47 - Privately owned fishing camp on Lake Winnipeg south of Long Point

The majority of commercial fishing which takes place on Lake Winnipeg is in the Hecla and Grindstone area. Very little commercial fishing activity occurs in the Long Point area, as fishermen have found more northerly locations to be advantageous.(Schykulski, 1999) Between the five communities nearest to the study site, approximately 30 summer and 175 winter licenses were issued. At the time of this study there were 11 hunting and fishing guide outfitting organizations within the Long Point region, predominantly from the community of Grand Rapids. These organizations must obtain guiding permits from the Province of Manitoba for a specific area of land, and must be maintained. There were between 10 and 30 commercial fishing licenses issued annually in areas immediately affecting the Long Point study area. (TAEM, 1996) Near the shorelines of this area are significant walleye spawning grounds, providing excellent fishing conditions in relation to the rest of Lake Winnipeg -

these areas have been, however, restricted to commercial fishing to help sustain fish populations. (Schykulski, 1999) Sport fishing is not popular in this region, partially as a result of its remoteness from large population centres and more successful fishing ground to the north and south. Some fishing does, however, occur within Katamik and Kawina Lakes, Cross Bay, The Saskatchewan River and Lake Winnipeg north of Long Point.

Regulated game hunting in the area had been permitted for approximately 20 years on the east side of PTH #6. Known as game hunting area 16, this area contains a wide variety of wild game, although moose hunting has been excluded for several years due to declining populations. In recent years, trapping within the area has declined dramatically, yet harvest estimates poorly indicate a trend in fur bearer populations. Deer populations have increased to a point at which the species is considered overpopulated, and recreational hunting may be a potential form of mediation. (Schykulski, 1999)

TOLKO

At the time of this study, TOLKO held Forest Management License (FML) #2 with the Province of Manitoba, covering forest management units 46 and 47. (Figure 30) This FML covers the Long Point study area, but the area had not been significantly harvested in recent years. Most of the timber harvesting was pursued by local residents for commercial sales of bulk wood under private

licenses. Most of the harvesting by TOLKO to date had been undertaken in the land area between Kawina and Katamik Lake. Because of a poor selection of fully mature tree stands, TOLKO had found that this land area was no longer strategic for harvesting for the production of timber products and paper manufacturing. (Becker, 2000)


Figure 48 - Coniferous forest stand

As identified by Mr. Jerry Becker (Becker, 2000) of Manitoba Forestry Branch, the interests of TOLKO were insignificant to the future development of the Manitoba Lowlands National Park. The withdrawal of blocks #47 and #46, the two blocks designated to the Long Point study area, was already underway by The Province of Manitoba Department of Natural Resources; a demand by TOLKO for additional land area was not foreseen, as their annual allowable cut in Manitoba would not change. (Becker, 2000) These two cut blocks represented approximately 4.8% of the allotted land area within FML #2, therefore having little significance to the overall cut area allocated to TOLKO.

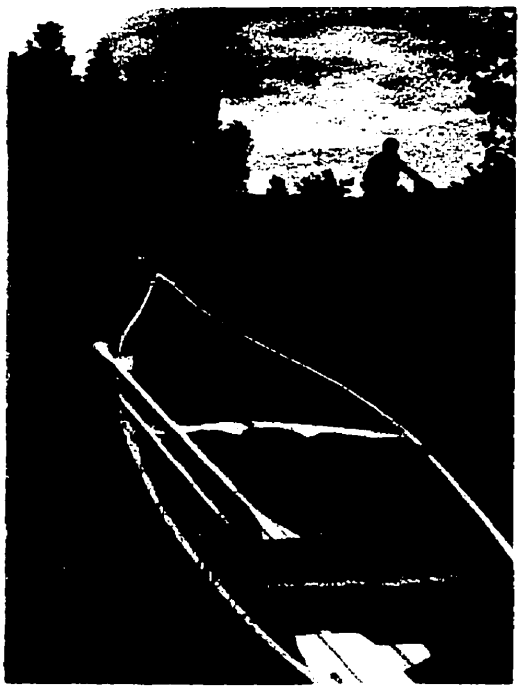


Figure 49 - Launching the canoes

Determine Future Activities

As a result of both consultation and other means of research, a list of potential activities had been determined for the purpose of integration into this plan. Because of several constraints in this project these activities may not have necessarily acknowledged each and every local and non-local interest, yet it was felt that it included sufficient activities for the purpose of this study.

Local Interests

- Maintaining access to lakes and streams for transportation and recreational fishing
- Maintaining active commercial fishing
- Allowing recreational hunting and trapping
- Providing suitable areas of forested land for personal and commercial timber harvesting
- Development of interpretive sites and other facilities to increase tourism and economic growth
- Selection of appropriate sites for educational facilities
- Development which would result in community economic growth

Manitoba Hydro

- Designation of appropriate land area for future corridor development
- Increasing public knowledge of the ecological effects of corridor development

Manitoba Department of Highways

- Maintaining control of vehicular right-of-ways
- Designating sufficient aggregate resources to provide adequate material for future development and maintenance
- Enforcing adequate rehabilitation standards within sites of resource extraction and researching potential future uses of these sites

Manitoba Department of Natural Resources

- Providing adequate ecological representation within the given area
- Providing sufficient environmental protection and responsible land use decision making

- Recognition and protection of rare and endangered species
- Allowing active harvesting of resources while maintaining ecological integrity, sustainable development, and vibrant economic growth at provincial scale
- Riparian protection from land and resource use
- Ecological representativeness, protecting ecological systems through working with Parks Canada's National Park System Plan

Non-Local Interest Groups

- Environmental protection of ecological structures, rare and endangered species, sustainable development
- Development of recreational facilities, ie. fishing, camping, park structure, etc.
- Adequate access through the planning area - maintaining existing routes as linkages between the south and north

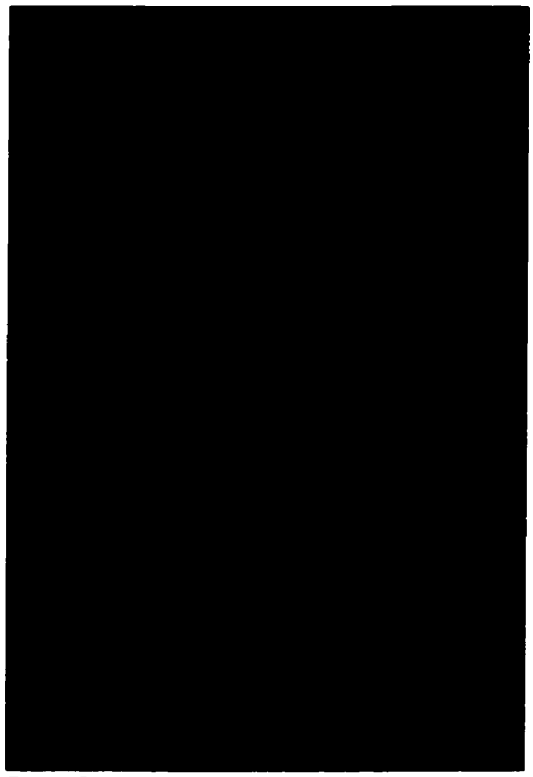


Figure 50 - Late night beside the campfire

Interaction Between Activities

This study provides an evaluation of the potential interaction between activities, making design decisions based on the most effective means of integrating activities. This study used a management zone strategy to organize and integrate activities. In some instances these zones became temporal in nature, responding to both ecological response and human demand for consumption. This time frame was developed through a general understanding of sustainable resource needs and regeneration patterns in the environment. A significant impairment of the results in this study was a result of the limited detail of this knowledge, and a dependence on "expert advice". For example, recreational and scenic uses were

implemented in areas which had either capacitated such activities in the past, or those which are less vulnerable to the effects of development.

In conjunction with development is the issue of human accessibility; development increases our mobility through new environments. Hydro corridors and forest harvest routes may provide access for hunters to areas which are not typically accessible. Accessibility may be favorable for recreation, yet can be harmful to ecological systems. On Kawina Lake, for example, access routes have allowed for easy access for power boat launching. Invasion by boats cause birds to leave their eggs which then become susceptible to extensive predation by Herring Gulls which nest in other locations adjacent to the lake. (Vermeer, 1969) This threat is known as 'misguided tourism', and has shown adverse effects on bird populations on this Lake.

Introduce Management Zones As a Strategy

The Long Point study area contains a diverse group of ecosystems which generally exist in patches. As many of the future activities can be correlated with land cover types, it was found to be effective in this exercise to designate management zones, each with a distinct description and management plan. The change in these zones over time reflected the temporal qualities of each area, thus suggesting the result of land and resource use over time. Built features such as right-of-ways and hydro corridors did not become individual zone types,

yet were acknowledged through the integration into larger zones. The components of each zone will be further defined in discussing zone development. Generally, the proposed zone types include:

- Protected Area
  - i) ecological preserves
  - ii) conservation areas
- Resource Development Area
  - i) active harvesting / consumption
  - ii) regeneration / rehabilitation areas
- Recreational Area
  - i) aquatic environments
  - ii) inland activities
- Settlement Area
  - i) cottage development
  - ii) potential community development
- Riparian Management Area
  - i) rehabilitation zones
  - ii) environmental protection buffers
- Mixed Use Area

These zone types were selected through categorizing desired uses of interest groups, and doing so in a manner which responded to some of the environmental needs relevant to this study. Through studying the land characteristics of certain areas, it was found that more than one activity could be allocated, therefore the designation of mixed use areas. Riparian management areas were created upon land areas containing, for example, sensitive wetlands or significant wildlife corridors along riparian routes. Settlement areas were selected as a result of a desire for accommodating future cottage and camping facilities, on land which has a higher aesthetic value, high recreational potential and ground conditions suitable for development. Recreational areas may include functions such as canoeing, fishing, hunting, etc., and had been designated to

areas which typically do not impede the functions of other activities. Resource development areas may also accommodate recreational use, yet had been selected due to the available resources for timber harvesting and aggregate extraction, and ground conditions which would minimize the impact of disturbance. Finally, protected areas were designated in conjunction with riparian management areas, yet would generally take a more aggressive level of protection. Although specific management recommendations were not described for each and every zone, a general description of six candidate zones helped to understand the conditions considered in the decision making process.

d) Develop a management zone strategy which accommodates desired future uses

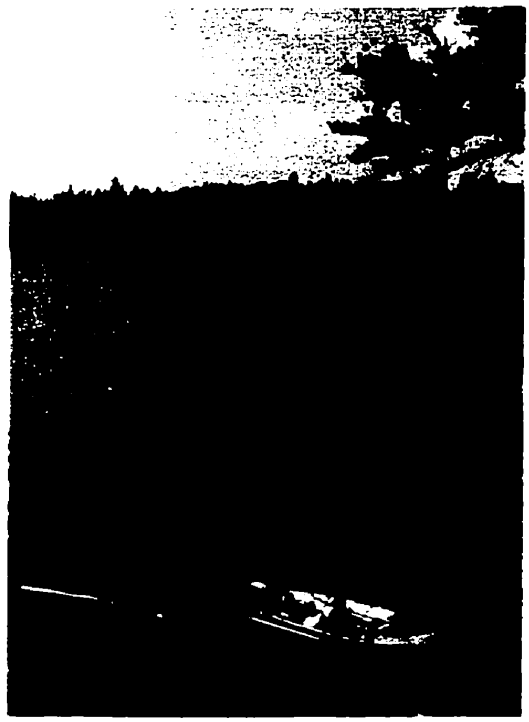


Figure 51 - On-shore lunch break from fishing

Goals and Objectives

This study produced a spatial representation of desired future conditions at both five and 25 years, the latter being a reasonable extent of predicted environmental circumstances derived from the available information. The changes were due to predicted land and resource consumption, as well as reasonable expectations of built development. These land and resource use patterns manifested from both responsible planning decisions, and the consideration of future desired conditions.

The primary goal in developing a land and resource management plan for this area was to accommodate a variety of land and resource uses while minimizing their impact on the environment. The uses incorporated into this management plan reflect:

- desired activities of local and non-local groups (TAEM, 1996)
- demands of site infrastructure (ie. hydro, highways)
- past land and resource uses (ie. hunting, forest harvesting)
- potential future uses (ie. cottage development)
- significant features (ie. protected areas)

Criteria for selecting management zones

Management zones were selected on the basis of a few conditions. First, ecosystem types were identified through the analysis of remote sensing information. This presented a matrix of patches and corridors which helped to identify the relationship (ie. connectivity / fragmentation) between ecosystems. This process highlighted a variety of characteristic sites, such as wetlands, forested areas, riparian zones, land of significant relief, etc. Understanding this configuration informed the pattern of zoning. For example, not only should a system containing rare and endangered wildlife be protected, but existing corridors and the potential for future corridors should be accommodated. Zones must be flexible in order to allow the potential for system fluctuation; edges should be adaptable in order to reflect future demand of specific ecological activities.

Zoning patterns were also influenced by more site specific features, and an attempt to integrate uses mas made in order to reduce the area of land to be disturbed. For example, future corridor alignments for hydro transmission structures followed routes which are also capable of hosting other potential uses of a similar pattern, such as that of vehicular traffic. An environmental assessment at a range of scales was undertaken, from identifying areas of previous disturbances to contesting whether or not soil types are appropriate for proposed uses. Minimal intervention was a priority.

Economic considerations were presented as a third condition set for management zoning, as monetary value is always designated to acts of resource consumption. For example, aggregate extraction locations are most financially feasible when adjacent to existing roadways, preferably those upon which material is needed. Minimizing hauling distance is a significant relief to project costs funded by all taxpayers. A second economic consideration informing zoning patterns included the allocation of land with higher recreational value, which could in time develop the potential for the economic growth of local communities.

A fourth condition, and perhaps most important in regards to responsible environmental protection, included providing adequate ecological representation through the protection of each of the ecosystem types in the region. The Manitoba Lowlands natural region contains a set of ecosystem types which are rather unique in a national context. The protection of a wide variety of ecosystem types - not simply those rare or threatened - should be preserved. Potential protected areas and riparian management zones included the entire range of ecological types in order to satisfy this level of representation.

5 Year Management Plan

As seen in Figure 52, approximately 20 management zones were designated to the Long Point study area over a 5-year period. Most zone types will be represented by one candidate zone, which shall be described in detail at a much more site-specific scale in order to help understand the selection of others.

Introduce Candidate Zones - Site Conditions

Protected Area RMZ

Existing ecological conditions have indicated the need for a variety of protected areas, such as the presence of rare and endangered species. PA1 (33750 ha) surrounds and includes Kawina and Katamik Lakes, protecting a sensitive habitat for nesting rare and endangered birds (Figure 53). Further, it contains a large area of old growth forests with a high species diversity. Two of the most dominant soil types of the west and central part of this land area include the Cedar Lake and Chitek Series, which are both described as being extremely calcareous, clayey, stony till with good to imperfect drainage. To the east of this area is a variety of stony and sandy soils including the Freshford Complex and Easterville series, both described as having higher presence of stone and gravel with good to excellent drainage. A range of soil conditions present a variation in forest type and growth rate, thus resulting in a diverse selection of ecological systems and wildlife habitat. Some ecosystem types include lakes, wetlands, a variety of forest types, associated linkage corridors, etc.

The overstory is dominated by Jack Pine, with Spruce and Trembling Aspen stands throughout the area. The understory is variable, usually with *Arctostaphylos uva-ursi* in the dwarf shrub layer. The herb layer is poorly developed, as a continuous layer of feather moss covers the forest floor. These are conditions consistent with well-drained, fresh to moist, coarse textured soils or very shallow soils over bedrock. These forests are successionally young, having originated following fire. If fire does not recur, stands will be invaded by spruce and fir, evident throughout the area. The low moss cover is likely a result of heavy shading by low shrubs.

A significant slope at north end of area allowing excellent views to the south, declining 50 m at approximately a 3:1 slope. The rest of the site is extremely flat with slight slopes inward toward lake shores. (Figure 28) These lakes are significant nesting grounds for several rare and endangered bird species, while the surrounding forested areas contain of the highest wildlife populations of the Long Point study region.

