Heritage Resources Centre
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Forested Areas of Long Point Region

Landscape History and Strategic Planning

Long Point Environmental Folio

Long Point Environmental Folio
Publication Series

Technical Paper 3

Long Point Environmental Folio Publication Series
Managing Editors: J. Gordon Nelson and Patrick L. Lawrence

A study team at the Heritage Resources Centre is developing an Environmental Folio for the Long Point Biosphere to assist management agencies and local citizens in understanding the human and natural components of the ecosystem. The folio will consist of a series of maps and text that would outline current major management issues and areas of concern. A series of project publications is being prepared to accompany the folio. These reports will consist of supplementary information collected during the study. This project is supported by the Royal Canadian Geographic Society and the Social Sciences and Humanities Research Council of Canada.

Forested Areas of Long Point Region

Landscape History and Strategic Planning

By

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Long Point Environmental Folio
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ABSTRACT

This study of the history, current state and future planning of forested and other natural areas in the Long Point region is part of the Long Point Environmental Folio. This Folio is being prepared to provide basic information on development and environment to government officials, businessmen and citizens, especially residents, who are interested in the future of the Long Point region, where high environmental and resource values have been recognized by designation as a World Biosphere Reserve. Forested Areas of Long Point Region summarizes information on the coastal, dune and wetland systems of the Long Point peninsula itself as well as forests and other natural areas in the surrounding region. The post-glacial nature and settlement history of these forests are described in general terms. Areas are identified which are considered to have high priority for planning in terms of their significance and the land use and other stresses at work upon them. A number of demonstration areas or sites are identified for protecting, enhancing and restoring forested and natural areas as part of planning for a regional natural areas system.

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1. INTRODUCTION

STUDY CONTEXT AND APPROACH

1.1 Introduction

Loss, fragmentation and degradation of forests and other natural areas have become a concern of planners, managers and the general public. In southern Ontario intensive agricultural, urban and industrial development have caused major changes in the extent, distribution and character of the forest cover. These and other changes have led to calls for protection of forests and have initiated discussions regarding the appropriate percentage of natural area to conserve, the means of preserving biodiversity, and sustainability generally. Various conventions, strategies and policies are being developed at provincial, national and global levels to address these and other issues.

In the Long Point region the proportion of forests is relatively high compared with many other areas of southern Ontario. Norfolk County has a relatively large percentage of forest and other natural areas. These forests represent a significant resource because they form part of the Carolinian Forest which is of limited distribution in Canada. Approximately 10 percent of the critical unprotected areas of the Carolinian Life Zone of Canada are located in Norfolk County (Eagles and Beechy, 1985).

The Long Point region is of biological interest because the natural vegetation historically included large areas of pine- and oak- dominated forests as well as oak savanna. These vegetation associations are distinct from others in southern Ontario, and probably developed originally because of the environmental influence of the dry soils of the Norfolk sand plain (Szeicz and MacDonald, 1991). Remnants of these native forests and savanna reportedly exist in isolated areas (Gartshore et al., 1987).

The lack of protection and recognition awarded to the forests of Long Point region is of concern to local planners, managers and citizens. Patterns in farming and other land based economic activities are changing (Wilcox, 1993). Natural areas may provide opportunities to diversify and complement the local economy, through recreation and tourism and related support services. The primary issue is the balance between protecting natural areas and supporting local economic activity.

This study is basically a synthesis and interpretation of existing information, with field checks in the early stages of the project and at the end of the assessment. The findings serve firstly to synthesize considerable information on a number of forested areas in the region. Secondly, a framework or system for assessing various existing sources of information on forest or natural areas was developed as a means of suggesting priorities for planning. The findings are not meant to represent a firm or final set of priorities but rather are offered as a basis for further consideration by citizens, planners and politicians. In this sense, the major contributions of the research are: to promote understanding; to educate; to initiate discussion; and to provide information for strategic planning, to be succeeded by demonstration, research and monitoring.

The first section introduces the context, purpose and approach. The second section describes land cover change through time and the distribution of remnant forested areas, utilizing an historical geographic approach. The final section describes an initial framework for planning and management, utilizing ideas in landscape ecology and conservation biology. The report as a whole is a summary of a Master of Arts thesis in the Geography Department, University of Waterloo (Beazley, 1993).

1.2 Study Area

The study area is the Long Point region, as defined by the political boundary of a portion of the Regional Municipality of Haldimand-Norfolk (RMHN) (Figure 1.1). The Long Point region is predominantly a rural agricultural landscape with scattered patches of remnant natural areas. Agricultural land comprises approximately 73 per cent of the total land area in the Regional Municipality of Haldimand-Norfolk, with tobacco, grain, ginseng, and market vegetables comprising the major crops (RMHN, 1989). Small settlements and larger regional centres exist along the coast and inland. The Long Point region is situated within three distinct physiographic regions: 1) the Norfolk Sand Plain; 2) the Haldimand Clay Plain; and, 3) the Long Point Spit (Stenson, 1993). The climate is characterized by hot humid summers and mild snowy winters. Long Point lies within the Erie Ecoregion and Ecodistricts 2 and 3 (Wickware and Rubec, 1989).

The Long Point region is within the Deciduous Forest Region, sometimes referred to as the Carolinian zone (Figure 1.2). This zone represents the most southern forest region in Canada and contains Carolinian species found nowhere else in Canada. The forest communities of the Deciduous Forest Region are dominated by broadleaved trees, with the characteristic association being primarily beech and sugar maple, with basswood and oaks (Rowe, 1972)* .

The Long Point region is drained by rivers and valley lands into Lake Erie. Much of the natural terrestrial vegetation remains in the deeply incised river valleys, wetlands, and on lands

* A list of the scientific names of key species is in Appendix I.

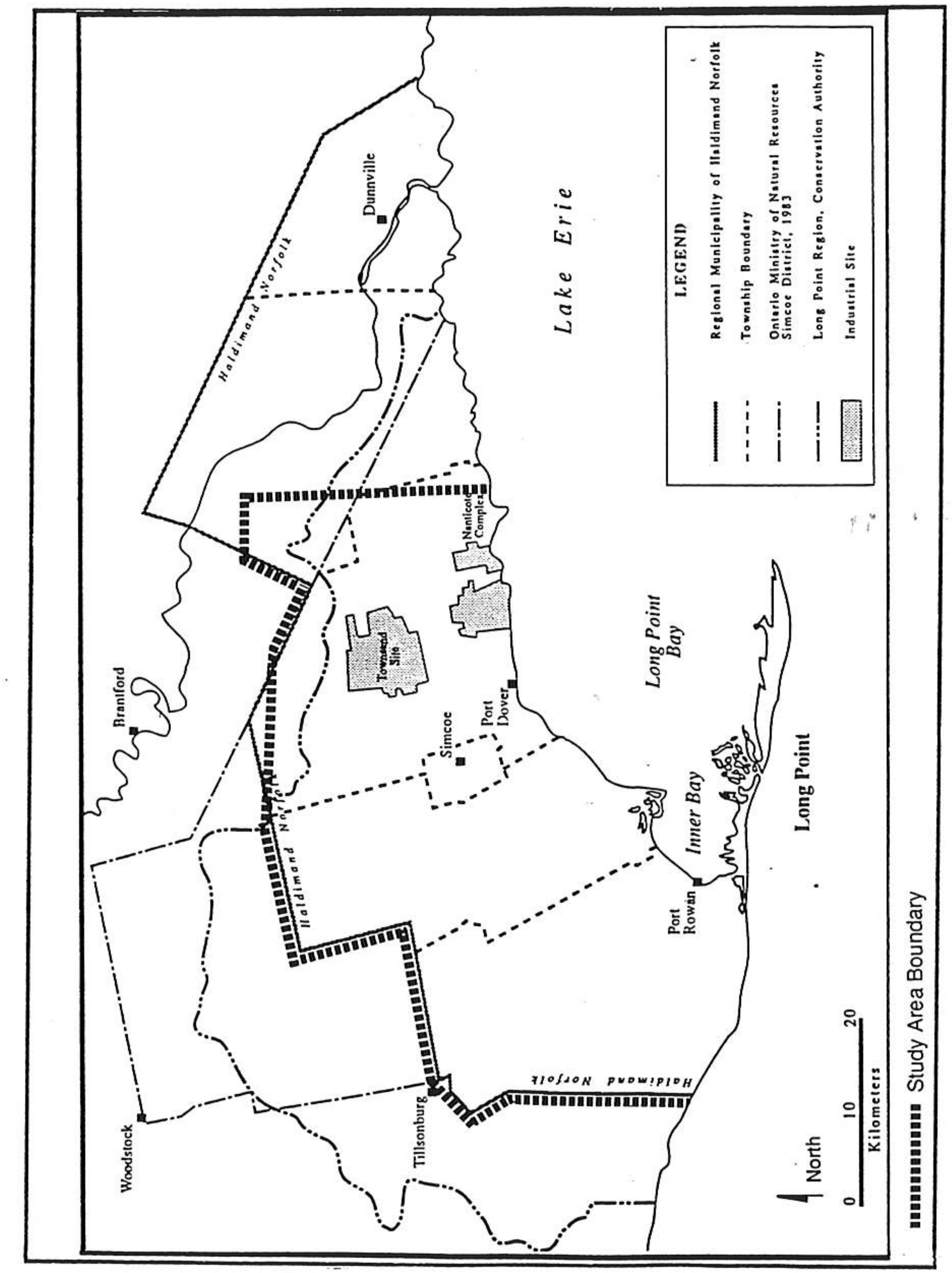

Figure 1.1 The Long Point Regional Study Area (Adapted from Francis et al, 1985)

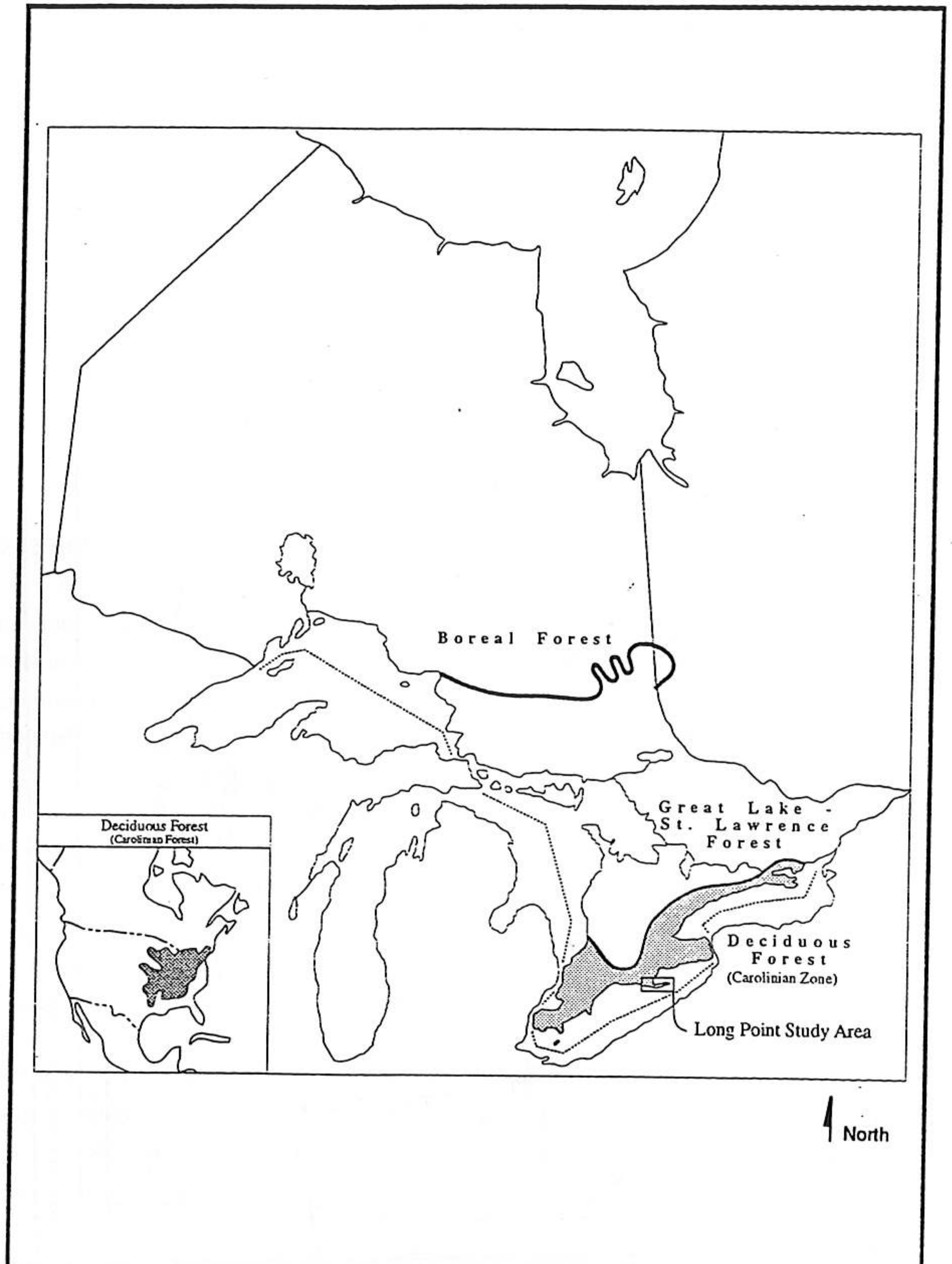

Figure 1.2 Ontario Forest Regions (Adapted from Rowe, 1972 and Allen et al, 1990)

protected through private stewardship efforts. Existing forests, wetlands and oak savanna are fragmented by rural settlements, agricultural fields, roads and industry. Reforested areas exist on the Norfolk Sand Plains, consisting largely of monoculture plantations of non-native species of pine. The Long Point spit or peninsula itself has remained relatively undisturbed by humans and is characterized by extensive forests, wetlands, ponds, grassed dunes and beaches.

