

NATURAL AREAS INVENTORY: Town of Fort Erie Settlement Areas (Volume 1 of 2)



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FINAL DRAFT

Prepared for:
Town of Fort Erie
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Prepared by:
Dougan & Associates
Ecological Consulting Services

Project Personnel

Project Director & Senior Ecologist:	Mr. Ken Ursic ¹
Project Wildlife Biologist:	Mr. Karl Konze ¹
Project Plant Ecologist:	Ms. Margy de Gruchy ¹
Support Wildlife Biologists:	Mr. Alan Wormington ² , Mr. Dave Martin ² , Ms. Linda Wladarski ² , Mr. Ross Snider ² , Mr. Pete Read ²
Report Research & Preparation:	Mr. Ken Ursic ¹ , Mr. Karl Konze ¹ , Ms. Marg Stalker ¹ , Ms. Margot Ursic ¹
GIS Mapping & Analysis:	Ms. Kristina Shaw-Lukavsky ¹

¹ Dougan & Associates – Ecological Consulting Services in-house staff

² Sub-consultants retained by Dougan & Associates

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Executive Summary

Dougan & Associates Ecological Consulting Services was retained by the Town of Fort Erie in June of 2002 to conduct a Natural Areas Inventory (NAI) for the Town's four urban Settlement Areas as well as the Town's one rural Settlement Area. Notably, the Bert Miller Nature Club is conducting a parallel study for the Town's Agricultural Area. The primary purpose of this NAI was to document and map the Town's natural heritage resources to a level of detail that would facilitate the development of locally appropriate natural heritage planning policies for the New Official Plan, and also serve as a basis for developing a natural heritage system. To this end, this study provides the baseline data required to help planning staff develop policies for the management and protection of locally significant natural areas in a manner that is consistent with Provincial and Regional policies and guidelines.

Key components of this study include:

- Synthesis of inventory and secondary source data to provide an overview of the study area's natural heritage resources.
- Application of the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998) to all semi-natural and natural habitat types.
- Identification and classification of 455 distinct ELC polygons of various size, shape, and type.
- Consolidation of the 455 ELC polygons into 117 larger habitat blocks in a manner consistent with current landscape ecology principles.
- Development of 7 Natural Areas Designation Criteria to permit the evaluation of ecological and cultural values associated with each habitat block.
- Determination of Locally Significant Natural Areas (LSNAs).
- A Conceptual Natural Heritage System with recommended Core Areas and Linkages.
- Recommendations to assist in the development of Official Plan policies designed to protect Fort Erie's unique natural heritage

This report sets Fort Erie's natural heritage resources within a regional context by providing an overview of the Niagara Region's physiography, soil types, hydrology, climate, vegetation and wildlife. It also provides a brief outline of the history of land use changes in the Town and Niagara Region, with emphasis on areas with recreational and/or conservation status.

Volume 1 of this report presents a summary of our inventory methods, including an explanation of the Natural Areas Designation Criteria, followed by our findings and final recommendations based on the results of applying these criteria to the habitats identified and characterized in the study. The text is supplemented by mapping of the natural areas showing both ELC communities and the larger consolidated habitat blocks, while Volume 2 contains appendices with supporting detailed methodologies, summary sheets for each habitat block, and species lists for vegetation and wildlife.

The Study Area of 7527 ha was found to include 3268 ha (i.e., 43.4%) of natural and semi-natural habitat requiring assessment, with very little of this area ever having been field surveyed for natural heritage purposes before. Our inventory and assessment of the study area's natural heritage consisted of a

combination of remote sensing analysis, windshield surveys, field reconnaissance and integration of secondary source data. Following an assessment of the available background data and preliminary remote sensing analysis using current air photos, high priority sites for field visits were selected based on (a) existing data gaps and/or (b) determination of their relative high quality. More than 80 hours were spent in the field for the collection of wildlife data, and more than 120 hours were spent in the field in order to collect ELC and vegetation data.