Adjacent to this management zone has been designated a large recreational zone to the east, and a resource development zone to the west. The implementation of a potential interpretive facility along PTH #60 would provide an excellent location for a physical overview of the protected area as well as the adjacent resource development zone. Soil conditions in a structural sense allow

the development of such a facility at the northern limit of the management area adjacent to PTH #60. Implementing an interpretive facility would increase public awareness of the value in environmental and species protection, and promote an understanding of how these features can be actively managed.

Settlement Area RMZ

This area of land designated as Settlement Area 1 has two components (1025 ha), the first found between Beaver Dam Lake and Shallow Bay (Cedar Lake), and the second adjacent to west shore of Shallow Bay (Cedar Lake). (Figure 54) These sites contain soil types of extremely stony till, and the second consisting of 1 to 10 cm of rubble overlying dolomitic limestone bedrock - soils which are well drained and favourable for this type of development. These sites are relatively flat sloping toward the adjacent lakes - local drainage is not problematic due to rapid natural drainage.

Jack Pine dominates each site, and currently is in cutting class 2 (relatively young) with even-aged stands. The understory is variable, usually with *Arctostaphylos uva-ursi* in the dwarf shrub layer. The herb layer is typically sparse, and feather moss is discontinuous and occurs in scattered patches. This vegetation is typical of rapidly drained, fresh, coarse-textured soils. These forests are successionally young, having originated following fire. If fire does not recur, stands will be invaded by spruce and fir, not yet evident within the area. The low moss cover is likely a result of heavy shading by low shrubs. (Zoladeski, 1995) The available forest stands present a high aesthetic quality, and shoreline conditions are highly favourable for development. Site visits have verified the information as presented throughout the research process. By experience, hunting and fishing potential is good to high.

The eastern site is adjacent to a hydro dam system dike and is segmented north to south by a roadway and hydro line corridor. Although development is difficult along the west edge of this zone, a highly developed access route allows for easy access along the shore of Beaver Dam Lake. The west location is surrounded by a recreational area with attractive forest stands promoting wildlife, and covers a length of shoreline along a protected bay of Cedar Lake.

Mixed Use Area RMZ

Located south of PTH #60, including Denbeigh Point and the land adjacent to the north shore of Skunk Bay (1820 ha), this mixed use area provides opportunities for a variety of functions. (Figure 55) Denbeigh Point consists of predominantly Atikameg Series soil, which is extremely calcareous, loamy, very stony brunosol till with good drainage. These soils may accommodate a variety of uses without significant damage to surrounding soil structures. In many areas, the immediate shoreline of Skunk Bay consists of Marsh Complex soil, consisting of thin loam and peaty muck overlying extremely calcareous, loamy, very stony till with poor drainage. The Horseshoe Island Complex soil dominates this area, consisting of ridged lacustrine beach and an outwash veneer of sand, being ideal natural conditions for recreational activities such as beach development. Its mode of deposition originates from glaciolacustrine, morainal processes.


Figure 56 - Tree-covered bog ecosystem

The tree canopy of this management zone consists of predominantly white spruce, with a mixture of trembling aspen, balsam fir, or white birch in the secondary canopy. The understory varies from shrub- and herb-poor to moderately rich. Balsam fir saplings can form dense shrub thickets, usually on

mineral rich soils. These forests are successionally mature, and are characterized by an uneven age structure.

Denbeigh Point is a ridged peninsula which has an elevation of approximately 10m above water level. The north shore of Skunk Bay has approximately a 10:1 slope upward toward PTH #60. Denbeigh Point has an established road accessing a wharf on its western shore. The north basin of Skunk Bay provides an excellent opportunity to develop a beach facility with excellent boating potential and high water quality. A variation in slope conditions and dense vegetation present excellent conditions for the development of a trail system.

Riparian Management RMZ

This area is a corridor of land and aquatic environments linking Kanusk Lake and Lake Winnipegosis. The core area of this zone is 1350 ha, excluding buffer zones as seen on Figure 57. It is dominated by Crane Series mesic peat soils, consisting of 40 to 160 cm of mesic fen peat with little or no Sphagnum peat surface deposits. Underlain by strongly calcareous, loamy to clayey, stone-free lacustrine sediments, these soils have very poor drainage qualities. These are highly sensitive soil structures which are vulnerable to development. Vegetation in the area includes lowland black spruce stands with occurrences of tamarack in the overstory. Ledum groenlandicum is often the most abundant understory component, although the understory composition ranges from poor to rich. The forest floor is typically covered by a continuous feather moss carpet, with patches of sphagnum, occurring on wet, typically organic, poorly drained soils. These communities are successionally mature, and are usually long-lived and compositionally stable because of abundant black spruce reproduction. These forests are typical of lowland depressions.

This area is depressional with the surrounding areas to the north and south draining toward it. Much of this area is only slightly elevated from Lake Winnipegosis and consists of a significant area of marsh and bog ecosystems. This area is known to be a significant migration corridor for many birds and related species between Lake Winnipegosis and Katiamik Lake. Stands of

spruce and tamarack provide excellent protection for marshes and bogs found within, and root structures help sustain soils from eroding into surface water systems. The removal of vegetation would create significant disturbances to surrounding environments.

Resource Use RMZ

This land designation area (1950 ha) is located east of PTH #6, at the intersection of PTH #6 and #60. (Figure 58) The south and west area is dominated by Kilkenny Complex soil, being shallow organic soils with a thin surface peat layer, underlain by extremely calcareous moderately stony till. The central zone is exclusively Freshford Complex soil, consisting of stratified layers of sand and gravel. The northern area is dominated by Chitek Series soils, being extremely calcareous, very stony till. These conditions present excellent conditions for a wide range of aggregate products, allowing for the potential production of the necessary types of aggregate products required within the Long Point study area.

Forested areas are exclusively open-canopied jack pine stands with occasional black spruce patches. The shrub and herb understory is typically poorly developed, and the forest floor is characterized by abundant lichen cover. These are typical conditions of dry to fresh mineral soil, usually on rock outcrops. Due to the accumulation of fuel on the forest floor (carpets of lichen and moss) and their position on dry, exposed rock outcrops on sandy ridges, these stands are highly vulnerable to burns. As a result, successional development is usually limited to a single generation. The management recommendation for this area is active timber resource harvesting.

This land area has a moderate slope toward the north-east. The site also has a slight crown at the centre, creating undulating local ridges which contain a variable depth of surface rock. The high potential for frequent fires along a major right-of-way corridor promotes the suggestion to cut forests for public safety. Many accessible aggregate deposits are found throughout this area, thus promoting a high potential for resource extraction. Areas of land locked between vehicular and hydro right-of-way corridors experience a high level of disturbance, and are existing conditions upon which uses of higher disturbance could occur, while avoiding land areas with much less existing disturbance features.

Recreational Use RMZ

This management zone covers the southern portion of the Long Point Peninsula, at the eastern-most land mass of the Long Point study region. (Figure 59) This area is 12200 ha, and contains many prominent characteristics of the Manitoba Lowlands natural region. The shoreline is comprised of two types of soils - Horseshoe Island Complex, which consists of moderately calcareous, fragmental sandy deposits; and the Freshford Complex composed of stratified sandy deposits - both ridged lacustrine beaches overlying ridged moraine with good drainage. The interior consists of two dominant soils - Lamb Lake Complex and Guy Hill Complex with a shallow peat layer overlying stony till and poor drainage - both level to depressional flat and blanket bog. Promoting recreational features within an area with a range of conditions allows users to experience a wide selection of diverse environments.

Forested areas are dominated by upland black spruce. The herb and shrub understories are often poorly developed, and extensive feather moss characterizes the forest floor. These vegetational conditions occur on fresh, well-drained, fine-textured soils. The majority of forest growth in this area occurs within 1.5 km from the shore of Lake Winnipeg. This forest type is common within northern Manitoba, and is successionally mature. They are both of fire origin and compositionally stable because of sustained spruce reproduction.

The southern edge of Long Point has a significant slope down to Lake Winnipeg, with approximately a 65 m drop over less than a kilometer; these slopes are covered in dense vegetation which helps prevent surface erosion. The interior of this management area is flat to depressional with bog ecosystems dominant. This area provides excellent access to Lake Winnipeg and has a high potential for beach development. Steep topography along its shoreline creates excellent viewing opportunities to the south, as well as challenging topography which promotes excellent hiking trails.

Provide site-specific recommendations for candidate zones

Of the candidate zones selected in the previous section, this study focused on some of these areas at a smaller scale as a method of critically analyzing local conditions and their ability to capacitate certain land and resource uses. In general, surface features which were considered included forest cover and type, surficial and underlain soils, existing disturbance features, as well as topography. This exercise demonstrated how the hard-edged limits of each proposed zone would be adjusted to a more site-specific level of detail.

Area one focused on a resource use area located at the intersection of PTH #60 and PTH #6. This is an area of previous disturbance due to hydro corridor and vehicular corridor development. Area two focused on a proposed multi-use area, designating both recreational and resource use activities. Other site-specific evaluations taking into consideration more defined site conditions can be seen in the section entitled 'Resolution of Prevailing Issues', including figures 70 to 78.

Area One - Resource Use Area RMZ

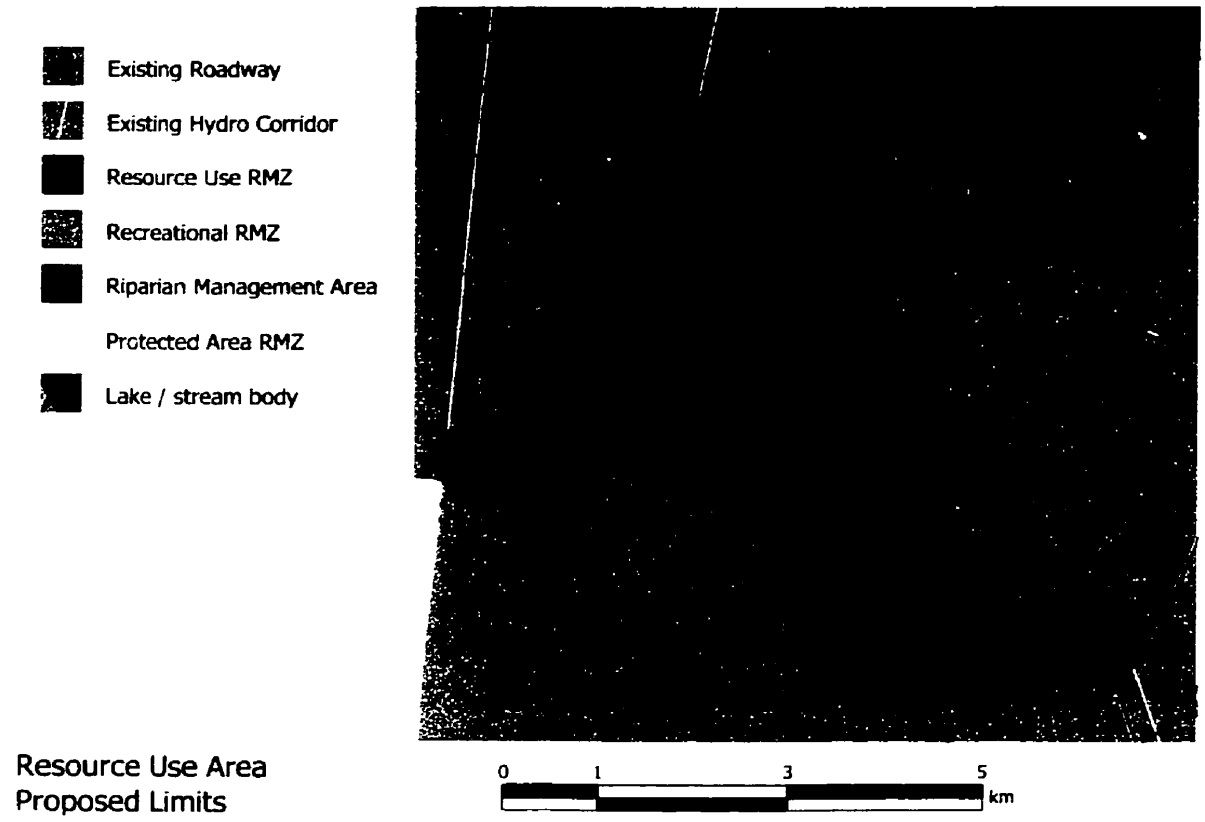


Figure 60 - Resource Use Area: Proposed RMZ's

A more detailed description of this proposed area can be seen in Figure 58 - Resource use area candidate zone. Figure 60 indicates the proposed RMZ's as previously indicated on Figure 52, '5 Year Management Plan'. Surrounding this management area is a recreational use zone. Corridor activity within this zone has created a degree of previous disturbance which made this an attractive site to focus resource harvesting within.

Figure 61 identifies the soil conditions within and adjacent to the proposed area, with 14 different soil series found. A description of each soil type can be found in

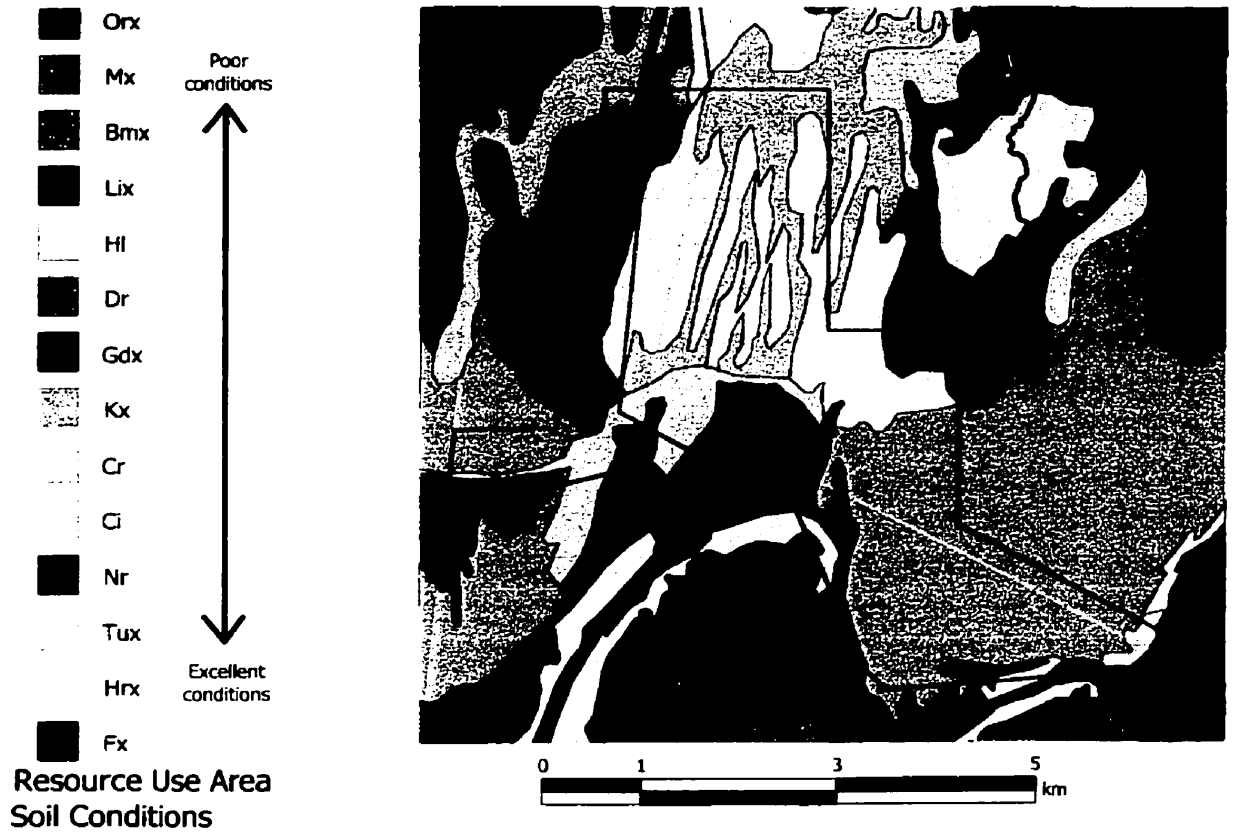


Figure 61 - Resource Use Area: Soil Conditions

Appendix F - Soil Descriptions. Soil types were ranked in suitability for two types of development, including aggregate extraction and forest harvesting. Forest harvesting practices impacts soil structure through a variety of disturbances, including compaction, the removal of surface vegetation, increased light filtration to the forest floor, runoff due to erosion, etc. The suitability range for aggregate extraction would correlate with a suitability range for forest removal, and as a result the same gradient diagram was used. Soils with higher stone content and less peaty structures can withstand much higher levels of disturbance due to forest harvesting. For example, better draining soils reduce the flow of nutrients in an erosion process. Further, soils with a higher stone content have a less

significant understory with much less groundcover which would normally be significantly disturbed by harvesting practices.