The Long Point region is mainly under the jurisdiction of the Regional Municipality of Haldimand Norfolk (RMHN), the Simcoe District of the Ontario Ministry of Natural Resources (OMNR), and the Long Point Region Conservation Authority (LPRCA). Many conservation areas exist, including Deer Creek and Backus Woods, and are managed by the LPRCA. The St. Williams Forestry Station contains large natural and reforested areas, and is historically important for its role in the reforestation of the Norfolk Sand Plains. Turkey Point and Long Point contain provincial parks managed by OMNR. Many agreement forests are located within the area, under the domain of the RMHN, LPRCA, and OMNR. Life Science Areas of Natural and Scientific Interest have been defined by OMNR and include the St. Walsingham Sand Ridges and Big Creek Floodplain, Delhi-Big Creek Valley, Turkey Point, Long Point, and Spooky Hollow (Lindsay, 1984). Provincially, regionally and locally significant Environmentally Sensitive Areas (ESAs) have been designated by the RMHN (1993). The Norfolk and Hamilton Field Naturalists clubs and numerous conservation-oriented individuals play prominent roles, including private stewardship of natural areas. Many other significant natural areas and significant sites have been identified and inventoried by the Norfolk Field Naturalists (Gartshore et al, 1987).

1.3 The Long Point Environmental Folio

This study was undertaken to contribute to the Long Point Environmental Folio. The Folio is a collaborative research effort among graduate students, faculty and others interested in the Long Point region. The goal is to better understand the natural and cultural elements and processes within coastal ecosystems for planning and management purposes. This is in response to issues such as land cover change and stresses resulting from increasing land use activities related to population growth, recreation and tourism, and industrial and economic pressures. The Folio will consist of a series of maps and text, synthesizing and graphically displaying important land use, resource and environmental information in a manner understandable to a broad range of local people, planners and managers. The project is funded through the Royal Canadian Geographic Society and the Social Sciences and Humanities Research Council (Nelson et al, 1993).

The emphasis is on collecting, analysing and interpreting existing information for strategic planning. Field observations have been conducted to verify and update information from other sources as well as to obtain general impressions of the characteristics of the area. Open houses and conversations with local people contributed additional information.

1.4 Purpose and Approach

The purpose of this study can be stated simply as: *to describe and analyse land cover change through time in the Long Point region, and interpret the results in terms of significance and constraints for planning and management.* The study attempts to integrate two philosophies of forest or natural area management which overlap to some degree. The first is traditional, historically-oriented conservation philosophy, based on the idea of the forest or other natural areas as a product of natural and cultural impacts through time. The approach is generally site specific, focusing on the internal features or characteristics of a defined area, and stresses the idea of a 'climax' state. Management has been oriented towards preserving an area in a particular state, through practices such as fire suppression and disease or animal control. Parks and protected areas are a good example of this school of thought (Nelson, 1991).

The second philosophy is an emerging, dynamic approach, incorporating ideas in bioregionalism (Noss and Harris, 1986; Grumbine, 1990; RCFTW, 1992), landscape ecology (Forman and Godron, 1986), conservation biology (Soulé, 1986), and restoration ecology (Jordan et al, 1987). This philosophy attempts to take a more "context" oriented approach, incorporating information about characteristics existing outside of the boundaries of the site. It often focuses on many natural areas and the interconnections among them (Nelson, 1991).

In this study an historical analysis of land cover change is utilized to determine the extent, distribution and character of the remaining forests and other natural areas. Natural areas are assessed to determine significance, constraints and priorities in order to select key natural areas for planning and management. Criteria for assessment are derived from ideas in landscape ecology and conservation biology, and incorporate concerns beyond rare species and other characteristics, including important linkage functions that extend into the broader region. The interpretation of significance, constraints and priority areas provides a basis for initial strategic planning recommendations. The recommendations take the form of a regional system of protected natural areas, consisting of core natural areas, buffers, and corridors linking them together. An implementation strategy is suggested, including candidate demonstration areas for potential corridor restoration and ideas for further research.

2. HISTORICAL PROCESSES OF LAND COVER CHANGE

2.1 Introduction

Land cover can be described as those surfaces, communities, biota, waters, soils, and other deposits that cover the earth's surface. The purpose of this section is to describe the changing land cover of the Long Point region through time, from glaciation to the present, focusing on changes in the forested areas.

Archaeological findings, historical accounts, atlases, topographic maps and interpretations by other authors can be used to recreate the extent, character and distribution of land cover in the past, as well as shed light on the human activities and attitudes that would have had an impact on the land cover . This reconstruction is organized in a chronological way around three distinct historical periods of human interaction with the land in the Long Point area:

1. Post Glacial, Pre-Euro-American settlement: geology, biology and culture from 20,000 B.P. to 1792;
2. Effects of Euro-American settlement, 1792-1900;
3. Effects of more recent human activities, 1900 -1991.

2.2 Period 1: Pre-Euro-American Settlement: 20,000 B.P.-1792 A.D.

Climate and Geologic Processes

The climate and geologic processes associated with glaciation and glacial retreat provided a changing environment for biological processes. Retreat of glacial ice, formation of glacial features upon the land, and drainage of glacial lakes such as Lake Algonquin, opened up vast areas for biotic colonization and development, allowing the immigration of plants and animals, including humans, into southern Ontario. These processes have influenced the formation of the land cover and resulted in the present character and distribution of the forests of the Long Point region. These processes illustrate natural changes that occur over long periods of time (Table 2.1).

Biologic Processes of Southern Ontario

The vegetative land cover of southern Ontario during the Late Wisconsinan time, 16,500-14,500 B.P., was primarily Arctic dwarf shrub and herbaceous taxa, with small groves of spruce

Table 2.1: The Geological and Biological Environment of the Long Point Region Since Glaciation

Years B.P. (Before Present)	Glacial Period	Biological Environment/Vegetation
20,000-17,000	Nissouri Stade (southern limit of ice advance)	
16,500-15,500 15,000-14,500	Erie Interstade Port Bruce Stade (ice readvance; most S. Ont. glacial features formed)	**dwarf shrub and herbaceous taxa** (Arctic) with small groves of spruce
14,000-13,000	MacKinaw Interstade	sparse vegetation; rapid environmental change and biotic colonization (open dwarf shrub meadows; wetland boreal and temperate plants; pond aquatic communities)
13,000-12,000	Port Huron Stade (Lake Whittlesey; surface glacial features formed: Norfolk sand plain)	closed black and white **spruce forest** (regional) with beach and dune communities (mastodons browsed on forest vegetation around wetlands and abandoned lake plains)
12,000-10,500	Lake Iroquois and Lake Algonquin	Mastodons and definite evidence of humans
10,500-10,000 10,000	Drainage of Lake Algonquin Nipissing Phase (isostatic effects)	significant effect on flora and fauna; **jack/red pine dominant** (open pine forest with poplar, birch, oak, esp. uplands and sandy lake beds; lowlands - eastern white cedar, tamarack)
9000	erosion/weathering	**white pine** with elm and ash
9000-7500		**mixed deciduous-coniferous:** oak, elm, maple, ash, ironwood
8000-7500		**deciduous:** hemlock appears
7500		hickory, basswood, walnut appear
6500		beech appears
5000		drop in hemlock quantities
600 200		**disturbance**: herbs, grasses, corn (First Nations agricultural use); ragweed, European weeds (Euro- American settlers)

(Compiled from Karrow and Warner, 1990)

trees. The ensuing period from 14,500 to 10,500 B.P. was one of rapid environmental change and biotic colonization. Open dwarf shrub meadows, open spruce forests, wetland boreal and temperate plants characterized the land cover at this time. By 13,000 to 12,500 B.P., closed black and white spruce forests existed on a regional scale, with numerous slough, wetland, beach and dune communities (Karrow and Warner, 1990).

In the transition to the Holocene period around 10,600 years B.P., pine began to dominate the pollen records. Inferences have been made that the land cover was an open forest of jack pine and red pine. White pine became the dominant forest species around 9000 years B.P.. Around 7500 years B.P., hemlock, hickory, basswood, walnut and other typical deciduous species began to appear. This change was significant for humans because many species were nut-bearing, providing an additional source of food (Karrow and Warner, 1990).

The forests remained relatively stable until around A.D.1300 when disturbance resulted from the advent of native agriculture. This disturbance is suggested by increases in herbs and grasses and Indian corn in the pollen record. Around 1820 A.D. disturbance by Euro-American settlers is inferred from the decline in tree pollen, increases in ragweed pollen, and the appearance of European weeds and modern agricultural species in the pollen record (Karrow and Warner 1990).

Szeicz and MacDonald (1991) suggest that the vegetational history in localized areas of well-drained soils such as the Norfolk Sand Plain differs from the general pattern in southern Ontario because of sandy soils and drier environmental conditions. According to Szeicz and MacDonald, white pine forests dominated the Norfolk Sand Plain for about 2000-2500 years longer than at other sites. Between 6300 and 4000 B.P., white pine was replaced by a mixture of hardwoods and herb-dominated openings. Oak savanna occurred in the drier areas and beech and sugar maple forests occurred on nearby, less-dry mesic sites.

Human Processes

Review of the literature suggests that impacts of the native populations on the land cover in the Long Point area were minimal. Most of the indigenous peoples, from the Early Paleo-Indians to the Middle Woodland Indians, were nomadic hunters and gatherers (Table 2.2). Later, horticultural based societies which utilized agriculture, may not have established many year round settlements in the Long Point region, perhaps due to the drier soils of the Norfolk sand plains. The area near the Point was primarily used for seasonal hunting and fishing camps.

Table 2.2: Human use of Land: Paleo-Indians to Euro-American Settlement in the Long Point Region

Period and Age B.P. (years Before Present)	Settlement-Subsistence Pattern
Early Paleo-Indians 11,000-10,400 BP Late Paleo-Indians 10,400-10,000 BP	hunting and gathering; non-agricultural; large territories; populations aggregated and dispersed throughout the year based on resources
Early Archaic 10,000-8000 BP Middle Archaic 8000-4500 BP Late Archaic 4500-2800 BP	hunting and gathering with more thorough and intense use of local resources; decreasing size of territories; continuous use of certain locations on a seasonal basis over many years; fish weirs; cemeteries (Bruce Boyd - Mortuary Site, near Long Point)
Early Woodland 2800-2000 BP Middle Woodland 2000-1300 BP Late Woodland 1200-400 BP	constant population growth; resources and territories more carefully defined; small groups/bands; prehistoric Central Algonquin pattern (maybe corn horticulture and village settlements)
Early Ontario Iroquoian 1050-650 BP Middle Ontario Iroquoian 650-550 BP Late Ontario Iroquoian 550-300 BP	cultivation of imported crops/cultigens (corn, beans, squash and tobacco); hunting and gathering; camping sites on sand plains (sites on and near Long Point, including: Lake Front, Bruce Boyd, Reid, and Too)
Neutral Iroquoians 550-300 BP	agricultural as well as fishing, hunting and gathering cabins/sites; range of settlement types; year-round occupation; towns and villages

Compiled from Ellis and Deller, 1990; Ellis et al, 1990; Spence et al, 1990; Fox, 1990; Williamson, 1990; Lennox and Fitzgerald, 1990)

However, there is some debate about the impact of indigenous peoples on forests, centering around the idea that oak savannas originated and were maintained by fires. These fires were presumably set to drive game and provide grazing habitat for white-tailed deer, or to clear land for agricultural fields (Szeicz and MacDonald, 1991).