While the Study Team made every effort to maximize coverage of the Study Area and provide as comprehensive a study as possible, there were a number of notable limitations to the scope of this study including late project start-up date, difficulty traversing some of the terrain, site inaccessibility, and limited resources. Key limitations include:

- the absence of a fisheries inventory;
- only incidental observations of mammals (rather than a comprehensive survey);
- reptiles and amphibians being surveyed out of season;
- the absence of a spring survey component in the vegetation fieldwork;
- a variable level of detail in the vegetation and wildlife inventories conducted among and within the habitat blocks; and
- wildlife surveys being conducted primarily in wooded areas.

A total of 117 habitat blocks, comprised of 455 discrete ELC communities have been identified in the Study Area. The predominant cover types include swamps, scrublands, meadows and forests, or various combinations or complexes thereof. Swamps account for 15% of the Study Area and represent approximately one third of the available semi-natural and natural cover. Cultural or semi-natural communities such as old fields, thickets, and regenerating lands comprise 15% of the Study Area and accounting for another third of available semi-natural and natural cover. Forests account for approximately 10% of the Study Area and approximately 23% of available semi-natural and natural cover. Swamps and Forests account for approximately 25% of the Study Area and just over 50% of the available semi-natural and natural cover. Given that most of the study area is flat and poorly drained; it is not surprising to find a predominance of Swamp and other wetland communities. Other less common and provincially significant community classes such as Beach Bar, Tallgrass Prairie, Sand Dune, and Coastal Marshes are present within localized portions of the Study Area.

Although the bulk of the time for this study was dedicated to the inventory and assessment of the natural and semi-natural habitats as described above, the crux of this study lies in the 7 Natural Areas Designation Criteria that have been selected to filter out the habitat blocks worthy of Locally Significant Natural Area (LSNA) designation. These criteria are: (1) Designated Areas, (2) Hydrological Functions, (3) Site Condition, (4) Habitat Diversity, (5) Special Features, (6) Representation, and (7) Socio-Economic Value.

It was determined habitat blocks meeting any 3 of the 7 Natural Areas Designation Criteria would be recommended for LSNA status. These blocks, called recommended Core Areas for the purposes of the Conceptual Natural Heritage System, account for a total of 2786 ha (85.25% of the natural cover, but only 37% of the Study Area). In addition, a preliminary system of linkages that connects natural areas throughout the Town is provided as part of the Conceptual Natural Heritage System.

The key recommendations of this Study are as follows:

1. The Natural Areas Designation Criteria developed for this Study should be adopted as the basis for designation of Locally Significant Natural Areas (LSNA's) for the Town of Fort Erie.
2. Of a total of 117 habitat blocks, 80 blocks should be given LSNA status, as identified in this Study and in the Conceptual Natural Heritage System.
3. These blocks (called "recommended Core Areas" for the purposes of the Conceptual Natural Heritage System) should form the basis for the Town's Natural Heritage System.
4. The 37 habitat blocks that have not been recommended for LSNA status (called "Other Natural Areas" in the Conceptual Natural Heritage System) should still be recognized as natural and semi-natural areas, albeit of lower priority.
5. Although the proposed LSNA's include many previously identified environmental areas, it is recommended that Provincially Significant Wetlands, Locally Significant Wetlands, Environmentally Sensitive Areas, Areas of Natural and Scientific Interest, Habitat for Endangered Species, Significant Woodland, Significant Valleylands, and Significant Wildlife Habitat should be officially recognized and integrated into the City's new Official Plan.
6. Prior to development of an official Natural Heritage System for the Town, additional field work to fill in the remaining data gaps should be conducted.
7. The linkages shown in this Study's Conceptual Natural Heritage System should also be taken into consideration during development of the Town's Natural Heritage System.
8. Specific policies should be developed to protect wetlands and groundwater resources.
9. Subwatershed Studies should further refine the boundaries of identified LSNA's and confirm the Natural Areas Designation Criteria for habitat blocks prior to finalization of Secondary or Neighbourhood Plans.
10. Core Areas should be protected from future development and agricultural impacts wherever possible. Where complete protection is not possible, an EIA should be required for any proposed development on or adjacent to these areas.
11. The terms of reference for the EIA should confirm the criteria for which the habitat block/Core Area/LSNA was designated, and should ensure that the ecological functions and attributes of these criteria are not impacted by the proposed development.
12. ELC should be adopted as the official standard for vegetation classification for the Town for all future environmental studies for consistency in evaluation and interpretation.
13. Policies or approved guidelines should be established encouraging naturalization of parks and open spaces.
14. The Town should consider developing a municipal Tree By-law that complements the existing Regional Municipality of Niagara Tree Conservation By-law (No. 8541-960) and addresses the specific needs within the Town with respect to tree and woodland conservation. Additional restrictions should apply to those areas situated within 1.5 km of Lake Erie in order to protect its significance as a migratory bird stopover habitat (i.e., place to rest and refuel).
15. Once the field data collection by the Bert Miller Nature Club for the natural habitats in the Town's Agricultural Areas is complete, this information should be integrated with this Study's findings to provide a more comprehensive picture of the Town's natural heritage.