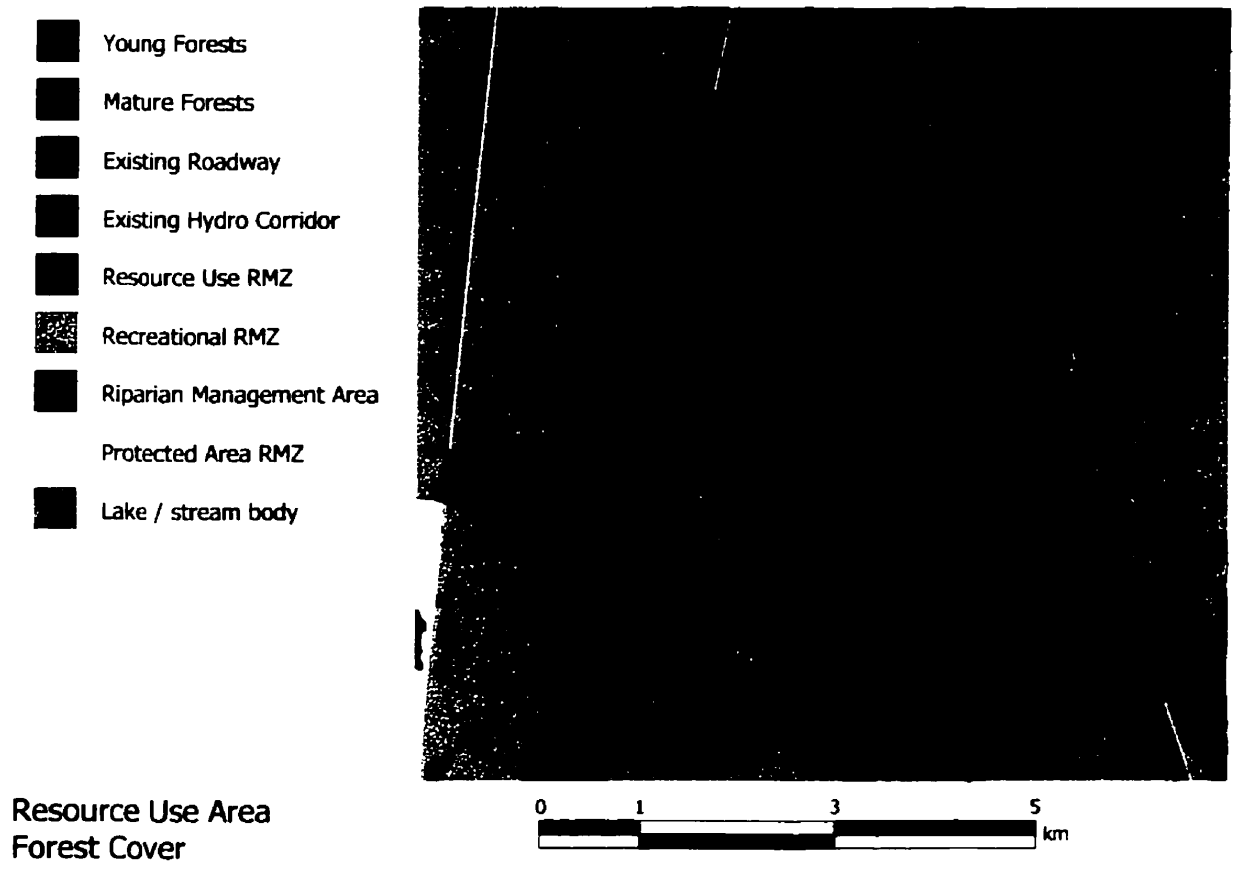


Figure 62 - Resource Use Area: Forest cover

Figure 62 identifies the forest cover within and adjacent to this candidate management zone. Growth appears to be stratified in nature, which corresponds to the soil types found. Minimal young forests can be found, suggesting that stands are mature to overmature and are at a suitable age class for harvesting. As the amount of forested area is limited, these stands can only accommodate the smaller quota requirements of members of local communities as opposed to commercial harvesting as practiced by TOLKO. The upland characteristics of this

management area, being relatively flat with good internal drainage, would allow for the ease of accommodating informal access routes into forest cut areas.

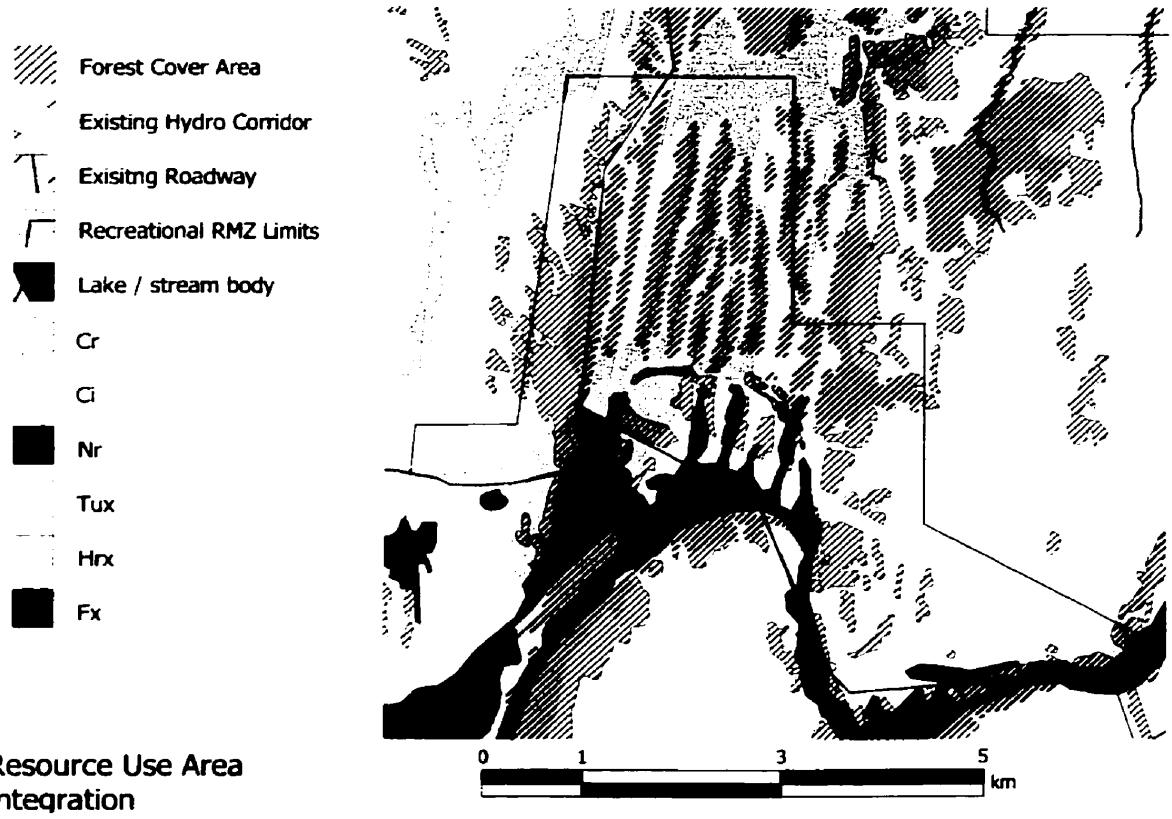


Figure 63 - Resource Use Area - Integration

Figure 63 depicts the integration of soil types with forest cover, and helped to understand the relationship between soil typology and surficial vegetation. Soil types which are shown in this diagram include those which had been considered suitable for aggregate extraction and able to accommodate forest harvesting practices. It is obvious from this diagram which areas cannot capacitate either use based on the suitability range as indicated.

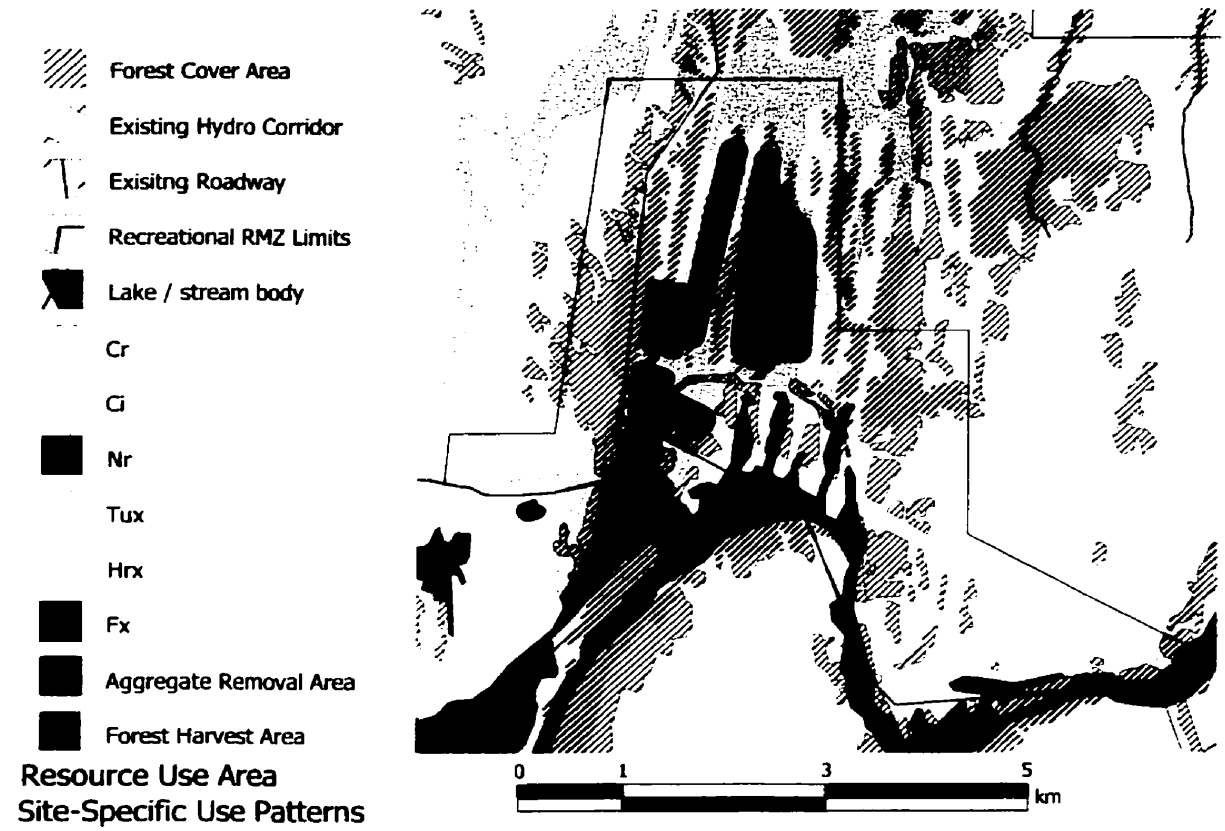


Figure 64 - Resource Use Area - Site-Specific Use Patterns

Figure 64 describes desired use patterns which designates both aggregate removal areas as well as forest harvest areas. Aggregate removal areas are most efficient when adjacent to existing right-of-ways through minimizing hauling distances, and in this case had been designated along PTH #6 while suggesting sufficient visual and safety buffers. The volume of material reflects the quantity as identified in Appendix E - Aggregate Requirements. The allocation of harvest areas had also taken into consideration the visual impact of this activity and had been designated away from view, yet in close proximity to areas of previous disturbance.

It is evident that the boundary previously suggested in Figure 60 would be much different and have significantly less of a visual impact when such a site-specific evaluation is done. Consequently, upon the designation of appropriate buffers related to safety issues, the recreational use area may overcome land areas on the periphery of resource use areas.

Area Two - Multi-Use Area

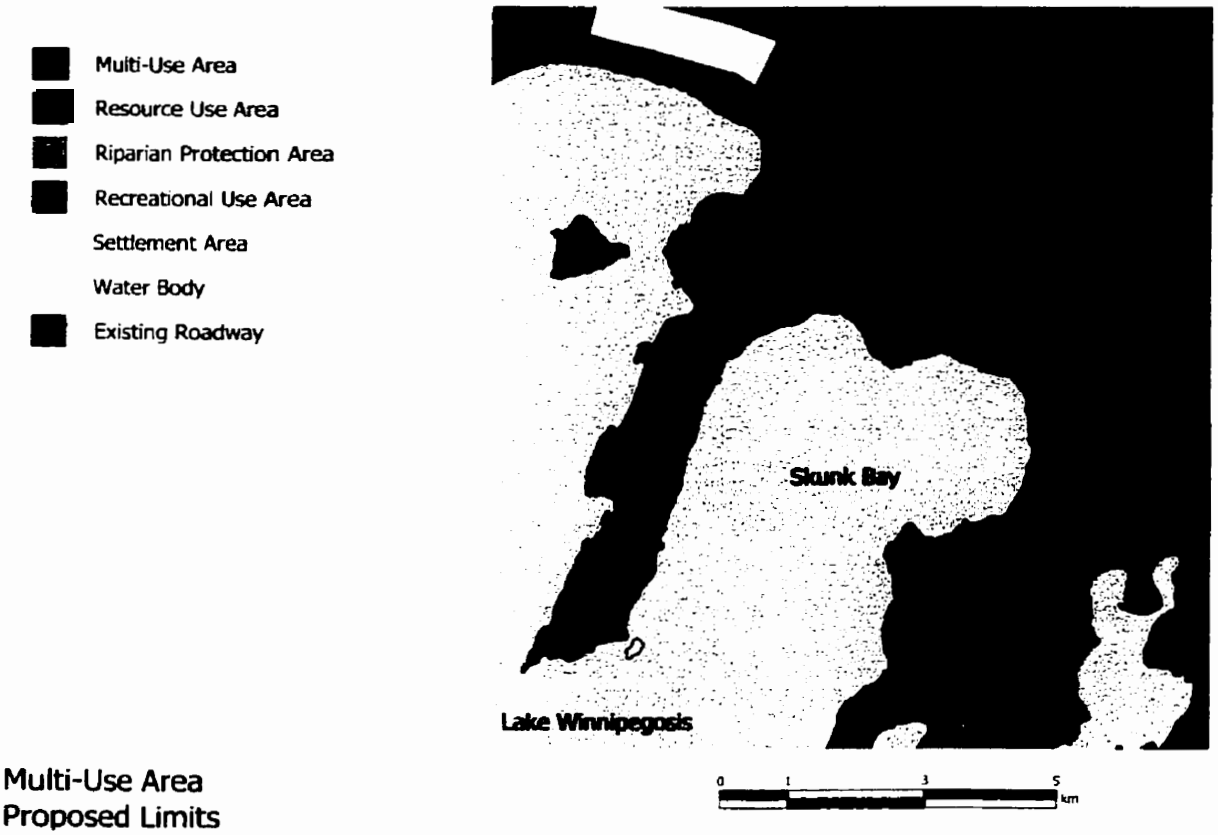


Figure 65 - Multi-Use Area: Proposed limits

Figure 65 identifies the proposed limits of the Multi-Use Area as previously shown in Figure 52 - 5 Year Management Plan. A more detailed description has also been previously identified for this area in Figure 55. This area is bordered by Lake Winnipegosis, and includes the Denbeigh Point Peninsula. As much of Denbeigh Point has been designated to Chemawawin First Nation as part of a treaty land entitlement, development had been focused, yet not limited to, areas outside this land designation. The boundary of this land entitlement can be seen on Figure 70. To the north of this zone, a recreational use area had been

proposed, while a resource use area and a riparian management area had been identified to the east and south, respectively.