Szeicz and MacDonald compared dates, settlement and subsistence patterns from the archaeological data with vegetational history, surface geology and climate reconstructions. They concluded that the existence of oak savanna was not caused by the use of the land by early indigenous peoples. In examining archaeological and fossil pollen records they determined that the

origin of savanna in the Long Point area coincided with a period of climate change and not with causes such as agricultural practices by indigenous peoples. They further justified their conclusion by relating the historical location of savanna to the most well-drained soils of the area, again suggesting environmental influence in savanna development (Szeicz and MacDonald, 1991).

Pre-Euro-American Settlement Land Cover

Reports by earlier explorers and settlers describe large expanses of oak plains, impressive forests of giant pines and areas succeeding to various species as a result of fires and windthrows. Galinee, in 1669, described a wintering place at Patterson's Creek, near Port Dover, as "The Terrestrial Paradise of Canada", stating, ". . . there is assuredly no better place in all of Canada. The woods are open, interspersed with beautiful meadows, watered by rivers and rivulets filled with fish and beaver, an abundance of fruits, and . . . full of game . . ." (Barrett, 1977, 35).

Surveyors' notes and statistical accounts provide information on the vegetation and other conditions encountered by the surveyors and perceived by the settlers. These accounts have been utilized by researchers in preparing maps of the pre-Euro-American settlement land cover in the Long Point region. Szeicz and MacDonald (1991) prepared a pre-Euro-American settlement map by combining surveyors notes and work by others (Figure 2.1). The map appears to be the most accurate to date, utilizing historical records, soils information and more recent research on vegetation associations.

Szeicz and MacDonald (1991) determined that mesic forest, dominated by sugar maple and beech was a common association in southern Ontario; however it was restricted to small pockets within the Long Point study area. Dry-mesic forests were the predominant forests in the study area, dominated by oak species, hickory, chestnut, ash, walnut, cherry, and white pine.
Large areas of white pine existed in the northwest portion of the study area, and large areas of oak savanna existed north of Turkey Point, with oak species as the strongest dominants.

2.3 Period 2: Euro-American Settlement: 1792-1900

Lumbering, Clearing for Agriculture, and the Normandale Furnace

In 1784, a tract of land was purchased by the British Crown from the Mississauga Indians, including the Long Point region (Dept. of Lands and Forests, 1963). Between 1791 and 1812, over 3000 immigrants took up land in the Long Point area. This was the beginning of a period of intense human impact on the area around Long Point, with lumbering, repeated wildfire after

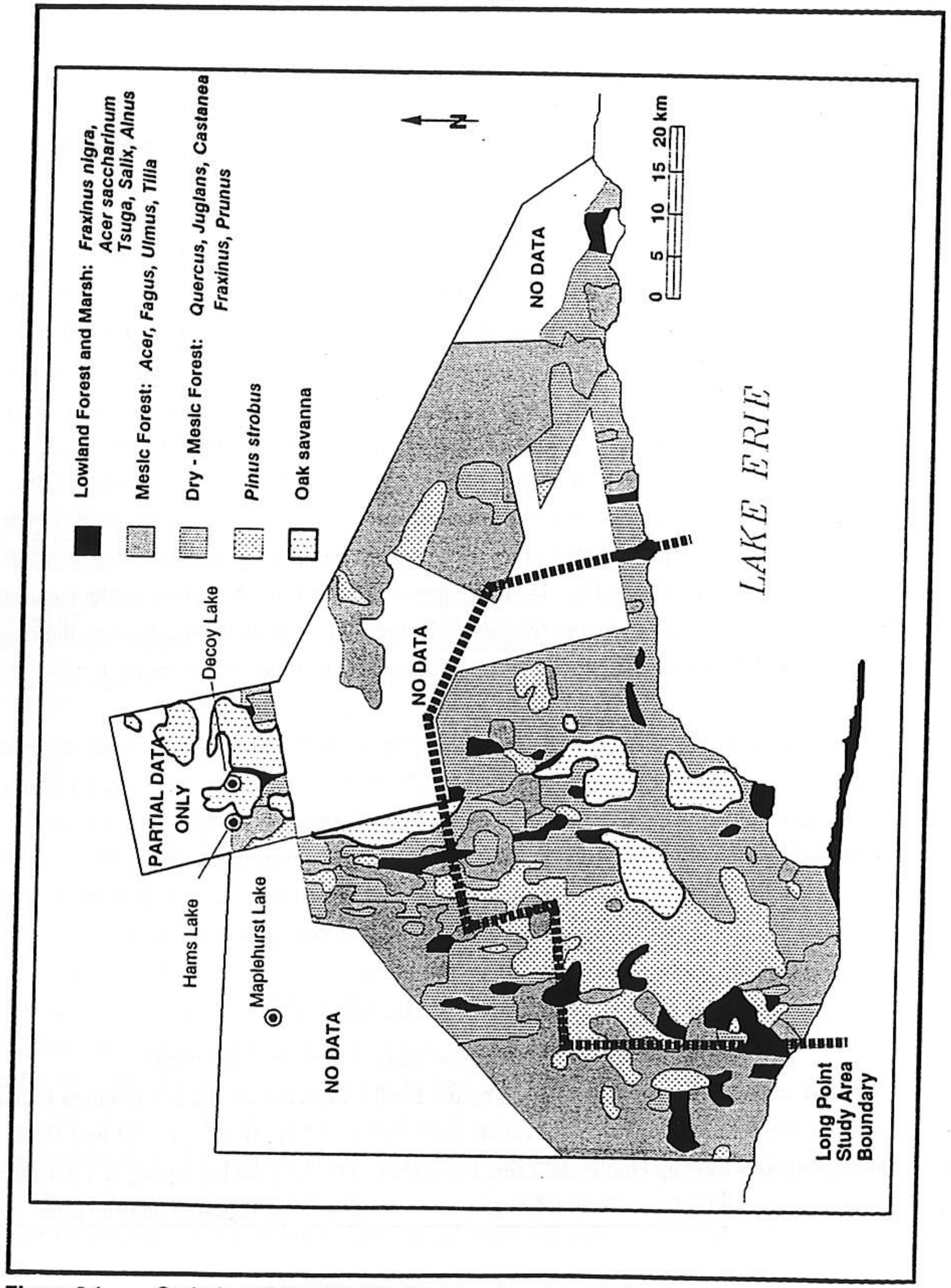

Figure 2.1 Szeicz's and MacDonald's Pre-Euro-American Settlement Land Cover Including Areas of Oak Savanna (Adapted from Szeicz and MacDonald, 1991)

logging, clearing for agriculture and grazing of livestock in the forests, plains, and marshes (Heffernan, 1978). Lumbering in the Big Creek watershed was particularly attractive due to the stands of large pine, oak and other trees suitable for the ships of the Royal Navy. Around 1850, Port Royal, Port Rowan and Port Dover were important timber exporting centres (Zavitz, 1963). Industrial activities, such as the production of iron at Normandale, also depleted local forest resources, both through mining of the ore and collection and burning of wood to make charcoal fuel for the smelting furnace.

From 1851 to 1900, the forest cover of the Big Creek Watershed was reduced from 72 per cent to 11 per cent through lumbering and other commercial activities and clearing for agriculture (Table 2.3) (Dept. of Lands and Forests, 1953). By 1860, the mainland forests began to be depleted. Lumbering continued at such a pace that by 1880 the local demands for timber could not be met (Chanasyk, 1970). Of the forests that remained in the river valleys, wetlands and other areas in the Haldimand-Norfolk region around the turn of the century, many were severely affected by logging and grazing, so that only 8 per cent of the total land area contained forest ecosystems which might be considered self-reproducing or viable (Chanasyk, 1970).

Table 2.3: Remaining Woodland in Per Cent in Big Creek Region (Estimated from Census of Canada figures, 1851-1901)

Year	Per Cent
1851	72.1
1861	56.9
1891	23.6
1901	11.0

(Compiled from Dept. of Lands and Forests, 1963)

2.4 Period 3: Human activities in the Twentieth Century: 1900 to the Present

Reforestation: The St. Williams Forestry Station

In the early 1900s, forested lands in the Long Point region had been reduced to 11 per cent. Farms were turning into blow-sand deserts as a result of loss of the forest cover and types of agricultural practices on the Norfolk Sand Plain, and were being sold or abandoned (Barrett, 1981). Some lands began to revert back to woodlands while others supported sparse natural vegetation. Many felt that the land was useless for anything but reforestation (Phipps, 1883; Zavitz, 1909).

In 1908, through the efforts of Zavitz, the first Provincial Forestry Station was established on the 100-acre Waterbury farm near St. Williams by the Province of Ontario, Department of Lands and Forests (Pearce, 1973). This signalled the beginning of a series of government initiatives to conserve the forest cover (Table 2.4). Forestry Station No. 2, also in Charlotteville Township, was purchased by the Province in 1924.

Table 2.4: Government Initiatives Related to Forests

1911	Counties Reforestation Act	Empowering municipalities to purchase land for forestry purposes
1930s	Norfolk Chamber of Commerce	Initiated a program of reforestation at both the county and individual land owner levels
1927	Assessment Act	Exempted woodlots from the area of farm assessed for taxation purposes
1946	Trees Act	Controlled the cutting of trees in areas where bylaws were in place
1947	Norfolk County passed bylaws under the powers of the Trees Act	
1949	Haldimand County passed bylaws under the powers of the Trees Act	
1966	Woodlands Improvement Act	Authorized the Minister of Lands and Forests to enter into agreements with land owners to plant trees on their properties and to improve their woodlots

(Compiled from Zavitz, 1963 and Pearce, 1973)

Reforestation can be seen as an important process in creating the present landscape. Pearce (1973) estimated that more than 25,000 acres of waste land in Norfolk County has been reforested. Forest cover in the watershed increased to 17.2 per cent by 1963, mainly as a result of reforestation efforts and regeneration (Table 2.5). Ninety-nine per cent of this woodland was second growth (Dept. of Lands and Forests, 1963). Reforestation efforts increased the amount of wooded area, however these plantations are primarily single species coniferous plantings and often are not perceived as diverse forest ecosystems.

Table 2.5: Woodland in Per Cent in Big Creek Region
(Estimated from Census of Canada figures, 1901-1951, and from Field Surveys, 1953-1963)

Year	Per Cent
1901	11.0
1911	12.5
1921	13.2
1931	13.3
1941	12.1
1951	11.5
1963	17.2
1989	18.0*

(Compiled from Dept. of Lands and Forests, 1963; * based on Haldimand-Norfolk County: Chanasyk, 1970; RMHN, 1989, in Wilcox, 1993)

Agriculture and the Impact of Tobacco Farming

In the 1920s, it was discovered that tobacco could be successfully grown on the sandy soils of the Norfolk Sand Plain. Further land clearing began, opening up land for agriculture once more and enlarging existing fields. By 1930, 17,200 acres were planted in tobacco; by 1951, that area had risen to 53,287 acres (Wilcox, 1993; RMHN, 1989).

The tobacco farming economy remained strong in the Long Point area into the 1980s, with 62,789 acres of tobacco being grown in Haldimand-Norfolk in 1981. A rationalization of the tobacco farming economy has been taking place since 1981, with only 35,365 acres of tobacco being grown as recently as 1986 (RMHN, 1989, in Wilcox, 1993). Today, the trend is towards fewer but larger farms (Wilcox, 1993). Current perception is that the amount of tobacco farming has increased recently, primarily for sale in overseas markets. Although current statistics are not yet available, casual field observations and personal communications indicate that this may true.

The effect of these changes in the tobacco economy on the forest structure and overall landscape is complex. The planting of hedgerows and the retention of woodlots to reduce erosion and provide suitable microclimate contributed to landscape change and the present land cover pattern. As time passed, in some areas forest patch size was reduced as fields were expanded, and connectivity was lost with the removal of wind breaks and hedgerows. Effective forest interior habitat was reduced in size, although no specific statistics on such changes are available. However, the strong tobacco economy enabled the preservation of woodlots, some of which appear now to be being sold or developed for residential or other uses as a means of supplementing farm income. Such activities are of concern to some individuals in the Ontario Ministry of Natural Resources (OMNR) and the general public.

Other Processes

The chestnut blight became noticeable in Norfolk County in 1923 and wiped out the native species within 15 years. Dutch elm disease appeared in Ontario in 1950 and continues to affect the American elm (Zavitz, 1963). Grazing in woodlands is a longstanding process, with the result that nearly 25 per cent of woodlands showed virtually no natural regeneration in 1963 (Table 2.6) (Dept. of Lands and Forests, 1963). Very little research has been done in reference to this issue; further study is needed to understand the extent and the impacts of this activity on the forests. Another process occurring in the forest is the introduction and invasion of exotic species. Exotic species are often more aggressive than native species and may compete for resources.

Table 2.6: Percentage of Woodlands Affected by Grazing in Big Creek Watershed

Year	Percentage
1900	30 %
1950	28 %
1963	25 %

(Compiled from Dept. of Lands and Forests, 1963)

2.5 Discussion

The most significant change in land cover occurred between the time of early Euro-American settlement, beginning about 1792, and the late 1800s. During this time the natural forest cover was removed through lumbering, clearing for agricultural fields, and burning for charcoal for the Normandale furnace. By 1900, only 11 per cent of the forest cover remained. Forest cover has remained more or less stable since then, with an overall gain mainly attributed to reforestation and natural succession on abandoned farmland (Figure 2.2). Much of the remaining forest cover is in ravines or areas of rugged topography, wet areas such as swamps, and other areas not easy to access for logging nor suitable for cultivated fields. Some forested areas remain at the backs of farms, mainly woodlots for purposes such as providing fuelwood, and on lands being conserved through private stewardship, such as at Backus Woods. Many of these remaining wooded areas have been recently grazed, retarding growth of the ground layer and the ability of the forest to succeed. The present forest cover represents about 18 per cent of the land area (RMHN, 1989).

3. PLANNING FOR NATURAL AREAS: A NATURAL AREAS SYSTEM

3.1 Interpretation and Recommendations for Planning

The remaining forests and some marsh and savanna areas provide the basis for a natural areas system or "green framework" for the Long Point region. Planning for the conservation, enhancement and sustainable use of these natural areas requires that they be identified and described in terms of their species composition, age, and other physical or natural characteristics. This identification and description allows for recognition of natural areas that can be seen as more important than others for their uniqueness, their representation of historic forests, or for other reasons.

A number of attempts have been made to identify and describe significant natural areas in the Long Point region including the work of Eagles and Beechy, 1985; Lindsay, 1984; Gartshore

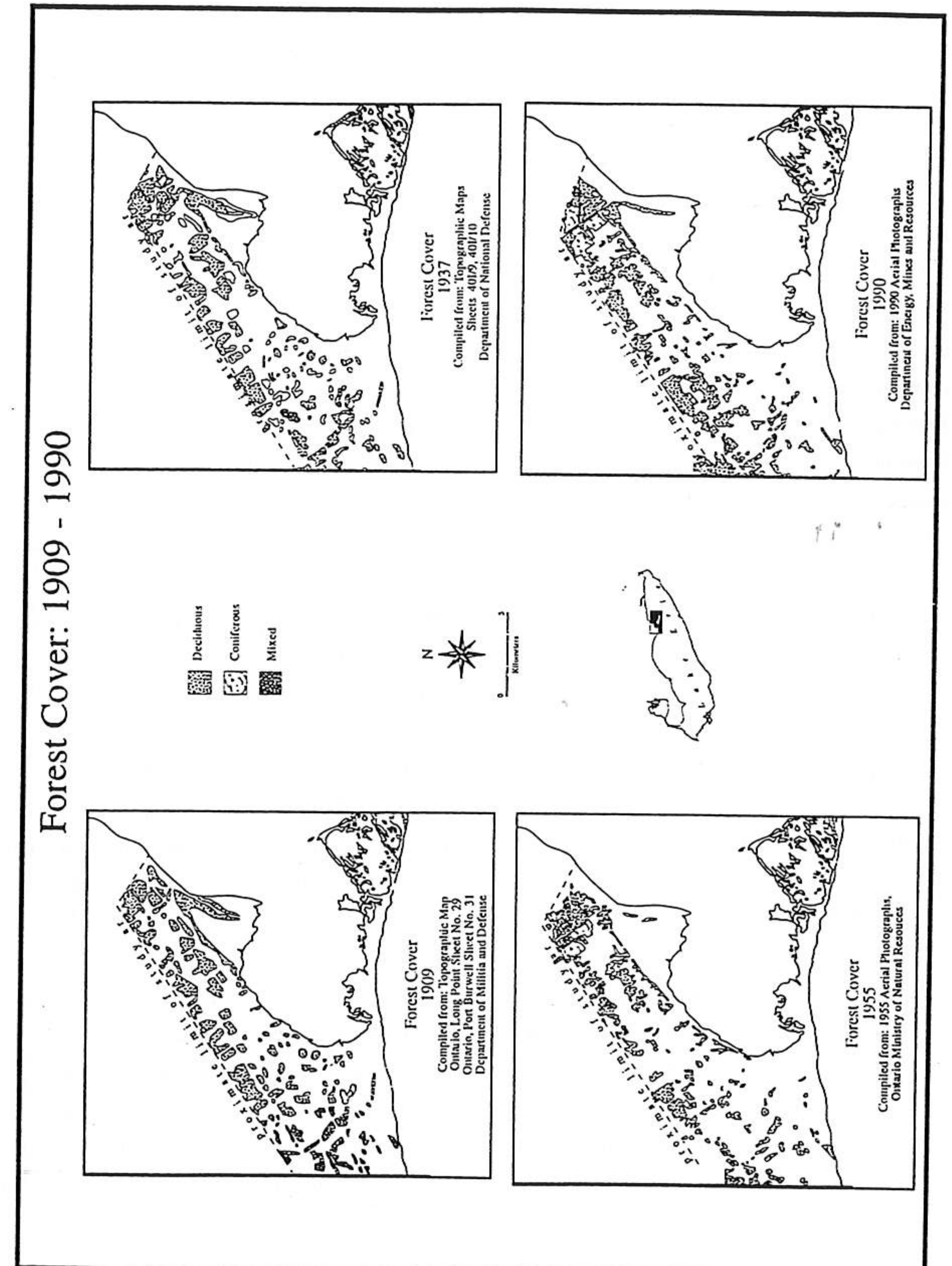

Figure 2.2 Forest Cover Change: 1909 to 1990

et al, 1987; Allen et al 1990; Tufescu and Hounsell, 1991; and Pearce, 1993. Of special interest are the *Life Science Areas of Natural and Scientific Interest (ANSI) in Site District 7-2* (Lindsay, 1984), *Critical Unprotected Natural Areas in the Carolinian Zone* (Eagles and Beechy, 1985), and the *Natural Areas Inventory of the Regional Municipality of Haldimand-Norfolk* (Gartshore et al, 1987). Thirty-two of the more significant natural areas and twenty-three of the less significant sites identified in these studies fall within the Long Point study area as defined for this study. These natural areas and sites are shown in Figure 3.1.

All of these 55 natural areas and sites are considered to be significant for conservation and sustainable development purposes. They provide for protection of species, tree cover, flood control, wildlife habitat and other social services to varying degrees. It is risky and difficult to identify some of these areas as more important than others for several reasons. Some may offer fewer services to humans than others, yet the service or services that they offer may be very important locally or to some people more than others. Furthermore, all of the areas are part of an interacting system which we do not completely understand. We should therefore be cautious about losing any portion of it. The system itself is a relatively small part of the total land in the study area and for that reason should be protected, enhanced and wisely used in its entirety.

It is nevertheless useful to try and identify areas that could be given priority in planning if funding, staff and other limitations make it necessary to do so. It is also important to identify natural areas that are under more pressure or stress than others lest they be damaged or destroyed and society loses their services indefinitely.

An attempt has therefore been made to priorize the natural areas in a general way by classifying some of them as of primary and some as of secondary significance. This distinction was made by evaluating the natural areas and sites in terms of values or criteria such as rare and endangered species, unique communities, diversity, size, and their role as links or corridors among natural areas and sites (Figure 3.2). Such criteria were used in the earlier work by Gartshore et al (1987) and others. The criteria were amended and added to in this study in the manner summarized in Table 3.1 which names and describes the meaning of the criteria and links them to the traditional historic approach (Content or Internal) and the more recent dynamic (Context or External) approach to natural areas planning and management. Areas which meet only "the potential linkage function" are considered to be of secondary significance; all others are considered primary. Readers with an interest in securing more details on the evaluation procedure should consult the M.A. thesis by Beazley (1993). The results of the analysis are shown in Table 3.2 and Figure 3.3.

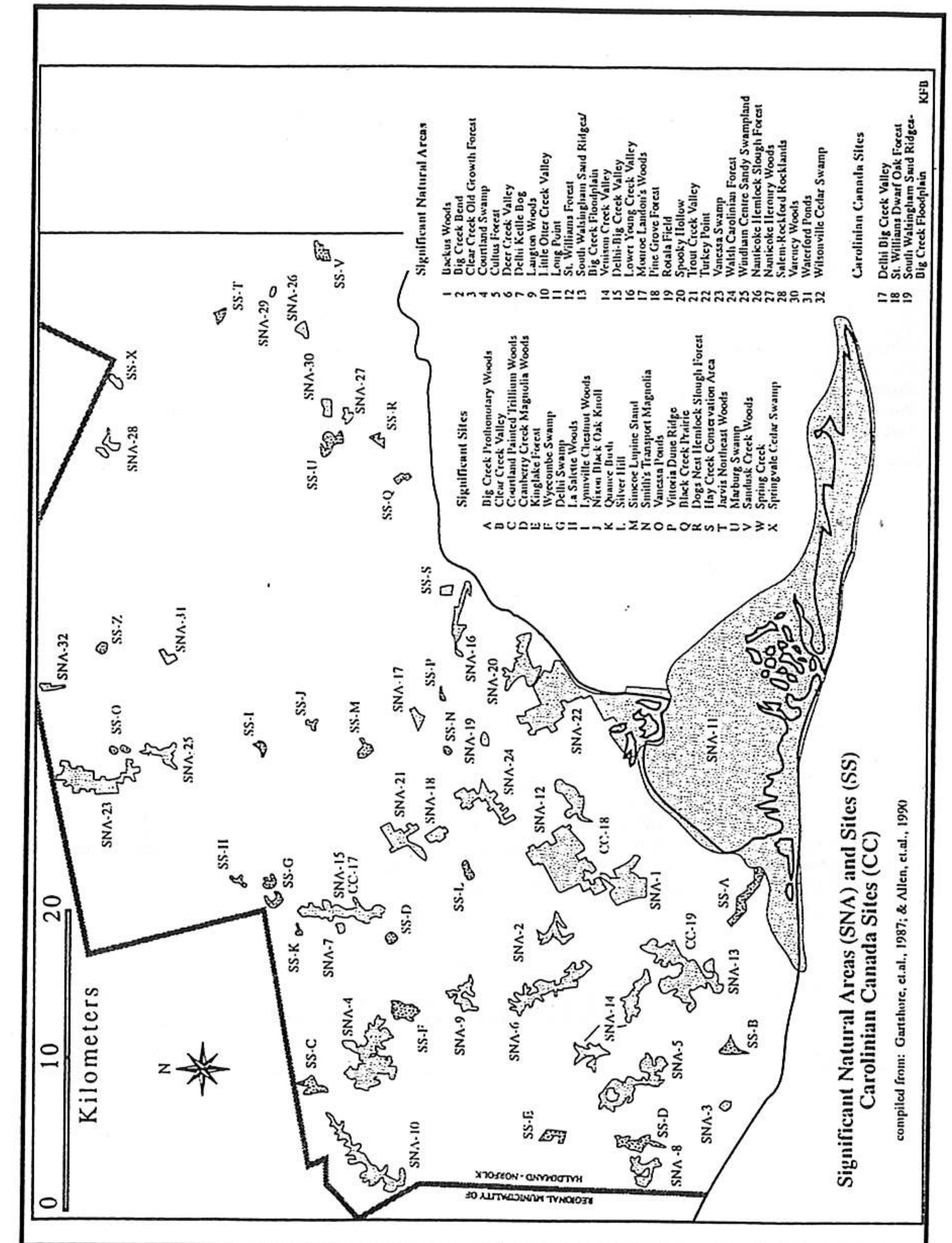

Figure 3.1 Significant Natural Areas (SNA), Significant Sites (SS), and Carolinian Canada sites (CC) (Compiled from Gartshore et al, 1987 and Allen et al, 1990)

Figure 3.2: Process and Criteria for Identification of Primary and Secondary Significance

Evaluation Based on Identification of Significance by Others (Expert Consensus)