Human use activities considered in this evaluation included the implementation of a camping / cottage development area as well as vehicular access routes leading from the Denbeigh Point access road and PTH #6 to the suggested development area. Aggregate extraction, hydro corridor development and forest harvesting were other activities considered in this multi-use area. Amongst the network of these activities, recreational trails can be implemented, yet the designation of these were not part of this evaluation as they tend to be capable of being implemented in a great range of land types. Ecological features which were evaluated include soil types, forest cover, as well as topography. The previous boundary had been defined to the north by PTH #60, to the south and west by Lake Winnipegosis, and to the southeast by a natural migration corridor represented by a riparian management area.

Figure 66 describes soil types found within and adjacent to this multi-use land area designation. Soils were ranked for their suitability for three general uses, including building development, aggregate extraction, as well as recreational potential. Building development standards were based on selecting soil series which provided sound structural qualities while maintaining good internal drainage characteristics. These soils would also be more stable, having a greater

	Develop.	Agg. Ext.	Rec. Dev.
Cl	1	7	4
At	2	2	7
Sox	3	4	2
Tux	4	5	1
Bc	5	1	8
Hrx	6	3	3
Dr	7	6	5
Hw	8	8	9
Cr	9	10	11
Ca	10	11	10
Lix	11	9	13
Mx	12	12	14
Orx	13	13	12
Hl	14	14	6
Ghx	15	15	15
Mh	16	16	16

Multi-Use Area
Soil Conditions

Figure 66 - Multi-Use Area - Soil Conditions

suitability for disturbance. As outlined in 'Area One - Resource Use Area', aggregate potential was determined by size and quantity of stone content, the ability to carry a higher level of disturbance, as well as good internal drainage qualities. Recreational potential was ranked based on the potential of these soils in a shoreline environment; soil structures must provide fine sand material for beach development, yet also sufficiently nutrient-rich in order to facilitate the growth of vegetation for protection and aesthetic purposes. This figure indicates very poor conditions for all three activities along Denbeigh Point on the shores of Skunk Bay, with good conditions just beyond a seam of 'Mh' soils. The east shores of Skunk Bay provides excellent conditions for all three activities.

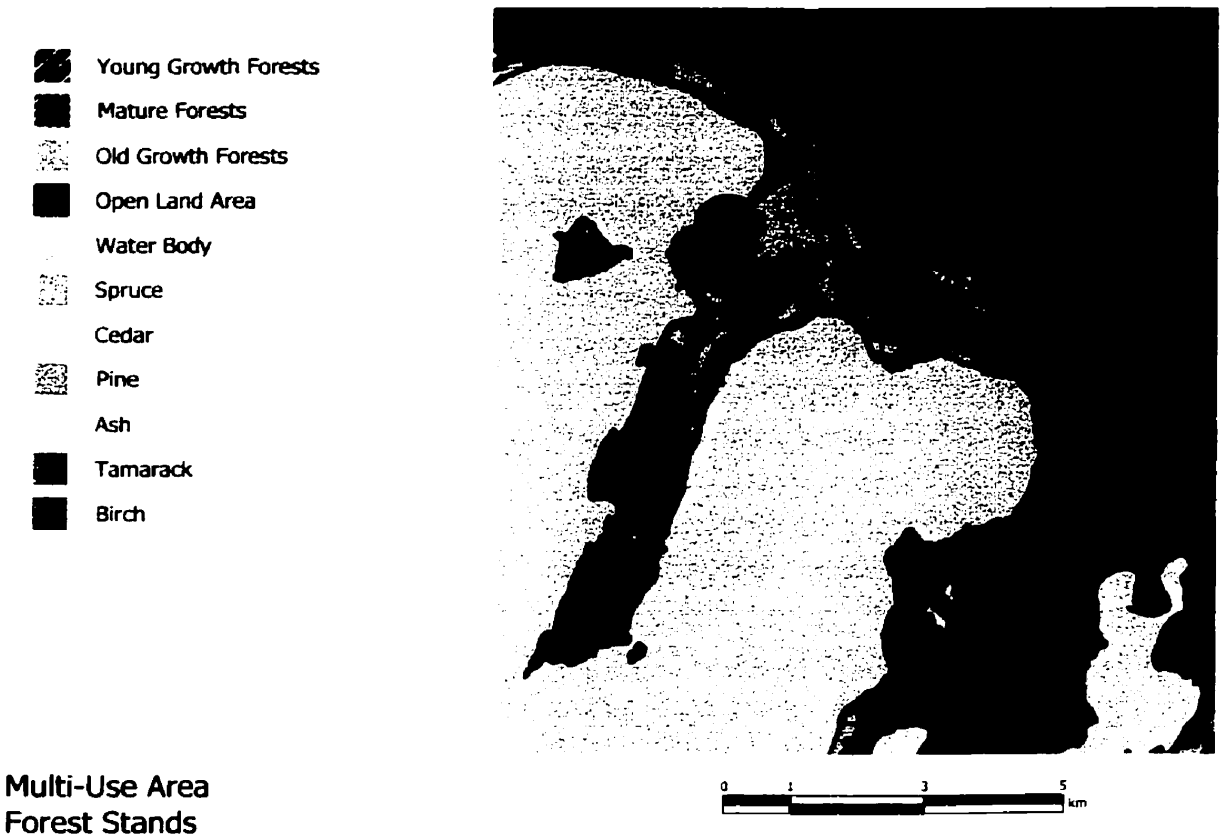


Figure 67 - Multi-Use Area - Forest Stands

Figure 67 describes the existing forest stands and their respective age classification characterized by young, mature, and old forests. Aggregate development would best occur on sites with little to no vegetation, while recreational activities and development would be more favourable in areas with significant tree cover. Six tree species are outlined on this diagram, which only represent overstory vegetation species. The soils and forests diagrams were not integrated upon one another, as it was evident that patches of open areas and the growth of different species strongly correlated with the suitability range of soil series described in Figure 66; trees are sparse to non-existent on sites containing soils on the lower end of the soil type range.

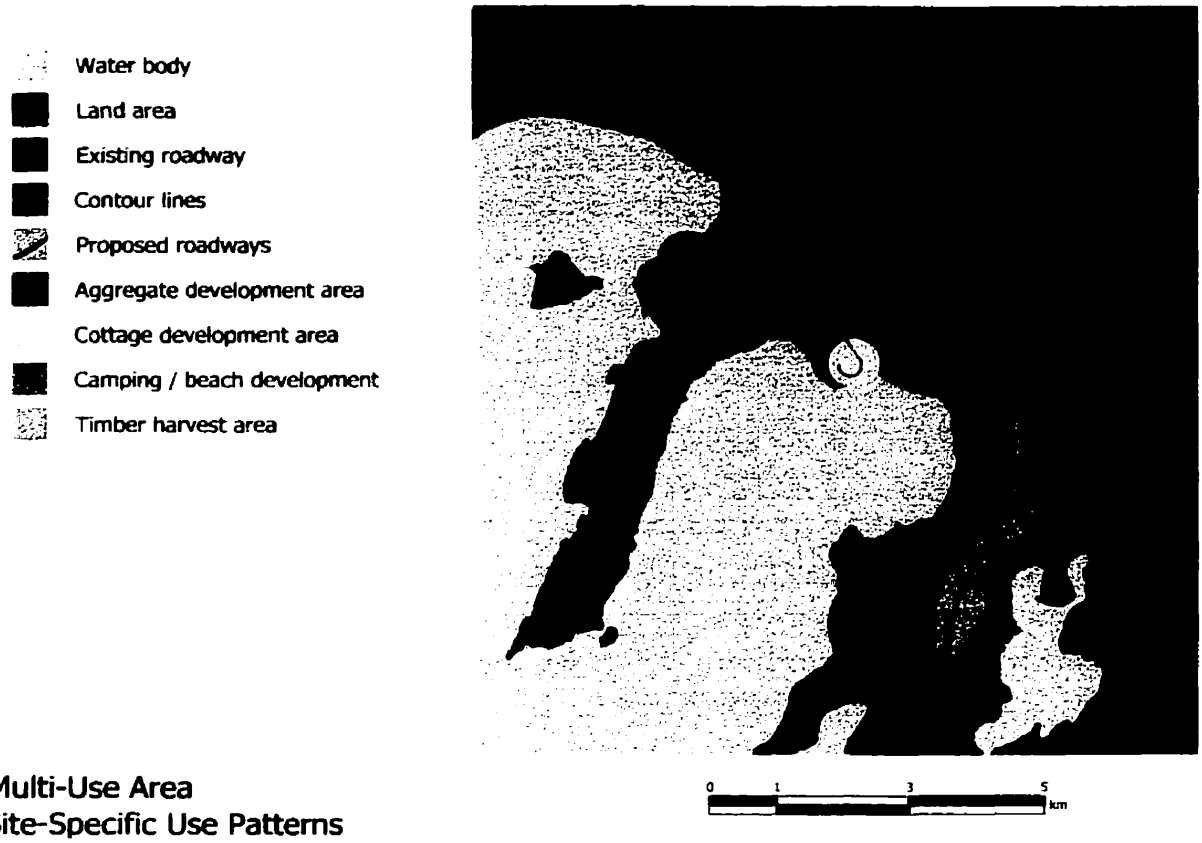


Figure 68 - Multi-Use Area - Site-Specific Use Patterns

Recommended use areas have been identified on Figure 68. This strategy identified two aggregate development areas, one in an existing development area at the north end of Denbeigh Point, and another in the interior area of the management area. Both are located in areas containing optimal soil types. Forest harvest areas were designated east of Skunk Bay - soil and forest conditions are good to excellent for this type of activity, and roadway development could also be accommodated for as identified on the plan. Appropriate buffer areas were provided for adjacent to water bodies and unstable soil conditions. Proposed roadways took into consideration topography, minimizing the slope at which they led downhill to the south.

A cottage development area had been designated toward the north basin of Skunk Bay, within attractive forest stands, suitable soil conditions and close proximity to optimal fishing grounds (Figure 35). A camping and recreational beach development area designated along the east shore of Skunk Bay provides excellent shoreline conditions for recreation, while joint access can be achieved by sharing timber harvest routes. Further analysis on this area can be seen in figures 70 and 74 described later in this document.

Long-term zoning strategy

The development of a long-term strategy plan helps envision how zones may be managed, and the way in which they are transformed into alternate uses. The change in zone limits was a result of a variety of factors, including resource depletion and harvesting, ecological needs, and social demand. The rotation of activities would become apparent in this strategy over a longer period of time. The transitional characteristics of this long term strategy can be seen in Figure 69.

Resource use areas were the most prominent zones of transition in the study area. As forests mature in a cyclical nature, harvest areas shall follow trends in the development of mature forest stands. For example, the land area between Lake Winnipegosis and the Kawina Lake protected area had been identified as an active forest harvest area in the five-tear strategy, and upon reasonable consumption may become a recreational use zone. Forested land which experienced active harvesting may become excellent hunting grounds, and also promote more abundant animal populations; the development of trails and roads may provide greater accessibility for hiking, trail riding, stream access, etc.

A second area of significant change introduced by the 25-year strategy plan was the extension of the protected area surrounding Kawina and Katamik Lakes further west. An established roadway from timber harvesting may potentially become a multi-use corridor, accommodating potential hydro lines and

recreational accesses. Further, this would establish a protected migration route for bird species amongst marshland between Lake Winnipegosis and Katamik Lake, and also allow visitors to closely examine the way in which the landscape returns to a new state once under disturbance. It is important in this strategy to incorporate public education into management as a means of helping people understand both the adverse and beneficial effects of active land use and environmental management.

A third area within which changes were made included the establishment of a Settlement RMZ along the south shore of Long Point. The natural features of this area would accommodate an increased demand for tourism and cottage development within this region. In accessing this area with a vehicle, visitors pass through a Protected Area RMZ, and are within close proximity to numerous streams which access Lake Winnipeg and have high recreational potential. Passing through a protected area increases public awareness of the value of protection, and makes these areas more accessible to visitors in a controlled manner.

These are a few of the examples which help to understand the rationale behind the decision-making process in this study. Many other issues shall become apparent in later stages of this study. What is important to realize is that, within this management plan process, setting long term goals and strategies provided

an understanding of ecological capacity, the change in social demand, and the reconciliation of issues through land and resource allocation and management.

e) Identify opportunities / constraints - reconcile prevailing issues through site specific recommendations

A set of opportunities and constraints had been identified, which translate the desired patterns and uses of interest groups. It also took into consideration land and resource features and how these potential activities would work within the entire region. Developing a zoning strategy involved the allocation of land and resources for active use, as well as different levels of protection. This study took management to a further level of detail, including site specific recommendations at a variety of scales. At this stage, the land and resource characteristics described earlier in this document become essential to incorporate into these site specific recommendations. This section includes a list of opportunities and constraints, and will follow with a list of potential design features. These design features are then graphically illustrated to demonstrate how these uses can occur in an environmentally responsible manner.

Opportunities

1. Mixed Use Area
   - Site conditions create high potential for cottage development along Skunk Bay
   - Suitable conditions for beach development along the north shore of Skunk Bay
   - Established pier on west shore of Denbeigh Point
   - Established access route to southern tip of Denbeigh Point from PTH #60.
   - High Aggregate Potential along PTH #60
   - Significant relief creates interesting terrain for hiking trails

2. Riparian Protection Area
   - Existing wetland corridor for migrating birds and other related species
   - Excellent representation of a successionally mature wetland area

3. Resource Use Area
   - Established access from PTH #60 to the north
   - Existing forest harvest area with abundant mature forests and high economic potential

- High potential for diverse wildlife habitat
- Ideal location for future hydro corridor development (north to south) resulting from criteria set out by Manitoba Hydro

4. Protected Area
   - Host of significant waterfowl nesting and migration
   - Expansive views from elevated plateau at north end along PTH #60
   - Transitional area between old growth forest and more vulnerable aquatic environments, displaying a variety of ecological conditions

5. Recreational Area
   - Variety of formal and informal access trails for hunting and trapping
   - Host of stream sources linking zone to Lake Winnipeg with adequate depth for canoeing
   - Lakes within this area provide a variety of habitat for diverse game hunting and trapping

Constraints

1. Mixed Use Area
   - Denbeigh Point peninsula has been designated to Chemawawin First Nation as part of a previous land claim agreement, and development is limited
   - Steep slopes to the north create potential of significant erosion
   - Old growth forests hold high potential for forest fires
   - Potential beach areas with sand accretion are temporal and changeable

2. Riparian Protection Area
   - Endangered Species Act must be consulted in designating a management plan
   - Steep slopes to the north create potential of significant erosion
   - Old growth forests hold high potential for forest fires

3. Resource Use Area
   - Old growth forests hold high potential for forest fires
   - Area is adjacent to a protected area; functions of adjacent zones may not be compatible

4. Protected Area
   - Method of defining the borders of this management zone may be difficult to discern
   - Old growth forests hold high potential for forest fires
   - Existing hydro corridor bordering area to the east is well established with a large right-of-way.

5. Recreational Area
   - Old growth forests hold high potential for forest fires
   - Existing hydro corridor through this area may impose restrictions on land use
   - Lakes within this area have low potential for development due to poorly drained soils around them

Suggest Design Features

From integrating opportunities and constraints as previously identified, a list of design features had been suggested. These features reflect the desired land uses of each interest group.