Criteria:
- Significant Natural Area (two or more criteria) or Significant Site (one criteria) (Gartshore et al, 1987)
- Critical Unprotected Natural Area in the Carolinian Life Zone of Canda (Eagles and Beechey, 1985; Allen et al, 1990)
- ANSI (Earth Science or Life Science); and Significant Site (Lindsay, 1984)
- Top Botanical Site (Varga and Allen, 1990)
- Wetland Class 1-7 (RMHN, 1993)
- Prairie/Savanna Remnant (OMNR, 1992)
- Cold Water Stream (RMHN, 1993)
- Proposed and Existing ESAs (RMHN, 1993)
- Park, NWA, Conservation Area, Nature Reserve (Gartshore et al, 1987)

Valuation: Additive weight (one point for each criteria fulfilled); max. total score: 9

Re-evaluation Based on Criteria Selected for This Study (Table 3.1)

Criteria:
- Significant species; Significant communities; Importance for wildlife (Gartshore et al, 1987)
- Diversity (Gartshore eta al, 1987)
- Age (Gartshore et al, 1987)
- Presence of interior habitat (300m edge zone) (Measured from maps by Gartshore et al, 1987)
- Size (200 ha) (Gartshore et al, 1987)
- Linkage (Gartshore et al, 1987; and, from map examination)

Valuation: Additive weight (one point for each criteria fulfilled); max. total score: 8

Natural Areas of Primary and Secondary Significance (Table 3.2)

Criteria:
- High score in Identification of Significance by Others (Expert Consensus)
- High score in Re-evaluation Based on Criteria Selected for this Study (Table 3.1)
- Fulfillment of any one of the following disjunctive criteria, regardless of overall additive weight score (Disjunctive criteria represent characteristics that are considered valuable enough in their own right to constitute significance, regardless of the fulfillment of other criteria or the presence of other values):
  - Satisfy 6 or more criteria of Gartshore et al, 1987
  - Age/irreplaceability
  - Presence of interior habitat
  - Potential linkage function detected from mapping

Valuation: Fulfillment of any one of the above criteria indicates primary significance, with the exception of "Potential linkage function detected from mapping", which represents secondary significance.

Note: All sites are significant, based on the fulfillment of at least one criteria by Gartshore et al, 1987.

Table 3.1: Criteria for Assessing Significance Related to Biotic Resources

Criteria	Description
Internal or "Content" Criteria: Traditional Historic Approach (For core protected areas; to be evaluated on a community or ecosystem basis)	
Significant communi-ties	Includes: 1) *significant species* and *significant communities* as defined and identified by Gartshore et al (1987), including rare and endangered species and unique communities; additional comments by others were incorporated (Lindsay, 1984; Eagles and Beechey, 1985); and, 2) *importance for wildlife*, defined as migratory stop-overs (Gartshore et al, 1987), wildlife concentration (Eagles and Beechey, 1984) and nesting sites for colonial birds and concentrations of breeding and/or migratory waterfowl (Lindsay, 1984); **Comments:** This criterion is related to the idea of protecting endangered spaces and habitat for endangered species; heterogeneity at the regional landscape scale, reflecting variability in soils, moisture, topography and microclimate; a range of habitat types for wildlife functions such as staging, winter protection, feeding and migrating.
Diversity	As defined and identified by Gartshore et al (1987); additional comments by others were incorporated (Lindsay, 1984; Eagles and Beechey, 1985); **Comments:** This criterion refers to a high degree of "natural diversity" (Gartshore, et al, 1987) of biotic and abiotic features and considers the difference between native and non-native species and communities; the criterion "was not applied to areas which were diverse through human interference" (Gartshore et al, 1987, 9).
Age/ irreplace-ability	Areas described as old growth forest by others (Gartshore et al, 1987; Lindsay, 1984; Eagles and Beechey, 1985); **Comments:** this criterion is related to the idea of recoverability after loss or disturbance; areas of old growth forest would require a long period of time to re-evolve, and some species may be lost in the process, especially if the area is isolated from recolonizing sources (Martin, 1991; Grigoriew et al, 1985).
External or "Context" Criteria: Emerging, Dynamic Approach Conservation Biology/ Landscape Ecology (For spatial analysis; guidelines for a linked protected area network at a regional landscape scale)	
Size	Greater than 200 hectares, as defined and identified by Gartshore et al (1987); **Comments:** This criterion is important for: 1) species-area relationships; 2) minimum viable population and minimum critical area relationships (Grumbine, 1990); and, 3) stability and resilience in response to stresses, allowing localized disturbances while maintaining overall system stability as in the "shifting mosaic steady state" (Bormann and Likens, 1979; Loucks, 1983). Size is related to the issue of habitat fragmentation, which is considered to be the most serious threat to biological diversity.
Interior habitat	Incorporates shape and size; defined as areas surrounded by a 300 meter edge zone width, identified by taking measurements from maps in Gartshore et al (1987); and, as identified by Tufescu and Hounsell (1991) and Pearce (1993); **Comments:** This criterion is important in forested patches and is related to patch size and shape. Estimates of edge zones vary from 30-60m for plants and 60-600m for animals. Assuming an edge zone of 300m and a clumped or circular shape, minimum patch size would be 28.3ha; larger areas of a more convoluted shape may contain no interior habitat. Interior habitat supports forest interior/area sensitive species (Tufescu and Hounsell, 1991).
Linkage/ connectiv-ity	As defined and identified by Gartshore et al (1987); and as identified from examination of the forest cover maps prepared for this study; **Comments:** This criterion is related to migration, immigration and dispersal functions among natural areas, enabling recolonization after disturbance, maintenance of genetic diversity, and greater opportunity for adaptation to longer-term processes such as climate change. This contributes to the persistence, stability and resilience of the natural system.

Table 3.2: Natural Areas of Primary and Secondary Significance

	Table A	Table B	Disjunctive Criteria**			
Natural Areas	High score in identification of significance by others	High score in reevaluation based on criteria selected for this study	Satisfy 6 or more criteria of Gartshore et al, 1987	Age/ Irreplaceability	Presence of interior habitat	Important linkage function detected from mapping
Natural Areas of Primary Significance						
SNA-1. Backus Woods	*	*	*	*	*	*
SNA-3. Clear Creek Old Growth Forest				*		
SNA-4. Courtland Swamp		*			*	
SNA-5. Cultus Forest	*				*	
SNA-6. Deer Creek Valley		*	*		*	*
SNA-8. Fairground Forest	*				*	
SNA-10. Little Otter Creek Valley		*	*			*
SNA -11. Long Point (including Inner Bay	*	*	*		*	*
SNA-12. St. Williams Forest and Savanna	*	*	*		*	*
SNA-13. South Walsingham Sand Ridges/Big Creek Floodplain	*	*			*	*
SNA-15. Delhi-Big Creek Valley	*	*	*		*	*
SNA-16. Lower Young Creek Valley				*		*
SNA-20. Spooky Hollow	*	*	*		*	*
SNA -21. Trout Creek Valley		*			*	*
SNA-22. Turkey Point	*	*	*		*	*
SNA-23. Vanessa Swamp		*			*	
SNA-24. Walsh Carolinian Forest		*			*	*
Natural Areas of Secondary Significance						
SNA-2. Big Creek Bend						*
SNA-9. Langton Woods					*	
SNA-14. Venison Creek Valley			*		*	*
SNA-17. Monroe Landon's Woods					*	
SNA-18. Pine Grove Forest					*	*
SNA-25. Windham Centre Sandy Swampland					*	
SNA-26. Nanticoke Hemlock Slough Forest					*	
SNA-28. Salem-Rockford Rocklands					*	
SNA-32. Wilsonville Cedar Swamp					*	
SS-A. Big Creek Prothonotary Woods						*
SS-C. Courtland Painted Trillium Woods					*	
SS-F. Wyecombe Swamp					*	
SS-U. Marburg Swamp					*	

** These criteria were considered to be important enough to constitute significance in their own right, regardless of the results of the previous evaluations incorporating additional criteria.

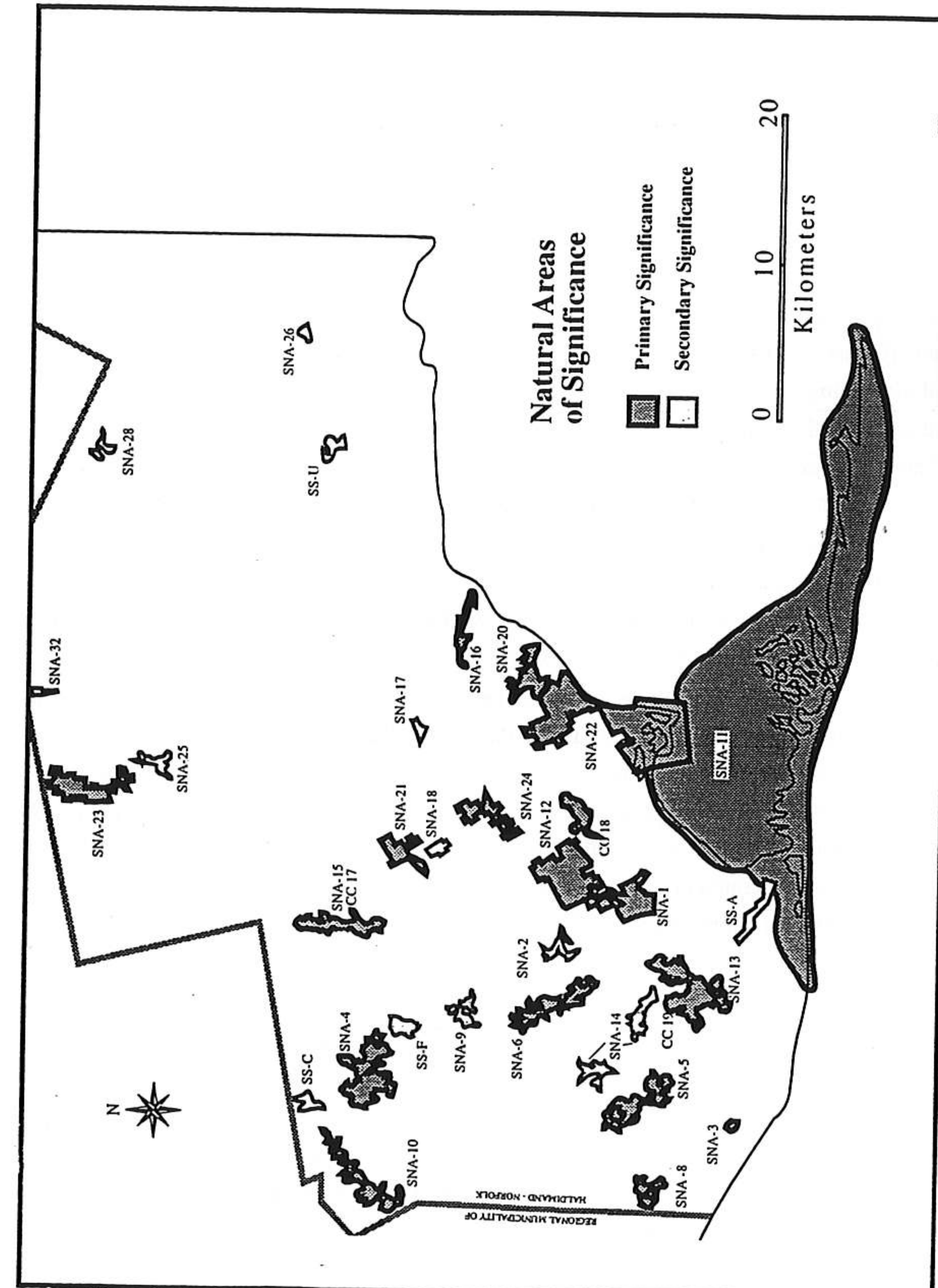

Figure 3.3 Natural Areas of Primary and Secondary Significance (Labels are: SNA-Significant Natural Area, and SS-Significant Site, per Gartshore et al, 1987)

After evaluating the significance of natural areas in the foregoing way, an analysis was undertaken of the stresses or constraints on natural areas and sites in order to identify those undergoing the most pressure for changes. Constraints were assessed by estimating the number and magnitude of land use stresses or pressures on each area or site and the extent to which land uses in and around the areas and sites were compatible or in tension or conflict with the conservation and sustainability of the services that the areas and sites offer to society. Stresses and constraints were described as primary or secondary on the basis of their extent, intensity or severity and other characteristics. For example, areas of high constraint and conflict were identified in terms of: 1) a large number of different land use stresses on a site as reported by others (Gartshore et al, 1987; Lindsay, 1984; Eagles and Beechy, 1985); 2) constraints related to land use zoning, designation/ownership, and land use change; and 3) conflict arising from current land use activities which are extensive or severe. A summary of the stress evaluation is presented in Table 3.3 and Figure 3.4. Details on the procedure, including information on weighting are presented in Beazley (1993) along with information on how significance and constraints was combined to produce a list of priority areas for planning (Table 3.4).

A map of the priority areas is presented in Figure 3.5. Six of these are considered to be areas of primary priority and seven of secondary priority. The results of this priority analysis may not always be acceptable to some readers who may evaluate or weight the information so as to arrive at a different list than the one presented here. We recognize this but advance the priority areas for strategic reasons. The intent is that the priority list will encourage discussion and the making of judgements about the future of the natural areas under study. Many of these areas are under increasing land use and other stresses and planning and management actions are needed if some or all of their services to society are not to be reduced or lost. In this regard it should also be pointed out that the natural areas provide the basis for an enhanced green framework or regional system of connected natural areas. In this respect, some natural areas can provide linkage or corridor functions, facilitating the flow of species and supporting community and landscape diversity.

Figure 3.6 is a schematic representation of a regional system of natural areas. A major part of this system centres on the Big Creek Valley with Venison Creek, Dedrick's Creek and Deer Creek as key corridors. Much forested cover remains in this network of natural areas and river valleys. In studying the foregoing and other possible networks in the Long Point region it is possible to envision reforestation or other restoration of some areas in order to expand and to strengthen the system as a whole.

Table 3.3: Summary Areas of Primary and Secondary Constraints

Natural Area	**High constraint:** Reported land use stresses on natural areas (related to number of different types of land use stresses)	**High constraint:** Interpretation of constraints related to land use activities, zoning, designation/ ownership, and land use change	**Conflict existing as a result of current land use activities** (related to magnitude extent, severity of land use stresses)	Additive Weight
Natural Areas of Primary Constraint				
SNA-6. Deer Creek Valley		*	*	2
SNA-10. Little Otter Creek Valley	*	*	*	3
SNA-11. Long Point, including Inner Bay	*	*	*	3
SNA-12. St. Williams Forest and Savanna	*		*	2
SNA-13. South Walsingham Sand Ridges/Big Creek Floodplain	*		*	2
SNA-15. Delhi-Big Creek Valley	*		*	2
SNA-17. Monroe Landon's Woods		*	*	2
SNA-18. Pine Grove Forest	*	*	*	3
SNA-19. Rotala Field		*	*	2
SNA-21. Trout Creek Valley		*	*	2
SNA-22. Turkey Point	*	*	*	3
SNA-23. Vanessa Swamp	*	*	*	3
SNA-24. Walsh Carolinian Forest	*		*	2
SNA-28. Salem-Rockford Rocklands		*	*	2
SS-B. Clear Creek Valley		*	*	2
SS-D. Cranberry Creek Magnolia Woods		*	*	2
SS-F. Wyecombe Swamp		*	*	2
SS-G. Delhi Swamp	*		*	2
SS-S. Hay Creek Cons.Area		*	*	2
SS-T. Jarvis Northeast Woods		*	*	2
SS-V. Sandusk Creek Woods		*	*	2
Natural Areas of Secondary Constraint				
SNA-2. Big Creek Bend	*			1
SNA-4. Courtland Swamp	*			1
SNA-9. Langton Woods	*			1
SNA-16. Lower Young Creek	*			1
SNA-20. Spooky Hollow			*	1
SNA-29. Sandusk Creek			*	1
SNA-30. Varency Woods			*	1
SNA-31. Waterford Ponds	*			1
SS-N. Smith's Transport		*		1
SS-X. Springvale Swamp			*	1

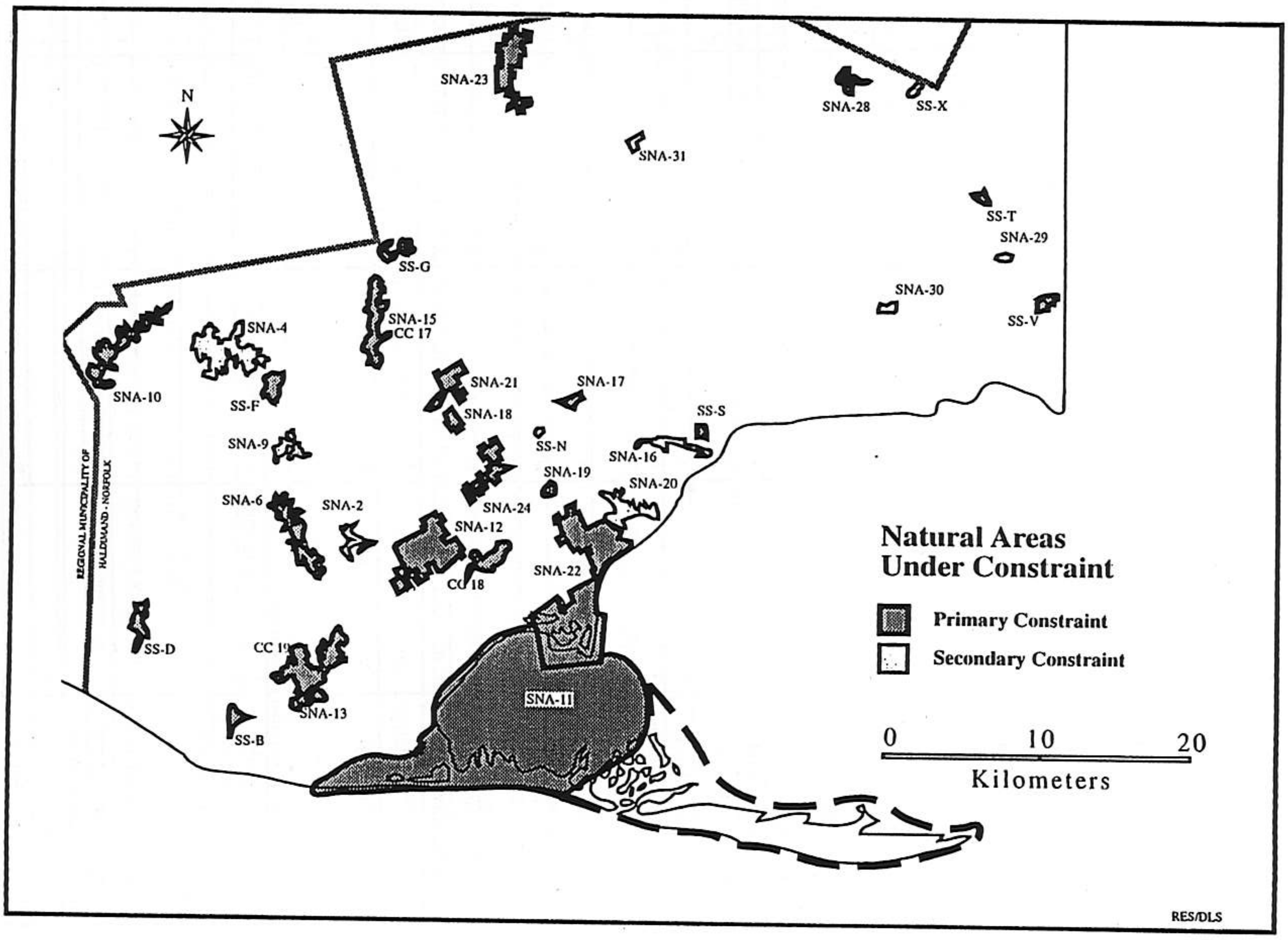

Figure 3.4 Natural Areas of Primary and Secondary Constraint (Labels are: SNA-Significant Natural Area, and SS-Significant Site, per Gartshore et al, 1987)

Table 3.4: Summary Characteristics of Priority Areas: Significance, Constraints, and Planning and Management Implications

Natural Area	Character of significance: 1) Robustness of values; or, 2) Linkage	Category of significance and constraint (Primary; Secondary)	Significance criteria fulfilled (criteria used in this study are in bold type)	Stresses or constraints	Existing designations and ownership/ management agencies	Planning and Management Implications
Primary Priority Areas						
11. SNA Long Point Inner Bay	Robustness of values	Primary significance; Primary constraint	**Significant species** **Sig. community** Sig. landform/soils Absence of disturbance **Diversity** **Linkage** Representativeness **Size** **Migratory stop-over** (Gartshore et al, 1987) **Presence of interior habitat** **Expert concensus**	Land use stresses: agriculture, logging, plantation, recreation, cottage, marina, drainage, channelization and dredging, roads, and other; Partial public ownership; Conflict with land use zoning	NAI-SNA ANSI-LS Top botanical site Wetland Class 1 Savanna-OMNR ESA-P Biosphere Reserve Provincial Park NWA CWS LPRCA OMNR RMHN Transport Canada	Prevent loss and degradation of habitat along the shoreline by: - restricting or controlling drainage, channelization and dredging; - restricting or controlling marina, cottage and recreational development; and, - considering use restrictions such as speed limits for boaters; Monitor and control deer population and grazing; Continue to protect and restrict access to core area of the Biosphere Reserve; Initiate private landowner contact or property acquisition; Utilize Class 1 wetland policy as protection mechanism
12. SNA St. Williams Forest and Savanna (Manester Property)	Robustness of values	Primary significance; Primary constraint	**Significant species** **Sig. community** **Diversity** **Linkage** Representativeness **Size** (Gartshore et al, 1987) **Presence of interior habitat** **Expert concensus**	Land use stresses: forest management, plantation, recreation and roads; Partial designation/ partial public ownership; Conflict with land use zoning	NAI-SNA Carolinian Canada Significant site (Lindsay, 1984)Top botanical site Wetland Class 1 Cold water stream Provincial forestry station OMNR RMHN	Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA); Include Manester property in ANSI (OMNR) program; Protect from recreational use such as ATVs; Prepare management/harvest plan with respect of savanna and other communities, to maintain interior habitat and linkage conditions, and to protect cold water stream; Utilize Class 1 wetland policy as protection mechanism. N.B. Conflicts may have been reduced recently with acquisition through Carolinian Canada program and management by OMNR
13. SNA South Walsingham Sand Ridges/Big Creek Floodplain	Robustness of values	Primary significance; Primary constraint	**Significant species** **Sig. community** **Diversity** **Size** (Gartshore et al, 1987) **Presence of interior habitat** **Linkage** **Expert concensus**	Land use stresses: agriculture, logging, forest management, plantation, recreation, drainage, and roads; Partial public ownership; Conflict with land use zoning	NAI-SNA ANSI-LS; ANSI-LS ESA-R Carolinian Canada Top botanical site Wetland Class 2 Cold Water Stream NWA LPRCA RMHN CWS OMNR	Include Big Creek Floodplain in ESA designation and develop protection policy for combined area (ESPA); Discourage drainage, grazing and logging; Protect from clearing of forest for agricultural cultivation; Consider rezoning land use from agricultural; Develop management plan with respect of significant species, to maintain interior habitat and linkage conditions, and to protect cold water stream; Initiate private landowner contact or property acquisition; Utilize Class 2 wetland policy as protection mechanism