1. Creation of vehicular access routes and pedestrian hiking trails on the north shore of Skunk Bay

2. Shoreline treatment to secure favourable conditions for cottage and beach development

3. Provide boat access to Skunk Bay or Lake Winnipegosis off Denbeigh Point

4. Provide extraction recommendations for aggregate resources north of Denbeigh Point adjacent to PTH #60

5. Establish parameters for edge definition of the Riparian Management Area and Protected Area

6. Develop a system of access roads for timber harvesting

7. Provide recommendations for potential hydro transmission line corridors within this area

8. Designate an appropriate land area to protect an adequate representation of local ecosystem types

9. Provide an adequate buffer and reasonable recommendations for protecting rare and endangered species

10. Provide an interpretive facility adjacent to the Protected Area upon the elevated plateau at north end along PTH #60

11. Promote the rivers in the south of the management area as part of a regional canoe system

Identify Prevailing Issues

Of the 11 suggested design features, this study identified a list of demonstrable issues. These issues were a result of apparent conflicts - either the resource use activity conflicted with ecological integrity, or one resource use conflicted with another resource use. As a result, seven issues were identified, and these were resolved spatially at a variety of scales. These resolutions immediately follow this list in the section entitled "Resolution of Prevailing Issues".

1. Development of logging haul roads have an effect on local ecosystems; recommendations for future alternate uses shall increase the potential of these corridors

2. Promoting ecological integrity of natural resources and the development of hydro corridors are two processes not seen by humans as compatible; recommendations shall attempt to display how these processes may be mutual

3. Edge conditions between management zones shall reflect an ecosystem based approach to management; edges shall be easily distinguished while on the land yet adequately promoting ecological integrity

4. Provide a recommendation of shared access to Skunk Bay and Denbeigh Point for local, non-local, and First Nation users

5. Aggregate extraction has a significant impact on the land surface; the method of more ecologically responsive extraction and rehabilitation should be recommended

6. Cottage and camping development increases the potential of human-created fire outbreaks; development surrounding settlement areas shall consider minimizing the spread of forest fires

7. Manipulation of shorelines may cause abnormal shoreline erosion and potentially local water nutrient overloading; shoreline treatment would not only protect land from eroding but may also promote favourable sand accretion

The resolution of these seven issues will be demonstrated in the section entitled "Resolution of Prevailing Issues", beginning on the next page.

Resolution of Prevailing Issues

Aside from understanding the prevailing issues through recommendations at a certain spatial level, it is essential to consider the implication of these issues at other potential scales. The intention of these design resolutions was to provide recommendations which were transferrable to sites with similar biophysical conditions. As documented in the work by Foreman, Dramstad and Olson (Foreman et.al., 1996), spatial resolutions of social and ecological issues can be represented at one, or a combination of, three levels, including:

a) macro scale - introduces issues of broad context which can be easily identified at a regional scale; patterns of resolution can be replicated in one of many applicable areas throughout the region without site specific recommendations, and may be demonstrated upon regional scale maps

b) meso scale - spatial resolutions begin to consider more site specific elements; design recommendations may be done on air photos which begins to show a more specific region, and begins to describe specific topographic elements; design recommendations may be a combination of patterns and specific components

c) micro scale - site specific conditions dictate desired landscape conditions with specific designed components; reconciliation may occur at a site level with direct reference to immediate topographic conditions; the study of issues such as treed lots, soils and site opportunities help address social demands in an environmentally responsible manner

1. Development of logging haul roads have an effect on local ecosystems; recommendations for future alternate uses shall increase the potential of these corridors (macro scale)

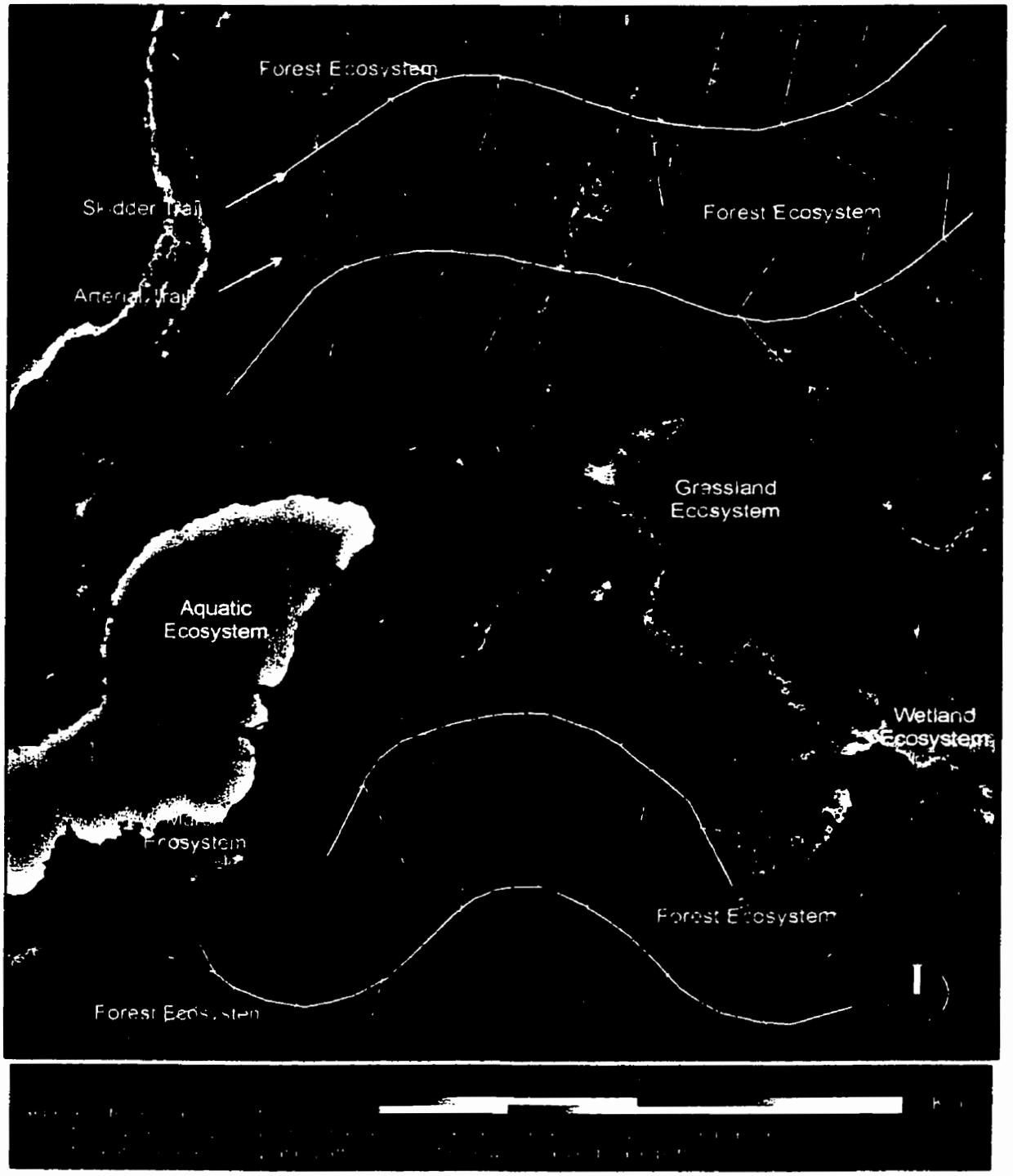


Figure 70 -Development of timber harvest access roads

Accessibility to timber resources is essential in the harvesting process of wood products. A network of access roads is typical of forest harvesting land, however the shape requires only a single access route through its interior with skidder trails extending perpendicular from it at approximately 1 km intervals. (Figure 70) The primary access road must be at least 5 m wide to accommodate large trucks, with turn-out stalls at 500 m intervals to accommodate for on-coming traffic. Skidder trails typically follow suitable topography along higher ground avoiding features such as marshes, ponds, and streams. The distance which these trails stem from the main road will be variable, and will also reflect desired patterns of forest harvest management, as seen in Figure 70.

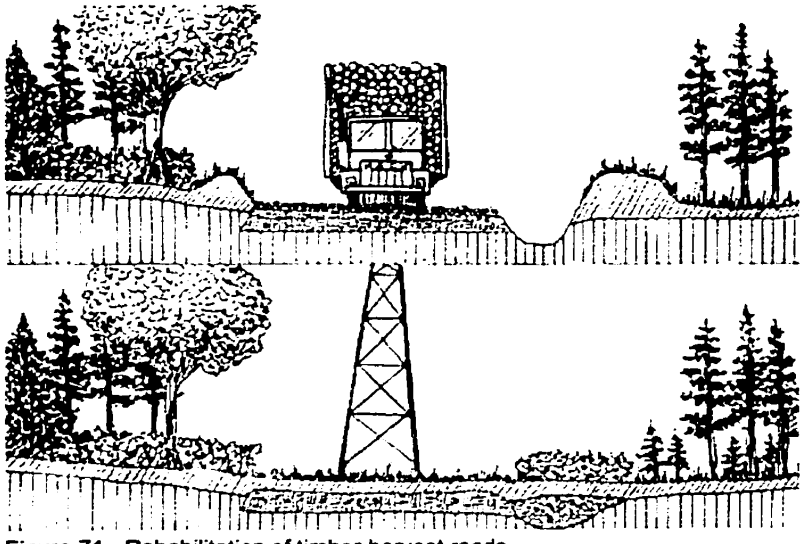


Figure 71 - Rehabilitation of timber harvest roads

As part of the 25 year management plan, the primary access route may be used as a primary base line for future hydro corridor development. This orientation is suitable for both uses, and requires minimal intervention. Stripping material from required ditches shall be used as the primary base course for the roadway; aggregate requirements for a secondary base course need only be of Class 'C' material, which has a sieve

size large enough to be integrated into backfilled areas. The process of creating access routes and their measures of rehabilitation can be seen in Figure 71. Upon rehabilitation, the installation of hydro towers would not require additional clearing or damage to the ground structure. Further, this cleared right-of-way would have compacted the soil structure sufficiently to prohibit the growth of trees. Shrubs, herbs and grasses are acceptable vegetation types to grow immediately beneath towers. This resulting condition would yield adequate access for off-road vehicles for future hunting and trapping access.

2. Promoting ecological integrity of natural resources and the development of hydro corridors are two processes not seen by humans as compatible; recommendations shall attempt to display how these processes may be mutual (macro scale)

Figure 72 - PTH #60 ROW with adjacent hydro transmission line

Social disputes toward hydro corridors in the Long Point region are due to visual contact with such infrastructure development. These extensive corridor systems are controlled by design codes established by Manitoba Hydro which are intended to minimize the cost of maintenance. From discussions with Hydro experts it is evident that there is potential flexibility for corridor development. The typical linear right-of-ways need not be maintained for accessibility, rather for safety requirements; Manitoba Hydro maintenance equipment is capable of overcoming extreme conditions, and the clearing of

corridors helps to control growth which could interfere with power lines. Consequently, corridors may undulate in width and also take indirect routing patterns in areas visually accessible to users. (Figure 70)

It is essential to portray to the public that ecological integrity can work in conjunction with corridor development. Little, if no, visual damage is caused by equipment used in the installation and maintenance of lines. This equipment does not compact soil structures due to flotation tires and tracks, as well as the more common use of helicopters for maintenance and access. Plant and wildlife species which experience a natural flow from one patch to the next would seldom be disconnected from adjacent patches when corridor widths are minimized and surface vegetation is permitted - in contrast with the conditions presented by the PTH #60 right-of-way.

Social concerns with hydro corridors are also due to the visual impact they have on the landscape. As a method of minimal intervention along PTH #6 and #60, corridors have been screened at points of intersection with vehicular routes. As discussed in the previous spatial resolution, corridor widths could also be much narrower and follow routes which have already been established and disturbed. As vehicular corridors have less of a negative perception felt by society, perhaps an increased acceptance of hydro corridors would prevail considering the multi-use strategy as prescribed by this study.

3. Edge conditions between management zones shall reflect an ecosystem based approach to management; edges shall be easily distinguished while on the land yet adequately promoting ecological integrity (meso scale)

Through examining past land and resource management plans in Canada, it is apparent that most management blocks are rectilinear, hard-edged zones with defined borders. This is often necessary when management recommendations do not carry over from one zone to the next, and field users must distinguish edges and boundaries easily. For example, Manitoba's Wildlife Management Areas within wilderness environments are bordered by three to five meter wide clearings; signs are posted at approximately 200 m intervals. These features help hunters and trappers discern hunting areas from non-hunting areas. The edge condition which this spatial resolution will focus on is that between Protected Area 1 and Resource Use Area 1.

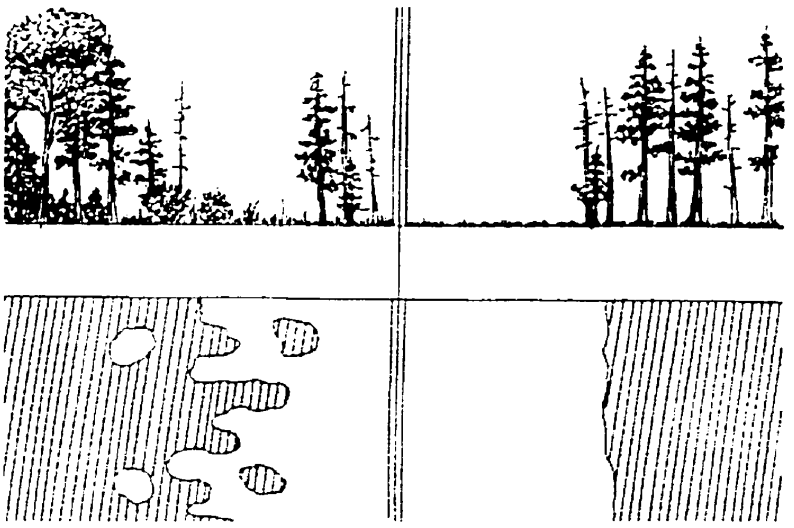


Figure 73 - Ecological effect of edges in forest harvesting

The ecological effect of forest harvesting is the issue described in Figure 73. (Forman, 1996) The diagram shows the selective removal of vegetation, and a probable effect on the forest structure. Disturbance tends to extend further into

protected areas when edges are straight; the effect of wind, disease, and increased exposures to other elements can be minimized through an edge strategy as described on the left of Figure 73. Although extended blocks of vegetation may be overcome in time by exposures, damage to existing vegetation would tend not to occur. In time, secondary vegetation growth would prevail in cleared areas. This pattern would also better replicate natural edge conditions and be more consistent with previously existing site conditions.

4. Provide a recommendation of shared access to Skunk Bay and Denbeigh Point for local, non-local, and First Nation users (meso scale)

As Denbeigh Point has been designated a land entitlement area for Chemawawin First Nation, its use and designated activities are controlled by the First Nation's council. Access through the site, however, is not exclusive to its members. Due to slope conditions and an established vehicular right-of-way south from PTH #60 down Denbeigh Point, it is advantageous to access the north shore off this route directly to the east. This access route must consider both slope stability, efficiency in length, as well as aesthetics. The resolution provided here at a more site specific level takes into consideration topography, forest stands and point of origin / destination. The desired access route can be seen in Figure 74.