15. SNA Delhi-Big Creek Valley	Robustness of values	Primary significance; Primary constraint	**Significant species** **Sig. community** Sig. landform/soils **Diversity** **Linkage** **Size** (Gartshore et al, 1987) **Presence of Interior habitat** **Expert concensus**	Land use stresses: agriculture, logging, forest management, plantation, residential, recreation,drainage, roads and other; Partial public ownership; Conflict with land use zoning	NAI-SNA ANSI-LS Top botanical site Wetland Class 1 Cold Water Stream Conservation Area LPRCA OMNR	Conduct biological inventory ; Develop management plan to protect species and communities and to maintain interior habitat and linkage conditions; Restrict logging on steep or unstable slopes (retain forested buffer); Initiate private landowner contact or property acquisition, to protect cold water stream by: - managing farm runoff; - restoring uncultivated buffer strip along valley rim; - reducing water withdrawal from small streams for irrigation; and - controlling refuse dumping; Determine sources of in-stream garbage accumulation from Delhi and control at source; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA); Utilize Class 1 wetland policy as protection mechanism
22. SNA Turkey Point	Robustness of values	Primary significance; Primary constraint	**Significant species** **Sig. community** Sig. landform/soils **Diversity** **Linkage** Representativeness **Size** **Migratory stop-over** (Gartshore et al, 1987) **Presence of Interior habitat** **Expert concensus**	Land use stresses: agriculture, plantation, recreation, cottage/marina, drainage, channelization and dredging, roads and other; Partial public ownership; Conflict with land use zoning	NAI-SNA ANSI-LS Top botanical site Wetland Class 1 Savanna-OMNR ESA-P Biosphere Reserve buffer Provincial Park Normandale fish hatchery Provincial forestry station OMNR RMHN	Conduct biological inventory; Revise management/harvest/fire plan with respect of rare species, savanna and other communities and to maintain interior habitat and linkage conditions; Increase educational component of Provincial Park; Prevent loss and degradation of habitat in the shore zone by: - restricting or controlling dyking, drainage, channelization and dredging; - restricting or controlling marina, cottage, recreational and agricultural development; and, - imposing and policing speed limits for vehicular traffic to alleviatel losses due to road kill; Initiate private landowner contact or property acquisition; Consider rezoning land use from agricultural; Utilize Class 1 wetland policy as protection mechanism
23. SNA Vanessa Swamp	Significant context values: size, presence of interior habitat	Primary significance; Primary constraint	**Significant species** **Sig. community** **Diversity** **Size** (Gartshore et al, 1987) **Presence of Interior habitat**	Land use stresses: agriculture, logging, plantation, recreation, drainage, roads and other; Partial designation/ partial public ownership; Conflict with land use zoning	NAI-SNA Wetland Class 2 IBP-CI Conservation Area LPRCA OMNR	Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA); Develop management plan to protect significant species and maintain forest size and interior habitat condition; Initiate private landowner contact or property acquisition to: - restrict forest clearance for agriculture and residential; - restrict clear cutting; - restrict drainage; Utilize Class 2 wetland policy as protection mechanism
Secondary Priority Areas						
4. SNA Courtland Swamp	Significant context values: size, presence of finterior habitat	Primary significance; secondary constraint	**Significant species** **Sig. community** **Diversity** **Size** (Gartshore et al, 1987) **Presence of Interior habitat**	Land use stresses: logging, forest management, plantation, drainage, vehicle trail; Partial public ownership; Conflict with land use zoning	NAI-SNA Top botanical site Wetland Class 1 LPRCA OMNR	Develop management plan to maintain interior habitat condition and protect species and communities; Initiate landowner contact program to: - restrict logging and forest management practices near heron colony, - discourage further drainage, and - restrict vehicle trail useage; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA); Utilize Class 1 wetland policy as protection mechanism
6. SNA Deer Creek Valley	Significant context values: linkage, size, representativeness	Primary significance; Primary constraint	**Significant species** **Sig. community** **Diversity** **Linkage** Representativeness **Size** (Gartshore et al, 1987)	Land use stresses: logging, recreation, and other (dam); Partial designation/ partial public ownership; Conflict with land use zoning	NAI-SNA Top botanical site Cold water stream Conservation Area LPRCA OMNR	Develop management plan to locate significant species and communities and protect from logging, recreation and park maintenance; Restrict logging on steep or unstable slopes (retain forested buffer); Initiate private landowner contact or property acquisition; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA)

10. SNA Little Otter Creek Valley	Significant context values: linkage, size, representativeness	Primary significance; Primary constraint	**Significant species** **Sig. community** **Diversity** **Linkage** Representativeness **Size** (Gartshore et al, 1987)	Land use stresses: agriculture, forest management, plantation and other (dam, estate residential); Partial designation/ partial public ownership; Conflict with land use zoning	NAI-SNA Significant site (Lindsay, 1984) Cold water stream LPRCA (dam) OMNR	Restrict logging on steep or unstable slopes (retain forested buffer); Initiate private landowner contact or property acquisition, to: - prevent farm effluent runoff (control at source); - restore riparian plantings along side streams to reduce flooding and siltation and to protect cold water stream; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA)
16. SNA Lower Young Creek Valley	Significant context values: linkage	Primary significance; Secondary constraint	**Significant species** **Linkage** Representativeness (Gartshore et al, 1987) **Age**	Land use stresses: forest management, plantation; recreation and other; Partial designation/ partial public ownership; Conflict with land use zoning	NAI-SNA Wetland Class 1; Cold water stream Conservation area LPRCA OMNR	Restrict logging on steep or unstable slopes to protect cold water stream; Initiate private landowner contact or property acquisition to: - restrict forest clearing for agriculture and residential development, and - control refuse dumping; Develop management plan to protect linkage and age values; Conduct research, re: potential impacts of upstream quarry operation; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA); Utilize Class 2 wetland policy as protection mechanism
20. SNA Spooky Hollow	Robustness of values	Primary significance; Secondary constraint	**Significant species** **Sig. community** Absence of disturbance **Diversity** **Linkage** **Size** (Gartshore et al, 1987) **Presence of Interior habitat** **Expert concensus**	Land use stresses: plantation, recreation, and roads; Partial public ownership; Conflict with land use zoning	NAI-SNA ANSI-LS Top botanical site Wetland class 2 Savanna - OMNR Cold water stream Conservation area LPRCA OMNR RMHN	Develop management plan to maintain interior habitat and linkage conditions; Restrict logging on steep or unstable slopes to protectcold water stream; Initiate private landowner contact or property acquisition to: - restrict logging, and - remove or harvest plantations to allow prairie regeneration; Protect stream from runoff from gravel roads; Consider rezoning land use from agricultural; Develop ESPA protection policy (ESPA); Utilize Class 2 wetland policy as protection mechanism
21. SNA Trout Creek Valley	Significant context values: linkage, size, presence of interior habitat	Primary significance; Primary constraint	**Significant species** **Sig. community** Absence of disturbance **Linkage** **Size** (Gartshore et al, 1987) **Presence of Interior habitat**	Land use stresses: logging, plantation and roads; Partial designation/ partial public ownership; Conflict with land use zoning	NAI-SNA Cold water stream RMHN OMNR	Prepare management plan; restrict logging on steep or unstable slopes (retain forested buffer); Harvest plantations and allow natural savanna regeneration; Initiate private landowner contact, including upstream landowners, to: - manage runoff into cold water stream; - restore natural vegetation as buffer strips along stream; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA)
24. SNA Walsh Carolinian Forest		Primary significance; Primary constraint	**Significant species** **Sig. community** **Linkage** Representativeness **Size** (Gartshore et al, 1987) **Presence of Interior habitat**	Land use stresses: agriculture, logging, forest management, plantation, roads and other; Partial public ownership; Conflict with land use zoning	NAI-SNA ANSI-LS ESA-R Wetland Class 3 LPRCA OMNR RMHN	Develop forest management/monitoring plan to protect significant species and forest size, interior habitat and linkage conditions from logging and clearcut practices, including those by LPRCA; Initiate private landowner contact or property acquisition to: - restrict clearance of forest edges for agriculture; - restrict clear cutting and selective logging of Carolinian tree species; Consider rezoning land use from agricultural; Include in ESA designation and develop protection policy (ESPA); Utilize Class 1 wetland policy as protection mechanism

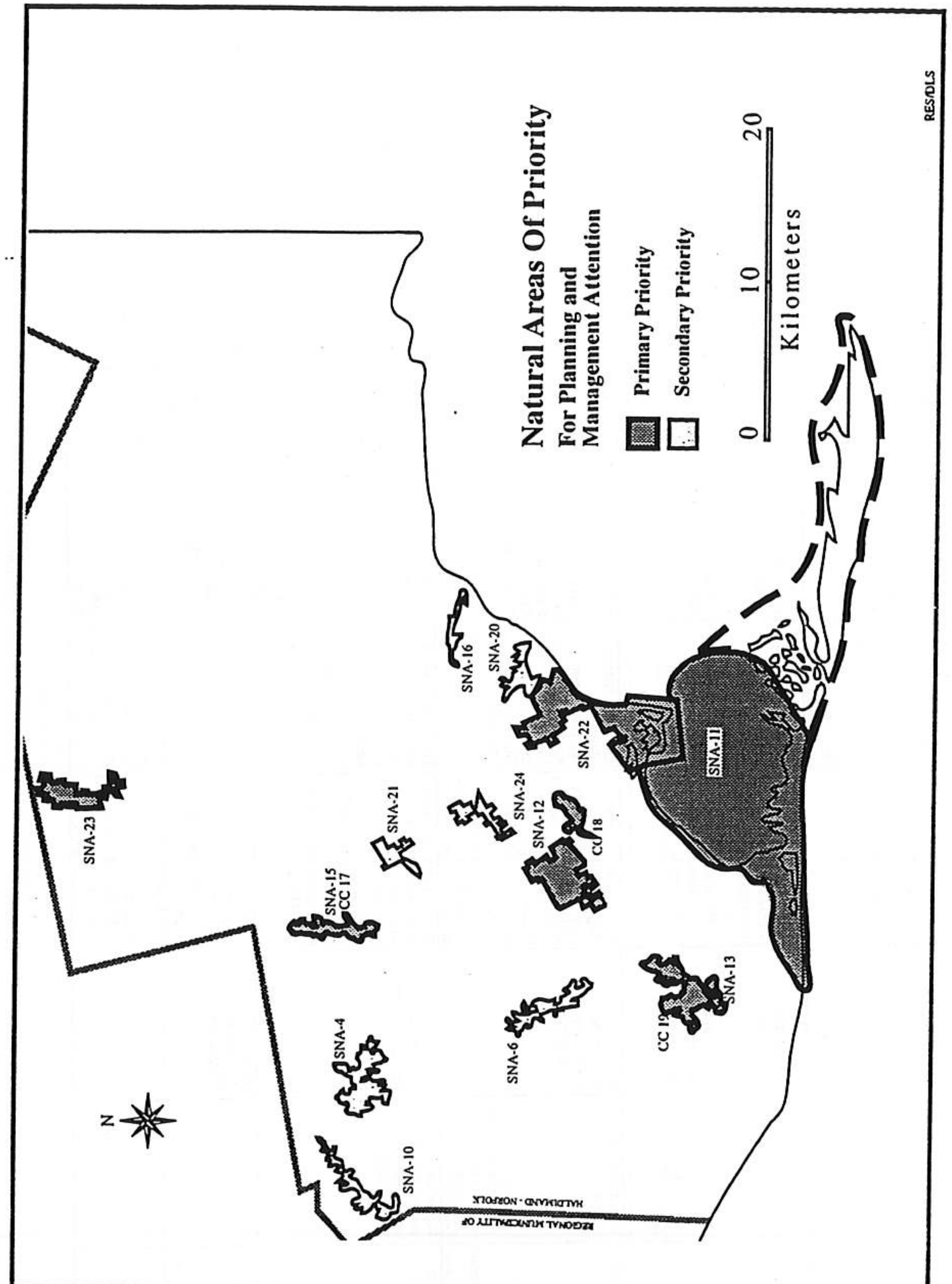

Figure 3.5 Natural Areas of Primary and Secondary Priority for Planning and Management (Labels are: SNA-Significant Natural Area, and SS-Significant Site, per Gartshore et al, 1987)