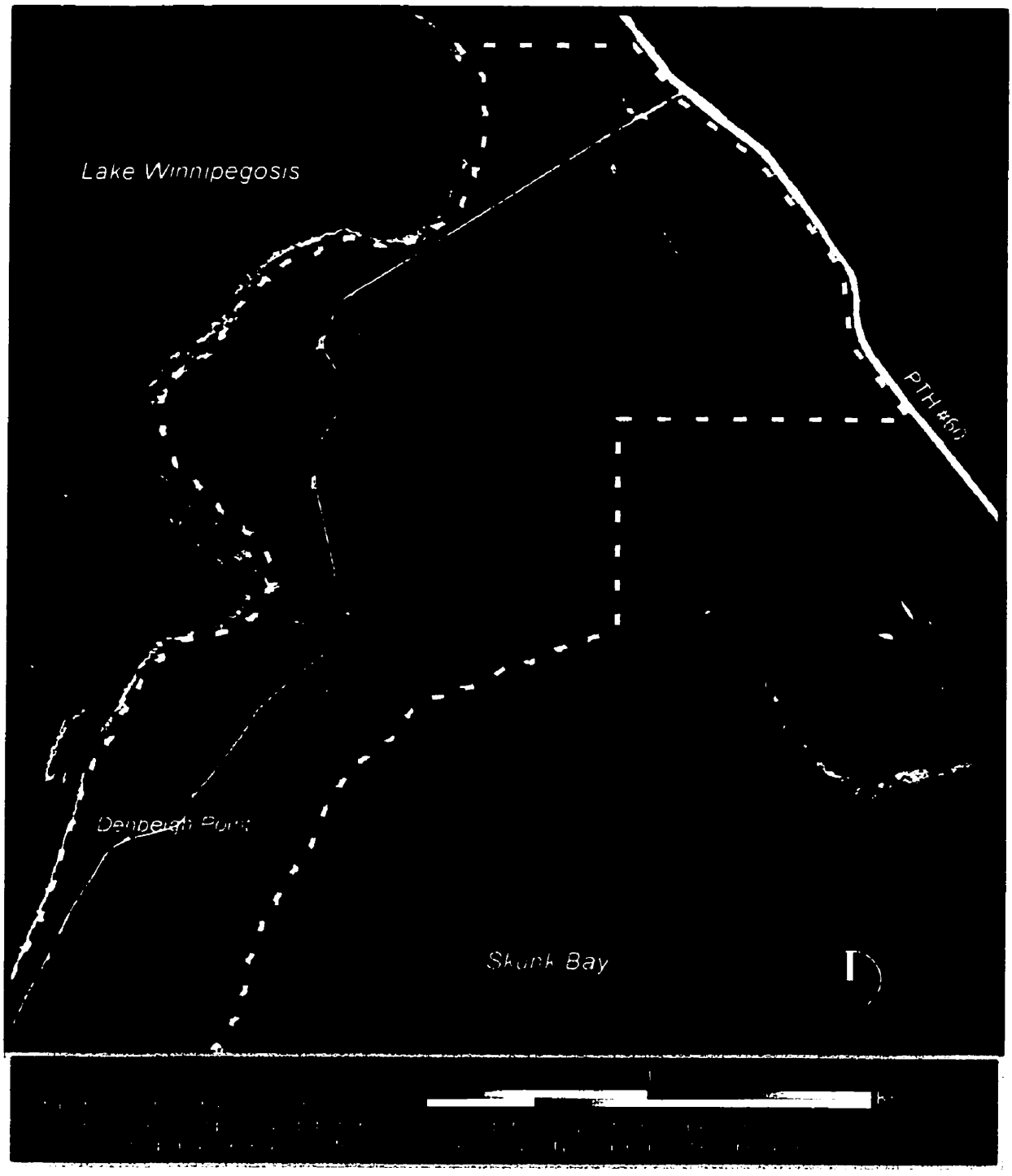


Figure 74 - Shared access route, Skunk Bay / Denbeigh Point

5. Aggregate extraction has a significant impact on the land surface; the method of more ecologically responsive extraction and rehabilitation should be recommended (meso scale)

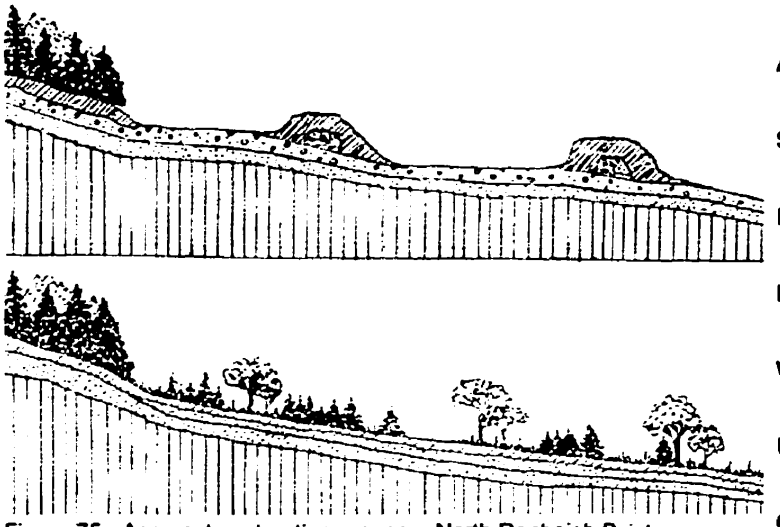


Figure 75 - Aggregate extraction process, North Denbeigh Point

Areas within the Long Point study region are of significant relief to the surrounding area, resulting in steeper slopes which hinder development upon them without causing concerns such as erosion. Figure 28 describes slope conditions throughout the region; this design feature focuses on land at the north end of Denbeigh Point near PTH #60. A diagrammatic scenario, as seen in Figure 75, describes a process of opening, operating, and rehabilitating surface extraction areas. The first stage of implementation involves the removal of overburden material and surface vegetation to expose soils of adequate stone content. Tree stock shall be removed from the site, while branches, shrubs and grasses may be placed in the bottom layers of berm developments. Surface soil can then be placed on top, and be later used for surface capping procedures. Strips of removal should not exceed intervals of 50 m, and additional berms shall be established further downhill. This process minimizes soil erosion beyond bermed strips, and creates ledges of land which can easily support more rapid regeneration of vegetation.

6. Cottage and camping development increases the potential of human-created fire outbreaks; development surrounding settlement areas shall consider minimizing the spread of human-caused forest fires (micro scale)

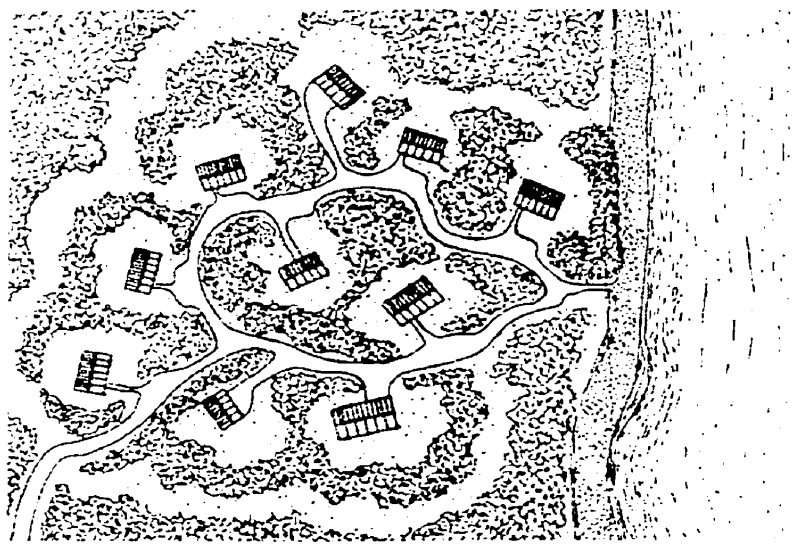


Figure 76 - Cottage development orientation to minimize fire outbreak

The establishment of a campground within the Multi Use Area RMZ poses an increased threat of forest fire. Dense forest stands surrounding a proposed cottage area cause great concern in relation to human-caused fire outbreak (Figure 76). Although fires are understood to be a vital component of the regeneration of forests in the Manitoba Lowlands, human-caused fires are not a natural disturbance. Further, campgrounds may attract a large number of people, and human safety becomes a great concern. Designing a campground facility which reduces the possibility of fires spreading from site to site would be an effective measure of increasing efforts in fire suppression. Figure 76 demonstrates a stall orientation which promotes this effort, while attempting to maximize the amount of natural vegetation to maintain the aesthetic character of the site.

7. The disturbance of shorelines through development may cause abnormal erosion; shoreline treatment would not only protect land from eroding but may also promote favourable sand accretion (micro scale)

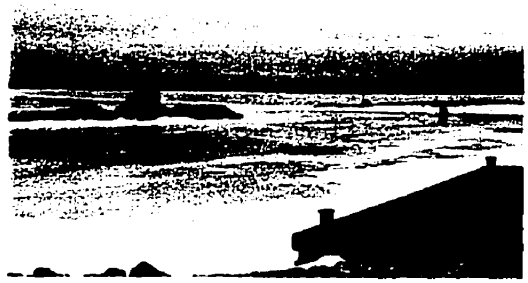


Figure 77 - Shoreline reconstruction on Lake Winnipeg

In order to increase the quality of shoreline recreational space, it is essential to assure adequate long term conditions. The implementation of a breakwater series at a site-specific level would promote fine sand accretion, allow for excellent boat and float plane docking facilities, and designate zones of different use. Figure 78 shows an example of a series of stone breakwaters in a configuration which would allow for a variety of recreational uses. Further, this development would minimize the recession of shorelines due to high water levels, wave action and ice scouring.

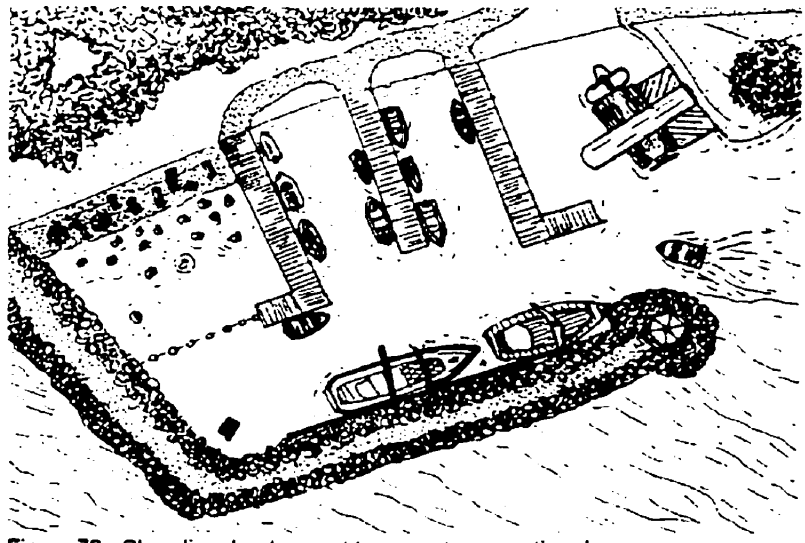


Figure 78 - Shoreline development to promote recreational use

g) Introduce Parks Canada and national parks - management practices and legislation

Introduction

National Parks exist throughout our country for the purpose of preserving examples of our nations diverse environments present and the ecological condition within. As stated in the National Parks Act, these parks are dedicated to the people of Canada for their benefit, education and enjoyment; the National Parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations. (Parks Canada, 1997) Although these areas have been designated as protected areas from both commercial resource extraction and wildlife harvesting, they are not inaccessible; they have been created as places for visitors to experience the outdoor realm, and gain an understanding of the natural environment.

As a precedent, this report describes a national park within the Southern Boreal Plains and Plateaux Ecosystem, Riding Mountain National Park in the upcoming section entitled "Riding Mountain National Park". Although the ecosystem type is different from that of Long Point, it does share many physical characteristics and topographical features. Further, the scale of these developments are comparable, having similar ecological structures and design challenges.

Ecological Integrity of Canada's National Parks

"National Parks are established for the purpose of assuring benefits, education and enjoyment to all Canadians. In the legislation and policies for Canada's National Parks the priority objective is maintaining ecological integrity." (Parks Canada, 1998) For the last ten years Parks Canada has made significant progress in regards to understanding the ecological integrity of the natural environment. This helps promote more effective means of conservation and preservation methods of national park planning processes. Many of the current proposals, including that of the Manitoba Lowlands, are in northern locations and include a requirement for negotiation and consultation with First Nations.

Ecological integrity, according to Parks Canada, is the condition of an ecosystem where 1) the structure and function of the ecosystem are unimpaired by stresses induced by human activity, and, 2) the ecosystem's biological diversity and supporting processes are likely to persist. Each park may contain several zones with differing ecological conditions and levels of management. In Banff National Park, for example, there are five different ecological zones, each calling for a unique conservation strategy. These zones include areas of special preservation, wilderness, natural environment, outdoor recreation and park services. It is apparent that planners have recognized the extreme sensitivity of a site and responsibly understood an appropriate manner of conservation.

National Park Policy - Current Legislation

Work done by Parks Canada is guided by the National Parks System Plan. This plan describes "the goal to represent each of Canada's 39 terrestrial natural regions through the implementation of national parks." (Parks Canada, 1997) But an unclear issue is that of the sustainability of national parks at a local level. This is the premise of part two of this practicum study, and is discussed further in the conclusion.

> *"The federal government is committed to implement the concept of sustainable development. This concept holds that human economic development must be compatible with the long-term maintenance of natural ecosystems and life support processes. A strategy to implement sustainable development required not only the careful management of those lands, waters and resources that are exploited to support our economy, but also the protection and presentation of our most important natural and cultural areas." (Parks Canada, 1997)*

According to 1998 amendments to the National Parks Act, a parks management plan must ensure the protection of "ecological integrity". (Parks Canada, 1998)

First Nation Involvement

The National Parks Act states that: "(1.4.3) parks will be established pursuant to agreements with the territorial government and with relevant Aboriginal organizations; (1.4.10) existing Aboriginal treaty rights of the Aboriginal peoples of Canada will be honoured; (1.4.11) in areas subject to existing Aboriginal or treaty rights or to comprehensive land claims by Aboriginal peoples, the terms and conditions of park establishment will include provision for continuation of renewable resource harvesting activities, and the nature and extent of Aboriginal

peoples' involvement in park planning and management; (1.4.12) in addition to Aboriginal or treaty rights, when new national parks are proposed within areas where local people have traditionally depended on the land for subsistence and no immediate alternative can be found, an agreement may be negotiated regarding the continuation of specified subsistence resource harvesting activities for a finite period of time, subject to regulation." (Parks Canada, 1997) These accommodations, however, are made specifically to First Nation groups.

Riding Mountain National Park

Mandate

Riding Mountain National Park, located in southwestern Manitoba, is mandated to protect for all time representative landscapes and their naturally evolving ecosystems of the Southern Boreal Plains and Plateaux Natural Region.

History

Various Aboriginal groups wandered throughout this portion of the province. Traditionally, the Nakota (Assiniboine) Nation claimed this area as their home, until the westward migration of the Ojibway. Reduced populations due to European diseases resulted in a significant change of tribal boundaries; a decrease in bison herds and other resources forced Aboriginal groups to move on from the Riding Mountain area.

These Aboriginal groups were active in the fur trade, as well as being active fishermen and gatherers. Upon confederation, treaties were signed between the Government of Canada and Aboriginal peoples creating the reserve system we observe today. This led to several First Nation communities now located around the Park. Much of what is now known of the history of this area was recovered by oral histories of various First Nations' elders. The abundance of water was known as a dominant feature of Riding Mountain.

European settlement occurred in this area in the late 1800's. Since this time human inhabitancy has left many signs of settlement throughout the Riding Mountain region, some of which have been recognized as historic sites within Riding Mountain National Park. Many of the current facilities found within the park boundaries were created during the depression when the park supported a large work camp. In 1930, the federal Department of the Interior relocated the Keeseekoowenin Objiway First Nations, which was initially located near the present community of Elphinstone. As a result of a claim by this First Nation group of wrongful removal, the land was designated back to the reserve in 1991. Further land areas, also known as the 1906 lands, are currently being pursued by the Keeseekoowenin Objiway First Nations.

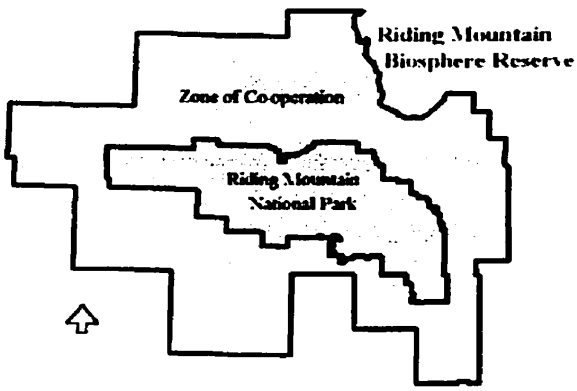


Figure 79 - RMNP land area

Physical Characteristics

Riding Mountain National Park (RMNP) covers a total land area of 2,976 square kilometers. (Figure 79) A prominent feature of the park is its height in relation to the surrounding agricultural land, at an elevation of 756 meters above sea level. RMNP is of the last remaining woodland areas of Western Manitoba, and part of the Manitoba escarpment. Three distinct landscapes are found within the confines of the park area, including Eastern Deciduous Forest, Boreal Forest and

Grasslands. As a result, a diverse system of wildlife and vegetation remain within the protected areas of the park boundaries.

Ecological Condition

Remnant grasslands, occasional in the east portion and more common to the west, remain important contributors to the biological diversity of the Park as a whole. While some sites are resistant to succession, many prairie openings are giving way to shrub and forest communities of the aspen parkland with a lack of fires. Although several wildlife species have disappeared from the area in the past, the varied and productive landscape still supports diverse and complex communities of flora and fauna, including some rare and endangered species. The size of Riding Mountain National Park allows many - but not all - normal ecological processes to function to a great degree, while the surrounding agricultural lands retain remnants of their original habitat sufficient to harbour some wildlife and native vegetation. The main objectives of the management structure of Riding Mountain is to maintain integrity of each of the above stated areas, with careful consideration of the effects which the confined nature of the Park has on its ecological state.

Design Installations and Recreational Features

Located on the eastern border of Riding Mountain National Park near McCreary is Agassiz Ski Resort, including a chalet, a licensed lounge, full ski rental and

repair shop. A small bison herd of approximately 30 animals is found within a fenced range of 647 hectares near Lake Audy. Clear Lake, a spring-fed body of water as deep as 33 m, is a place where people can swim, boat, wind-surf and fish.

For some time after the opening of the Park in 1931, a man known as Grey Owl gave talks and shows with his pet beavers, Jellyroll and Rawhide; his cabin can be visited in the park. The Town of Wasagaming is located on the south shore of Clear Lake, providing a variety of world class facilities, including a 18-hole golf course, tennis courts, lawn bowling and canoeing. Motels, resorts, shops, restaurants, a cinema, campsites, a marina and a big dance hall are also found within the townsite. Two 1930s log buildings, Park Theatre and the Wigwam Restaurant are designated as provincial heritage sites.

Design Motivation

When talks of a national park for Manitoba began in the 1920's, politicians within the area favoured the location at Riding Mountain. Residents also approved of this location, as the area was aesthetically attractive and its natural features represented several landscape types found throughout the province. A secondary motivator in the designation of a national park was the potential recreational and economic benefits for western Manitoba.

Design Challenges

Lately, it has been felt that RMNP is too small in area to be an ecologically sustainable system. The surrounding land area abruptly becomes agricultural land without transition from the natural park environment. A connection between this land and that of Duck Mountain Provincial Park once provided an ecological corridor allowing species interaction and increased ecological health RMNP. It has been suggested that cooperative management between government and private may help establish such a connection. Although it may not be necessary to physically increase the park limits, a more sincere management strategy for surrounding land areas may become beneficial. Land use practices and management strategies on either side of park limits have interfered with natural processes which traditionally promote ecological health. Riding Mountain is evidently an island of wilderness within a sea of agriculture.

Although not the case in the Long Point study area, land allocation becomes rather difficult when land is privately owned. Riding Mountain National Park was created at a time when reserving its land area was not as difficult as it would be today. One issue which should have been addressed at this time was establishing guidelines for the future need for buffer zone management. RMNP is a land reserve within a sea of open agricultural land, and the need to establish a buffer zone surrounding this island has become a current recommendation.

Summary of Parks Canada Management Strategy

The mandate of Parks Canada firmly states that ecological integrity is of prime importance to national park planning. The introduction of Riding Mountain National Park is valuable to this study, as it begins to suggest the activities which national parks can promote. Further, it expresses potential ecological problems which can arise after a longer period of management. Within the confines of RMNP is a wilderness oasis with plentiful wildlife, well maintained and preserved ecological systems and first class facilities to accommodate guests. Developments such as Riding Mountain National Park prove that the national park program can indeed provide the opportunity for all people to enjoy our natural environment. However, the establishment of parks and the on-going negotiation process between Parks Canada and adjacent landowners presents a set of issues which are not immediately apparent to visitors. While practicing sound management to promote ecological integrity, personal interests of local individuals and other stakeholders are often challenged.

h) Compare management strategies

The final objective of this study was to compare the management recommendations of this study with planning principles and strategies of Parks Canada. Creating a spatial national park model for the Long Point study area would be an in-depth process beyond the scope of this academic study, and would require numerous assumptions. The guiding principles which are used to establish national parks (as found in the National Parks Act and Parks Canada System Plan) adequately provided an idea of potential strategies which would influence the Manitoba Lowlands National Park. The comparison of these two strategies helped to understand what activities or ecological features would be jeopardized, or even discarded, by either approach.

Should community development increase throughout central Manitoba in future years, the Long Point study area may soon be unable to expand its management limits, as in the case in Riding Mountain National Park. Private land ownership is currently not an issue in the Long Point study area, yet there is an established interest in the land and its resources. In many other instances within Canada, private land ownership is one of the primary constraints in designating a management plan to a given area of land. Management strategies must consider a buffer zone, or predetermined land surrounding the study area, as part of its management plan. "We have come to realize lately that the park (RMNP) itself is too small to be a self-regulating ecosystem. In the long-term, preserving all of the

life forms and ecological processes currently found here will require co-operative management within the whole region by everyone from private landowners to government departments." (Parks Canada, 1998)

> "Decision making processes are extremely cavalier about other peoples' property and casually, as in the case of RMNP, talk about managing the land around the Park as if the federal government had some inherent right to the place. Surely there are public resources such as wildlife and water throughout the farms but the local attitude is that if the public cares about them then they should pay for their upkeep, not the landowner." (Sopuck, 2000)

The concept of a self-regulating ecosystem, as in RMNP, is difficult to imagine within the confines of the Long Point study area. A valuable lesson learned from the RMNP experience is the need to respect existing ecological processes through an intimate understanding of species requirements. Although a management plan would potentially delineate management practices for the designated area, it may also become essential to suggest strategies for adjacent land. The Long Point land selection must deal with a much greater amount of shorelines, which is not the case in RMNP. Long Point is a wilderness oasis surrounded in many areas by water.

Both RMNP and the Long Point land selection have a major highway running through the centre of its land area in a north-south orientation. Management strategies must identify design characteristics of highway right-of-ways in accommodating species flow and the interaction between traffic and nature, while still conforming to modern highway safety regulations. PTH #10 currently

runs through Riding Mountain National Park; curves were added to its course for aesthetic purposes, making conditions less safe with both ice in the winter and abundant wildlife crossings year-round. For example, abundant curves reduce sight line distances, reducing a driver's potential reaction distance. Manitoba Department of Highways has expressed an interest to retain control of PTH routes within the Manitoba Lowlands National Park area, and would retain current standards which promote highway safety and efficiency. (Hiller, 1999)

The potential of problems with federal ownership of major highway right-of-ways in Manitoba was evident with the transfer of jurisdiction of a segment of PTH #10 running through Riding Mountain National Park. More stringent weight and speed restrictions were enforced, eventually eliminating PTH #10 as a major link for commercial trucking between northern and southern Manitoba. This highway, however, is not the only route leading from north to south of the park, therefore not completely prohibiting large loads or heavy flows. In the instance within the Long Point proposed area, PTH #6 is the only route to all of northern Manitoba, thus becoming a more sensitive issue than that seen in Riding Mountain.

Past negotiations between Manitoba Department of Highways and Parks Canada have proven that Parks Canada is extremely firm on their position of disallowing resource identification and extraction from within national park boundaries. However, as Parks Canada is reasonably concerned about lowering

tax dollars spent unnecessarily, there is still potential for resource identification in the park confines. (Hiller, 1999) Considering the historic presence of numerous active and inactive quarrying locations, limited resource extraction has traditionally occurred while jeopardizing ecological integrity at a regional scale. Highways Department had indicated that depleted quarries would be satisfactorily reclaimed using standard rehabilitation fees submitted by contractors, then turned over to Parks Canada and declared federal jurisdiction. (Hiller, 1999)

The protection of rare and endangered species is critical in national park planning. Protected areas are prevalent in national parks throughout Canada, which works hand in hand with maintaining ecological integrity. The development of tourist facilities, however, begin to impede upon ecological integrity. In March, 2000, the Minister of Canadian Heritage, the Honourable Sheila Copps, announced a series of immediate actions to protect the ecological integrity of Canada's national parks; this followed the release of the report of the Panel on the Ecological Integrity of Canada's National Parks, which found that the ecological integrity of virtually all of Canada's 39 national parks is threatened from a variety of internal and external sources. (Parks Canada, 2000) Many of these apparent threats are related to recreational development which promotes increased tourism - recreation which is not typical to the park area (Ms. Copps specifically eluded to golf courses as an example). Parks Canada is currently

faced with the similar dilemma of reducing services in order to preserve and promote ecological integrity and natural land uses. The recreational uses suggested by this study have an extremely minimal impact on ecological integrity, such as camping and shoreline recreational development as seen in Figure 78. These are activities which have traditionally been supported in national parks, yet may soon be limited if not eliminated within future park areas.

To date, national parks have not accommodated the development of new high voltage hydro corridors and tower structures. They have permitted electrical structures in order to service the facilities within a park, yet not nearly at the scale as suggested in the Long Point management plan. The site-specific recommendations made by this study cannot be easily measured against Parks Canada principles. These recommendations are meant to demonstrate the reconciliation of issues through site-specific design solutions, while minimizing the impact which these activities have on ecological structure.

The concept of zoning as a method of allocating use types is certainly not a new practice. Most LRMP processes seen across Canada use a zoning strategy in order to categorize function and better designate desired activities. Further, the types of management zones and recommended functions are a result of site-specific analysis. The level of management is usually due to the sensitivity of the ecological structure. This study does not detail levels of management, yet a

range of requirements is obvious. For example, protected areas within the Long Point study area may include rare and endangered species which require active management, while preserving old growth forests requires a more passive strategy. A variety of management levels are prevalent in national parks.

Land and resource management plans tend to immediately state a vision - this study supports responsible land use, in which we must deal with environmental, social, and economic factors. Within the Long Point study area there are groups of people, an environment to manage and economic growth to facilitate. Simply emphasizing the value of one and fully satisfying its needs is not a sustainable solution. While providing environmental protection, we often forget about those who intimately depend on land and resource use as a way of life. Wilderness advocates often remove local needs from any environmental equation. The alternative plan identified in this study supports that a land and resource management plan has to accommodate the needs of local economies, just in an environmentally responsible manner. Parks Canada management planning takes a more aggressive approach toward environmental protection, with less consideration towards traditional uses than this study.

The concept of economic and ecological sustainability is essential in land and resource management planning. These are two fundamental terms which we often hear Parks Canada advocating. They involve rather complex investigation

and research, and are often extremely difficult to evaluate in the short term. The results of this alternative approach did not measure either economic or ecological sustainability, and this would have been an effective means of testing its results. A valuable lesson in this study was the investigation of site-specific elements and their impact on a regional scale management zoning strategy. The effects which local conditions had on the edges of the proposed management areas, in Figure 70 for example, would influence a much different looking zone plan as seen in Figure 52 and 69. This exercise considered general principles which begin to influence more ecologically responsible recommendations. Although only a few site conditions were considered, this process effectively demonstrated a method of evaluating environmental features and using this information to establish a more environmentally sound management strategy.

4. Conclusion

Through a process of gathering and analyzing information related to landscape features and human uses, a 5-year management plan was established to provide a macro-scale, integrated use zoning strategy (Figure 52). The rationale for selecting these zones was described in more detail through a more thorough investigation of candidate areas at a meso-scale (Figures 57-64). Correlating these environmental features with land and resource use demonstrated how site-specific conditions would inform land and resource management at a much more detailed level (Figures 60-68). A long-term management zoning strategy was established (Figure 69), taking into consideration factors such as potential recreational demand, resource depletion, and succession. The reconciliation of issues was represented by a series of site specific activities imposed upon defined sites (Figures 70-78). These activities were graphically represented through suggesting patterns of use, ranging from macro- to micro-scale, as a result of relevant environmental feature present on these sites. The objective at all stages of this process was to accommodate land and resource use in an environmentally responsible manner.

The investigation of a national park model identified current policies and management strategies of Parks Canada. Further, the description and evaluation of an existing national park helped to understand potential issues which may arise should a national park be established in the Long Point area.

The comparison of management strategies highlighted some stakeholder uses and values which would not be accommodated for through a traditional national park model, and also identified the deficiencies of the alternative management strategy. It takes a thorough understanding of the environment and local economies to manage them in a sustainable manner. This study applied a basic knowledge of the land toward recommendations for spatial land and resource use, yet within its scope did not test its results to the extent to which we can measure sustainability. Agencies such as Parks Canada would engage a team of many individuals from many disciplines over a period of several years to understand the impact of a management plan.

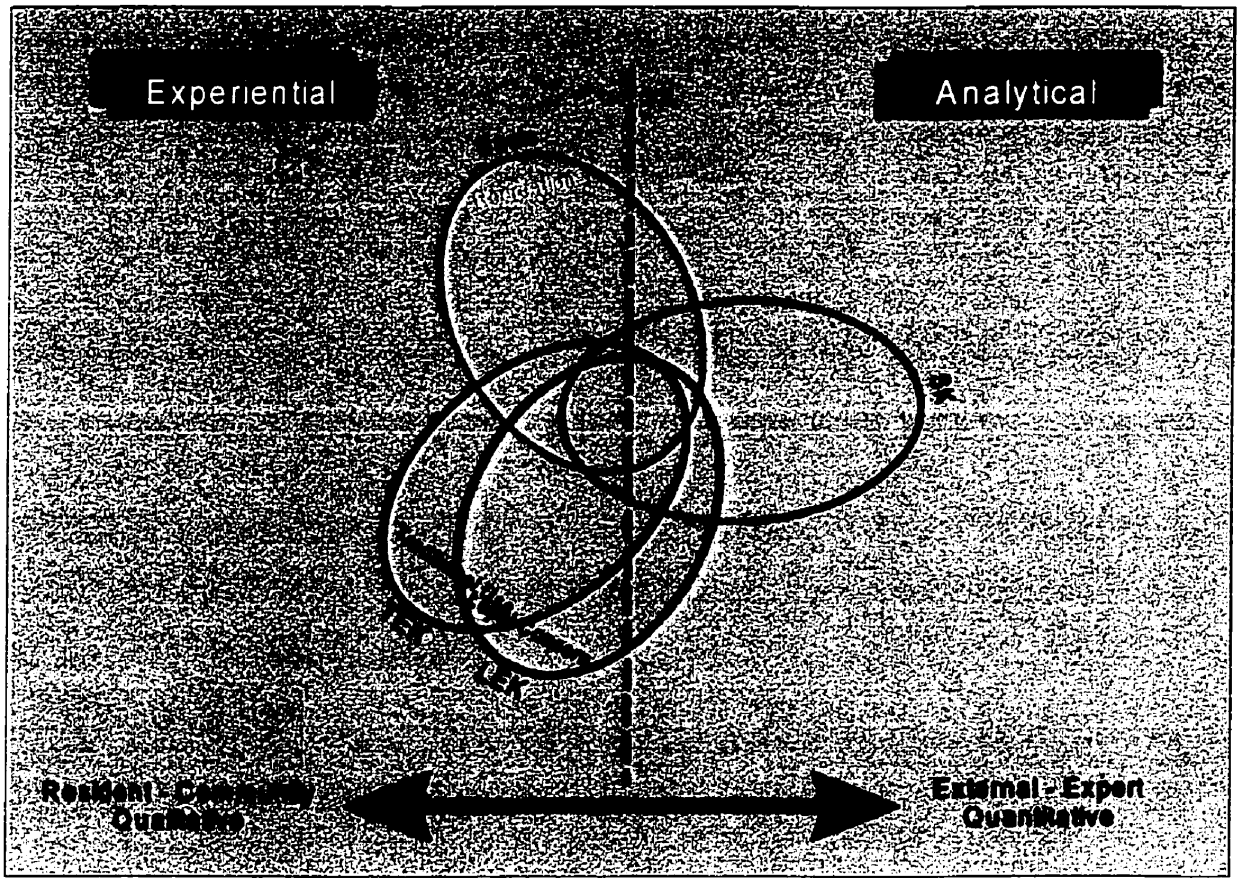
The initial goal of this study, to use cooperative management as an alternative approach, would allow the knowledge of interest groups to be more effectively integrated into the land and resource management planning process. Parks Canada has recently recognized this type of management as holding significant potential for certain areas within Canada, due to the knowledge which local groups have acquired over a long period of time through an intimate understanding of the natural world. It would have been a rewarding experience to have taken on this strategy for this study, however the approach used in this alternative strategy proved successful in understanding how the reconciliation of issues can occur through responsible land and resource management planning.