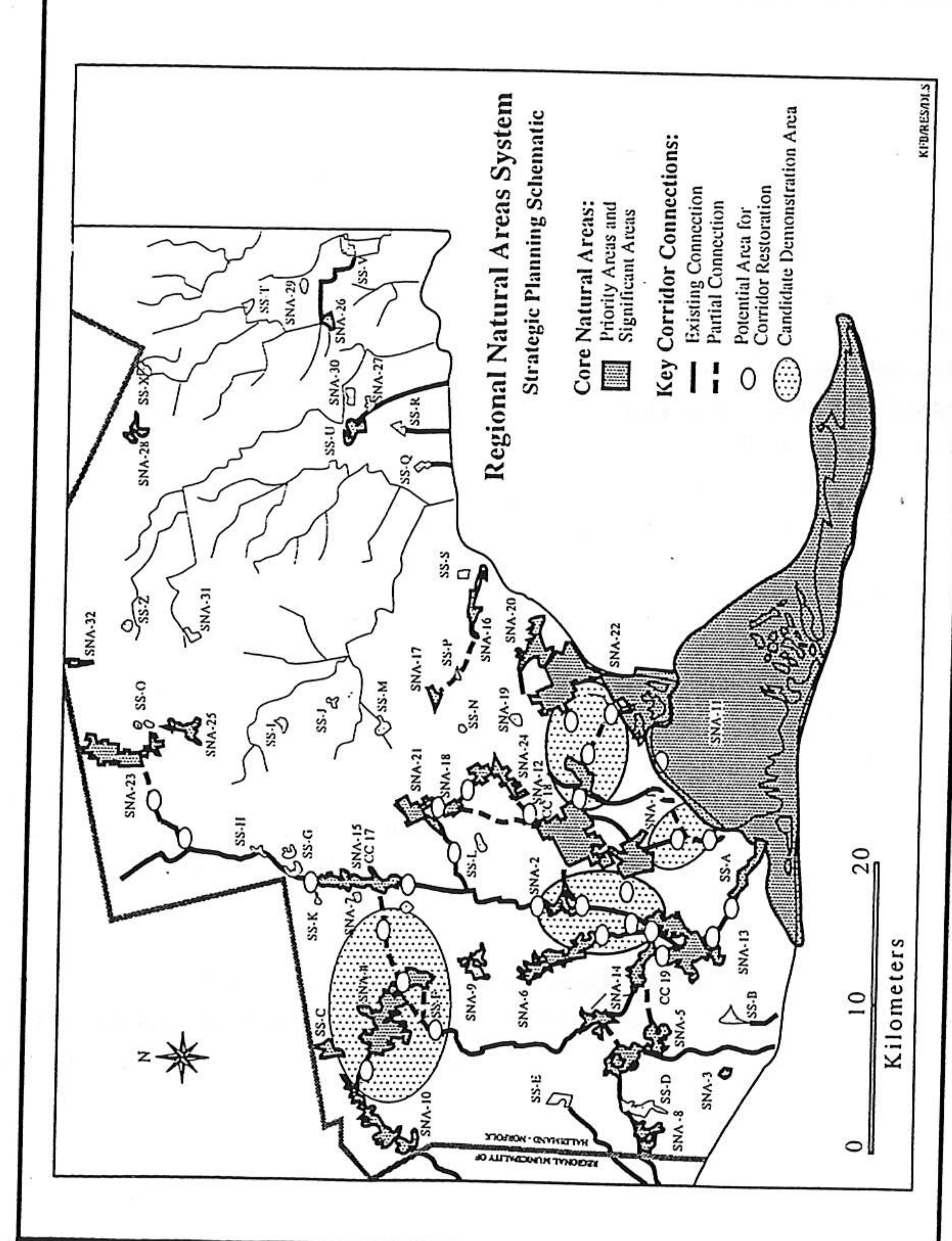

Figure 3.6 Initial Strategic Planning Schematic for a Regional Natural Areas System including core natural areas and corridors connecting them, primarily along river valleys

Opportunities for restoration identified in this study are focused specifically on the corridor or linkage system, although substantial benefit could also be provided by restoring areas as buffers and enhancing existing areas by removing exotic species and reintroducing native species. Potential areas for restoring connections are identified on Figure 3.6, based on the forest cover and drainage patterns indicated on topographic maps of the area (Energy, Mines and Resources Canada, 1986). This initial identification of areas is strategic in nature, with the intent that detailed ecological assessments will occur before action. Further analysis should be conducted to reassess and confirm the significance of these areas, the extent and magnitude of stresses, and historical changes that may have occurred since the initial inventory and field observations. Risk assessment should be conducted to identify potential negative effects of restoring connections among natural areas, such as the opening-up of previously isolated or sensitive natural areas to predation, the spread of disease, or invasion of exotic species. Cultural research could be carried out on land and resource use and possible economic opportunities linked to conservation.

Primary areas of focus for potential restoration occur along Big Creek and Dedrick's Creek, and at areas providing good potential for connections between natural areas and river valleys. In order to complete the backbone or basic framework of the system, important areas for potential restoration in the short term include connections: 1) among Vanessa swamp and Big Creek; 2) north and south of Big Creek Bend, and near settlements, such as Delhi, Lynedoch, Walsingham, Spring Arbour and Rowan Mills along Big Creek; and, 3) south of Backus Woods to Lake Erie along Dedrick's Creek.

Other areas of interest include connections along Venison Creek and Deer Creek at Big Creek; and, between Big Creek and Little Otter Creek, through Courtland Swamp headwaters and along Cranberry Creek. Numerous other opportunities for connections exist for medium and longer term attention, such as from Turkey Point and Spooky Hollow connecting inland to St. Williams Forest, Walsh Carolinian Forest, Pine Grove Forest and Trout Creek Valley, linking the Lake Erie coast with Dedrick's Creek and Big Creek. These areas are in close proximity to each other; direct connections could be restored with relatively small scale reforestation. The connection to Little Otter Creek Valley is significant for its linkage to the Big Otter Creek. Opportunities for such a connected natural areas system in the Big Otter Creek watershed warrant high priority and careful study.

3.2 Demonstration Projects

Several candidate areas exist for demonstration projects. Four potential areas are identified for further study. These represent key areas for potential connections within the context of the overall system.

Courtland Swamp Candidate Demonstration Area

The first candidate area for demonstration and potential restoration is the headwater area of Little Otter Creek, including Courtland Swamp, which could potentially connect Big Creek Valley to Little Otter Creek Valley, providing a bridge between these two watersheds. This area is an important area for further study and possible restoration of connectivity because it potentially connects three areas identified as being of primary significance, all of which are stressed to various degrees.

Big Creek Bend Candidate Demonstration Area

The second potential candidate is the Big Creek Bend area. Many small gaps of 100 meters or less exist in the connection along Big Creek, both upstream and downstream of this area. Opportunity for connecting Big Creek Bend to Deer Creek Valley also exists, with a gap of less than 250 meters. A connection to St. Williams Forest exists and could be protected and enhanced.

Dedrick's Creek Candidate Demonstration Area

The third potential candidate area for restoration is along Dedrick's Creek from Backus Woods to Lake Erie. This area is an important part of the corridor framework, but represents the longest gap in the connectivity of the bioregional system.

Turkey Point-Spooky Hollow Candidate Demonstration Area

The fourth possible demonstration area is from Turkey Point and Spooky Hollow, along the coast and inland to St. Williams Forest and Walsh Carolinian Forest, and beyond to Dedrick's Creek and Big Creek through Pine Grove Forest and Trout Creek Valley. This opportunity for connection among significant natural areas on the coast and others further inland is unique within the region. This area contains five sites of primary significance and one site of secondary significance.

3.3 Implementing the Concept:
The Turkey Point-Spooky Hollow-St. Williams Forest Candidate Demonstration Project

Rationale for the Choice of Demonstration Area

The Turkey Point-Spooky Hollow-St. Williams Forest area is complex and dynamic, both ecologically and culturally. The coastal location contributes to the diversity of ecosystems, through the transition from aquatic to terrestrial systems, and contains a high concentration of stressful land use activities, including cottages, marinas, beach use, camping, picnic and trailer parks, and sport fishing facilities. The number and magnitude of existing and future stresses make this area a priority for planning and management attention.. Turkey Point, Spooky Hollow and St. Williams Forest are all natural areas of primary significance. The coastal setting provides an opportunity for exploring potential connections along the coast and inland to other significant areas. All three sites and other areas of forest cover contain a mix of deciduous forest, monoculture pine plantations and remnants of oak savanna. There is a history of reforestation in the area. The area is a high profile one, thus justifying special attention. It includes a Life Science ANSI; Class 1 Wetlands; Significant Natural Areas and ESAs; a Carolinian Canada site; a Provincial Park and a Forestry Station; and, is part of the Biosphere Reserve buffer zone. Finally, existing gaps among areas of forest cover are relatively small (Figure 3.7).

Project Goals

The overall aim of the demonstration project could be to provide a connecting corridor of natural land cover from Turkey Point and Spooky Hollow to St. Williams Forest. It is meant to be understood that further study such as ecological risk assessment is part of the process and, if negative impacts of connections are identified, alternatives should be considered.

Research and Project Design

The major components of the demonstration project design relate to: 1) inventory, assessment and research; 2) community, landowner, and agency involvement; 3) institutional arrangements such as securement of funding and other support; as well as, 4) actual on-the-ground implementation or restoration work, including programs for land owner contact and co-operative development of conservation and economic benefits.

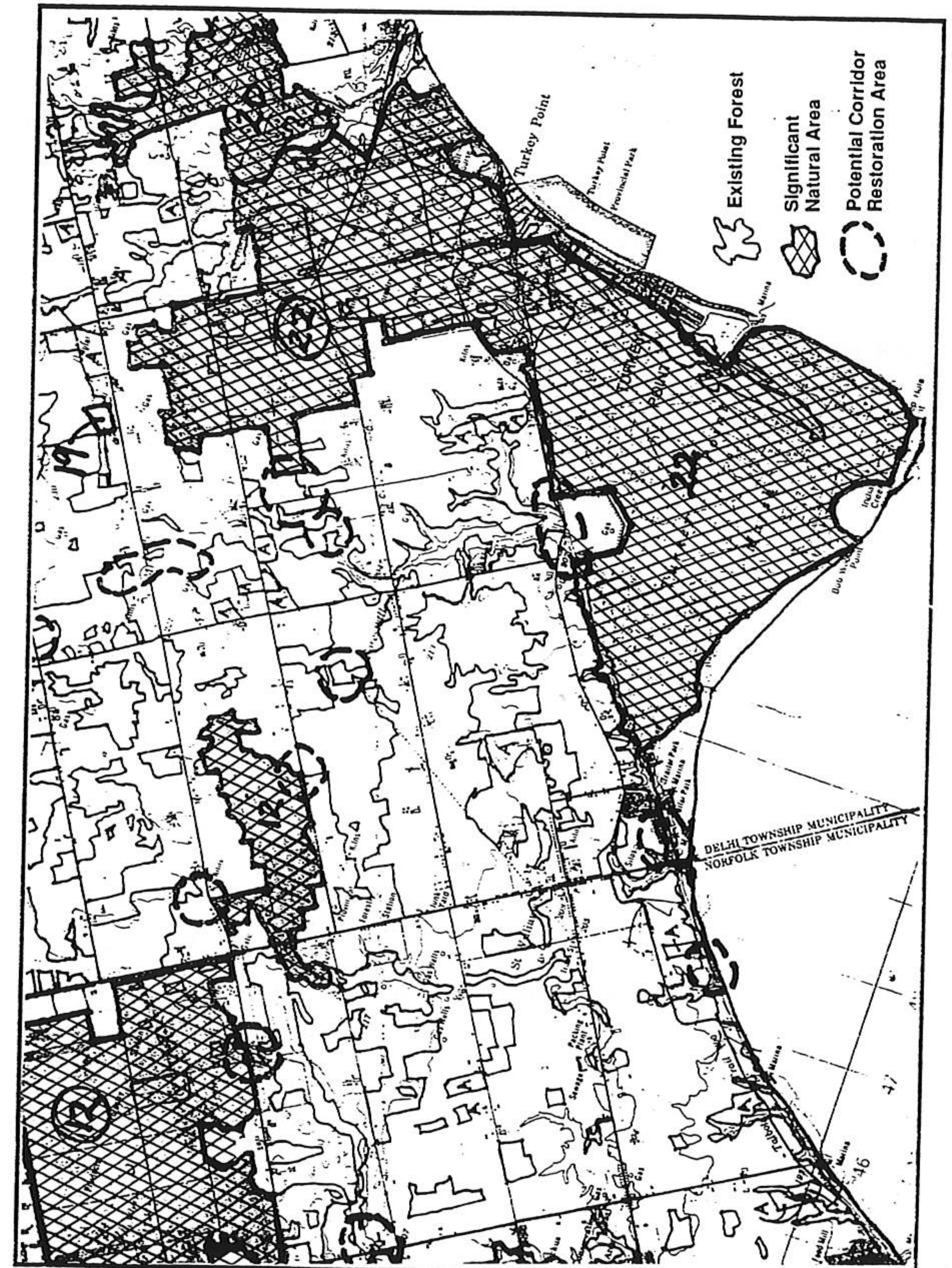

Figure 3.7 Demonstration Project: The Turkey Point (22), Spooky Hollow (20), and St. William's Forest (12) Areas

Overall for the region or study area, the first major information need is for more detailed and site specific biological or ecological assessments, including risk assessment associated with restoring connections among natural areas. The second area of research need is for greater understanding of land use, its history, rate of change, and economic, social and environmental implications, especially in regard to a natural areas system and sustainable development for Haldimand-Norfolk region. More research is also needed on the current and potential economic value of land uses related to natural areas, including tourism.

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APPENDIX 1

List of Species

Acer sp.	maple
A. saccharum	sugar maple
Aesculus sp.	chestnut
Betula sp.	birch
Carya sp.	hickory
Fagus sp.	beech
Fraxinus sp.	ash
Juglans sp.	walnut
Larix sp.	tamarack
Ostrya sp.	ironwood
Picea sp.	spruce
P. glauca	white spruce
P. mariana	black spruce
Pinus sp.	pine
P. banksiana	jack pine
P. resinosa	red pine
P. strobus	white pine
Prunus sp.	cherry
Quercus sp.	cherry
Quercus sp.	oak
Thuja occidentallis	eastern white cedar
Tilia sp.	basswood
Tsuga sp.	hemlock
Ulmus sp.	elm
U. americana	American elm