As landscape architects, our role in resource management is to ensure the responsible planning, development and allocation of resources throughout the human realm. This concept may involve a range of activities, from development of products throughout urban landscapes, to land and resource management planning as exercised in this study. The variety of scales at which the profession operates requires a wide range of knowledge, from creating intimate space for human use to the management of sustainable regional systems. An understanding of ecology and human interaction with natural systems is essential in providing sustainable ecological management plans for our environment. A landscape architect practicing in this area of the profession would be advised to collaborate with representatives from other professions (ie. natural sciences, forestry) to ensure a more informed planning and management process.

The relationship between man and nature is extremely dynamic; what may seem to be a rational allocation today may become less so tomorrow. But it is essential to understand that all land must be managed, even to the degree of simple observation, whether active use occurs or not. Through managing even pristine environments, we gain crucial information as to how natural systems work, which facilitates future decision-making. A landscape architect carries only a few of the tools required to accomplish a sound management plan - collaboration between all interest groups and a variety of professions is essential.

5. Appendix

Appendix A - Cooperative Management Strategy



TEK - Traditional Ecological Knowledge - a multi-facet phenomenon of both the relationship between man and nature

LEK - Local Ecological Knowledge - quite similar to traditional knowledge, only derived from non-Aboriginal culture.

SK - Scientific Knowledge - the use of data accumulated and compiled through professional studies

Basic - Basic Knowledge - implements knowledge gathered through researching use patterns and other visible activities

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This figure (Buchko, 1999) represents the integration of world views toward a co-management model of planning. Each oval represents an individual knowledge type. Further, each is associated with either an experiential (qualitative) or analytical (quantitative) upbringing. This model is supported by much of the available literature in relation to cooperative management. Local and traditional knowledge had been tied more closely together, as both have similar experiential knowledge and spiritual value in the land. Basic knowledge was expressed by non-resident users of the environment, those who have basic interests (ie. recreational use) in the land area, yet do not have knowledge acquired as a result of living there. Basic knowledge and that of TEK and LEK also incorporate expert driven knowledge into their world view, similarly SK credits a portion of its knowledge base to experiential learning and is typically expert driven. The core of overlap represented a balance of each point of reference, and is ultimately the goal of co-management.

Appendix B - Grand Rapids Climate Information

Grand Rapids

Latitude 53° 11' N Longitude 99° 16' W

Elevation 223 meters above m.s.l.

	Temperature			Precipitation			
	Mean Daily Maximum	Mean Daily Minimum	Mean Monthly	Mean Monthly Rainfall	Mean Monthly Snowfall	Mean Monthly Total	Degree Days
	(oC)	(oC)	(oC)	(mm)	(cm)	(mm)	(days)
Jan	-17.0	-27.2	-21.8	0.2	24.4	20.9	0
Feb	-12.8	-24.5	-18.3	0.0	17.8	19.0	0
Mar	-5.0	-18.9	-12.1	0.4	24.5	19.9	0.1
Apr	5.3	-6.6	-0.7	8.8	13.6	20.5	15.8
May	12.7	0.2	6.4	33.2	10.1	37.0	96.7
Jun	20.2	7.6	13.7	53.1	0.0	53.1	271.4
Jul	23.5	11.7	17.7	54.9	0.0	54.9	391.2
Aug	22.0	10.6	16.3	61.1	0.0	61.1	344.5
Sep	15.2	5.2	10.1	60.3	0.9	61.8	162.7
Oct	8.5	-0.6	4.1	31.1	5.7	35.6	48.2
Nov	-2.7	-10.8	-6.8	3.6	30.4	36.0	0.6
Dec	-12.8	-21.5	-17.0	0.2	25.5	22.9	0
Annual	4.8	-6.2	-0.7	306.9	152.9	442.7	1331.2

Appendix C - Significant Species Assessment

Common Name	Scientific Name	Rare	Vulnerable	Endangered	Threatened
Vegetation					
Chamomile-leafed grape fern	Botrychium matricariaefolium	X			
Livid sedge	Carex livida	X			
Ram's-head lady slipper	Cypripedium arietinum	X			
Slender-leafed sundew	Drosera linearis	X			
Beautiful cotton-grass	Eriophorum callitrix	X			
Menzies catchfly	Silene menziesii	X			
Smooth cliff-brake	Pellaea glabella	X			
Pondweed	Potamogeton pusillus	X			
Wild spikenard	Smilacena racemosa	X			
Smooth woodsia	Woodsia glabella	X			
Mammals					
Wolverine	Gulo gulo		X		
Cougar	Felis concolor			X	
Woodland caribou	Rangifer tarandus caribou		X		
Wood bison	Bison bison athabascae				X
Birds					
Cooper's Hawk	Accipter gentilis		X		
Piping Plover	Charadrius melodus			X	
Short-eared Owl	Asio flammeus		X		
Great Grey Owl	Strix nebulosa		X		

Appendix D - Aggregate Deposits

Deposit	1/4	sec	twp	rge	owner	material type	reserve (m3)	potential
1	NE	1	48	17W	Chem.	gravel	n/a	high
2	NE	36	47	17W	crown	gravelly till	< 5 000	none
3	SE	29	47	16W	crown	gravelly till	< 5 000	none
4	SW	3	47	16W	crown	gravel	n/a	high
5	NE	33	46	16W	crown	gravel	20 000 - 50 000	high
6	NW	34	46	16W	crown	gravel	20 000 - 50 000	high
7	NW	17	46	17W	crown	gravel	n/a	high
8	NE	17	46	17W	crown	gravel	n/a	high
9	NW	16	46	17W	crown	gravel	n/a	high
10	SE	16	46	17W	crown	gravel	5 000 - 20 000	high
11	SE	15	46	17W	crown	sand	5 000 - 20 000	high
12	SW	14	46	17W	crown	gravel	5 000 - 20 000	high
13	SE	14	46	17W	crown	gravel	5 000 - 20 000	high
14	NE	14	46	17W	crown	gravel	5 000 - 20 000	high
15	NE	13	46	17W	crown	gravel	5 000 - 20 000	high
16	NE	18	46	16W	crown	gravel	5 000 - 20 000	high
17	SW	17	46	16W	crown	gravel	20 000 - 50 000	high
18	SE	17	46	16W	crown	gravel	5 000 - 20 000	high
19	SW	9	46	16W	crown	gravel	n/a	high
20	SE	9	46	16W	crown	gravel	n/a	high
21	SW	5	46	16W	crown	gravel	20 000 - 50 000	high
22	NW	32	45	16W	crown	gravel	5 000 - 20 000	high
23	SE	30	45	16W	crown	gravel	5 000 - 20 000	high
24	NW	3	46	16W	crown	gravel	5 000 - 20 000	high
25	NE	34	45	16W	crown	gravel	20 000 - 50 000	high
26	SW	35	45	16W	crown	gravel	10 000 - 40 000	high
27	SW	36	45	16W	crown	gravel	5 000 - 20 000	high
28	NW	30	45	15W	crown	gravel	5 000 - 20 000	high
29	NW	20	45	15W	crown	gravel	20 000 - 50 000	high
30	NW	21	45	15W	crown	sand	5 000 - 20 000	high
31	SW	27	45	15W	crown	gravel	5 000 - 20 000	high
32	SW	26	45	15W	crown	gravel	5 000 - 20 000	high
33	S	25	45	15W	crown	gravel	10 000 - 40 000	high
34	SW	29	45	14W	crown	gravel	50 000 - 100 000	high
35	NW	28	45	14W	crown	gravel	20 000 - 50 000	high
36	SE	33	45	14W	crown	gravel	20 000 - 50 000	high
37	SW	34	45	14W	crown	gravel	20 000 - 50 000	high
38	NW	35	45	14W	crown	gravel	20 000 - 50 000	high
39	SE	2	46	14W	crown	gravel	5 000 - 20 000	low
40	NE	35	45	14W	crown	gravel	50 000 - 100 000	high
41	N	36	45	14W	crown	till / gravel	50 000 - 100 000	high
42	NE	31	45	13W	crown	gravel	20 000 - 50 000	low
43	NW	32	45	13W	crown	gravel	5 000 - 20 000	low
44	SE	32	45	13W	crown	gravel	5 000 - 20 000	low
45	SW	33	45	13W	crown	gravel	20 000 - 50 000	high
46	NW	27	45	13W	crown	gravel	5 000 - 20 000	high
47	NE	27	45	13W	crown	gravel	5 000 - 20 000	high
48	S	26	45	13W	crown	gravel	10 000 - 40 000	high
49	S	25	45	13W	crown	gravel	10 000 - 40 000	high
50	NW	32	45	12W	crown	gravel	< 5 000	high
51	SW	32	45	12W	crown	gravel	10 000 - 40 000	low
52	NW	29	45	12W	crown	gravel	5 000 - 20 000	high
53	NE	29	45	12W	crown	gravel	25 000 - 70 000	high
54	SW	28	45	12W	crown	gravel	5 000 - 20 000	high
55	SE	28	45	12W	crown	gravel	20 000 - 50 000	high
56	NW	22	45	12W	crown	gravel	5 000 - 20 000	high
57	S	22	45	12W	crown	gravel	40 000 - 100 000	high
58	NE	15	45	12W	crown	gravel	20 000 - 50 000	high

59	NW	15	45	12W	crown	gravel	5 000 - 20 000	high
60	NE	10	45	12W	crown	gravel	10 000 - 40 000	high
61	N	12	45	12W	crown	gravel	10 000 - 40 000	high
62	NW	7	45	11W	crown	gravel	20 000 - 50 000	high
63	NE	7	45	11W	crown	gravel	20 000 - 50 000	high
64	NW	8	45	11W	crown	gravel	25 000 - 75 000	high
65	NE	34	45	11W	crown	gravel	n/a	high
66	SE	7	46	10W	crown	gravelly till	5 000 - 20 000	high
67	NE	3	46	10W	crown	gravel	5 000 - 20 000	high
68	SE	10	46	10W	crown	gravel	5 000 - 20 000	high
69	NW	11	46	10W	crown	gravel	n/a	high
70	SE	24	47	13W	crown	limestone	20 000 - 50 000	high
71	NE	24	47	13W	crown	gravel	25 000 - 70 000	high
72	SE	2	48	13W	crown	gravel	5 000 - 20 000	low
73	SW	36	47	13W	crown	gravel	20 000 - 50 000	high
74	SW	2	48	13W	crown	gravel	20 000 - 50 000	high
75	NW	35	47	13W	crown	gravel	20 000 - 50 000	high
76	NW	2	48	13W	crown	gravel	5 000 - 20 000	low
77	NW	11	48	13W	crown	gravel	20 000 - 50 000	high
78	NW	34	48	13W	crown	limestone	40 000 - 100 000	high
79	NE	28	48	13W	crown	gravel	5 000 - 20 000	high
80	SE	29	48	13W	crown	gravel	n/a	high
81	NE	20	48	13W	crown	gravel	5 000 - 20 000	high
82	SW	29	48	13W	crown	gravel	20 000 - 50 000	high
83	SE	30	48	13W	crown	gravel	5 000 - 20 000	low
84	N	30	48	13W	crown	limestone	40 000 - 100 000	high
85	NW	29	48	13W	crown	gravel	5 000 - 20 000	low
86	SW	32	48	13W	crown	gravel	5 000 - 20 000	low
87	SE	32	47	13W	crown	gravel	20 000 - 50 000	high
88	NE	32	47	13W	crown	gravel	5 000 - 20 000	low

Appendix E - Aggregate Requirements

Site	Length (m)	Description	Material Req (m3 /m)	App.	5 Year 0	App.	25 Year 0
PTH #6	57000	Apshalt resurface	1.2	0	0	2	136800
	57000	Shoulder repair	0.4	1	22800	2	45600
	57000	AST resurfacing	0.24	1	13680	4	54720
PTH #60	46000	Shoulder repair	0.4	1	18400	2	36800
	46000	AST resurfacing	0.24	1	11040	4	44160
PTR #327	15500	Gravel resurfacing	0.9	1	13950	6	83700
Long Point Rd.	17500	Gravel resurfacing	0.9	1	15750	6	94500
Kawina L. Timber Rd.	18000	Development	3.8	1	68400	0	0
	18000	Gravel resurfacing	0.9	1	16200	6	97200
		Total	**773700**		**180220**		**593480**

5 Year Requirement 180 220 m^3

25 Year Requirement 593 480 m^3

Appendix F - Soil Type Classification

At	Atikameg Series	Extremely clacareous, loamy, very stony till
Bc	Birch Bay Series	20 to 100 cm of extremely calcareous, loamy, very stony till overlying limestone bedrock
Bmx	Baynham Complex	Deep mesic forest peat or very thin fibric sphagnum peat overlying mesic peat
Ca	Cayer Series	40 to 100 cm of mesic fen peat with little or no sphagnum peat surface deposits. Underlain by strongly calcareous, stone-free sediments
Ci	Chitek Series	Extremely calcareous, loamy, very stony till
Cl	Cedar Lake Series	Moderately to strongly calcareous, clayey, slightly stony till
Cr	Crane Series	40 to 160 cm of mesic peat with little to no sphagnum surface peat deposits. Underlain by extremely calcareous, loamy, moderately stony till
Dr	Dering Series	15 to 40 cm of mesic peat overlying extremely calcareous, loamy, moderately stony till
Fx	Freshford Complex	Stratified, calcareous, moderately stony fragmental to sany-skeletal deposits
Gdx	Grindstone Complex	Shallow mesic forest peat or very thin fibric sphagmun peat overlying mesic forest peat. Underlain by extremely calcareous, loamy, moderately stony till
Ghx	Guy Hill Complex	Shallow mesic forest peat with a very thin fibric sphagnum peat surface layer. Underlain by extremely calcareous, sandy sediments
Hl	Halcrow Series	Shallow mesic fen peat with a very thin fibric sphagnum peat surface later. Underlain by moderately stony till
Hrx	Horseshoe Complex	25 to 100 cm of strongly calcareous, stratified, moderately calcareous, fragmental to sandy-skeletal deposits overlying extremely calcareous, loamy till
Hw	Howell Series	Shallow mesic fen peat with a very thin fibric sphagnum peat surface, underlain by an extremely clacareous, loamy to clayey, stone-free lacustrine sediments
Kx	Kilkenny Complex	Shallow organic soils with a thin to very thick continuous fibric sphagnum peat surface overlying subdominant mesic forest peat. Underlain by extremely calcareous, loamy, moderately stony till
Lix	Lamb Lake Complex	Shallow mesic forest peat with a very thin fibric sphagnum peat surface later. Underlain by an extremely calcareous, loamy, moderately stony till
Mh	Marsh Complex	Thin loam to peaty muck overlying extremely calcareous, extremely stony till
Mx	Molson Complex	Shallow organic soils with a thin continuous fibric sphagnum peat surface layer. Underlain by strongly calcareous, clayey, stone-free lacustrine sediments
Nr	Norris Series	10 to 40 cm of mesic peat overlying stratified, calcareous, moderately stony, sandy-skeletal deposits
Orx	Orok Complex	Shallow mesic peat with a very thin fibric sphagnum peat surface layer. Underlain by strongly calcareous loamy to clayey, stone-free lacustrine sediments
Sox	Soul Lake Complex	25 to 100 cm of strongly calcareous, stratified, moderately stony, fragmental to sandy-skeletal deposits overlying extremely calcareous, loamy till
Tux	Tremauden Complex	Stratified calcareous, moderately stony, fragmental to sandy-skeletal deposits

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