The designation and protection of the Town of Fort Erie's significant natural heritage resources through the municipal planning process is a critical step in ensuring a healthy environment for the Town, but is only as effective as the commitment of Council and town staff to enforce the protection of these lands.

The recommended system of LSNAs aims to protect a substantial portion of the Town's remaining natural heritage resources in a manner that recognizes the ecological, social and economic value of these resources at the local level, and is also respectful of Federal, Provincial and Regional policies and legislation. The core components of the system comprise approximately 37% of the Study Area's land base. This level of natural cover is considered reasonable for the maintenance of a sustainable ecosystem in an urban environment and is within the range of current established targets (30 - 40%). (Holland-Hibbert 1996; Austen and Bradstreet 1996; Environment Canada 1998; American Forests 1999).

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I Introduction

I.1 Study Context & Scope

The Town of Fort Erie is unique from a natural heritage perspective because it contains an unusually high diversity of habitats and a much greater proportion of natural cover than most municipalities in the Region of Niagara, and in all of southern Ontario. Situated in Canada's Carolinian Forest zone, the Town boasts approximately 30% tree cover with about half of the Town's woodlots being over two hectares in size (Town of Fort Erie 2002). In order to be proactive about protecting this valuable natural heritage, and in response to the residents' strong desire to see the Town's natural areas protected, the Town has decided to make natural heritage policies one of the key elements of its New Official Plan. Although the Town has already collected data identifying the provincially and regionally significant natural heritage features within its boundaries, it required additional information to determine which of its natural areas should be considered significant on a local level. In order to obtain this data, the Town decided to hire a consulting firm to undertake a biological inventory.

In June of 2002, Dougan & Associates Ecological Consulting Services was retained by the Town of Fort Erie to conduct a Natural Areas Inventory (NAI). Given the existing time and budgetary constraints, the scope of this study was limited to Fort Erie's four urban and one rural Settlement Areas (see Figure 1 and Map 1). While the primary impetus for this study was to provide background for the development of natural heritage policies for the Town's New Official Plan, it was determined that it would be most expedient to allow the Study Team to focus their efforts on the natural areas under more immediate development pressure in 2002, with data on the remaining Agricultural Areas to be forthcoming.

Dougan & Associates' inventory and assessment of the study area's natural heritage consisted of a combination of remote sensing analysis, windshield surveys, ground-truthing and integration of secondary source data. Synthesis and analysis of the collected data was then used to:

- document and accurately identify the limits of natural features at the local level,
- develop an NAI database for the Town of Fort Erie (using the 117 identified habitat blocks as the base unit),
- develop species lists for both vascular plants and wildlife recorded, and
- develop a significant bird species list for the Town.

Notably, this NAI was primarily a study of vegetation communities and bird species even though, ideally, an NAI should include a fisheries inventory as well as a wildlife inventory covering mammals, amphibians and reptiles as well as birds. Due to late project start-up (i.e., June 2002), difficulty traversing some of the terrain, site inaccessibility, and limited resources it was only possible to make incidental observations of mammals and limited observations of reptiles and amphibians. In addition, a variable level of detail in the vegetation and wildlife inventories conducted among and within the habitat blocks.

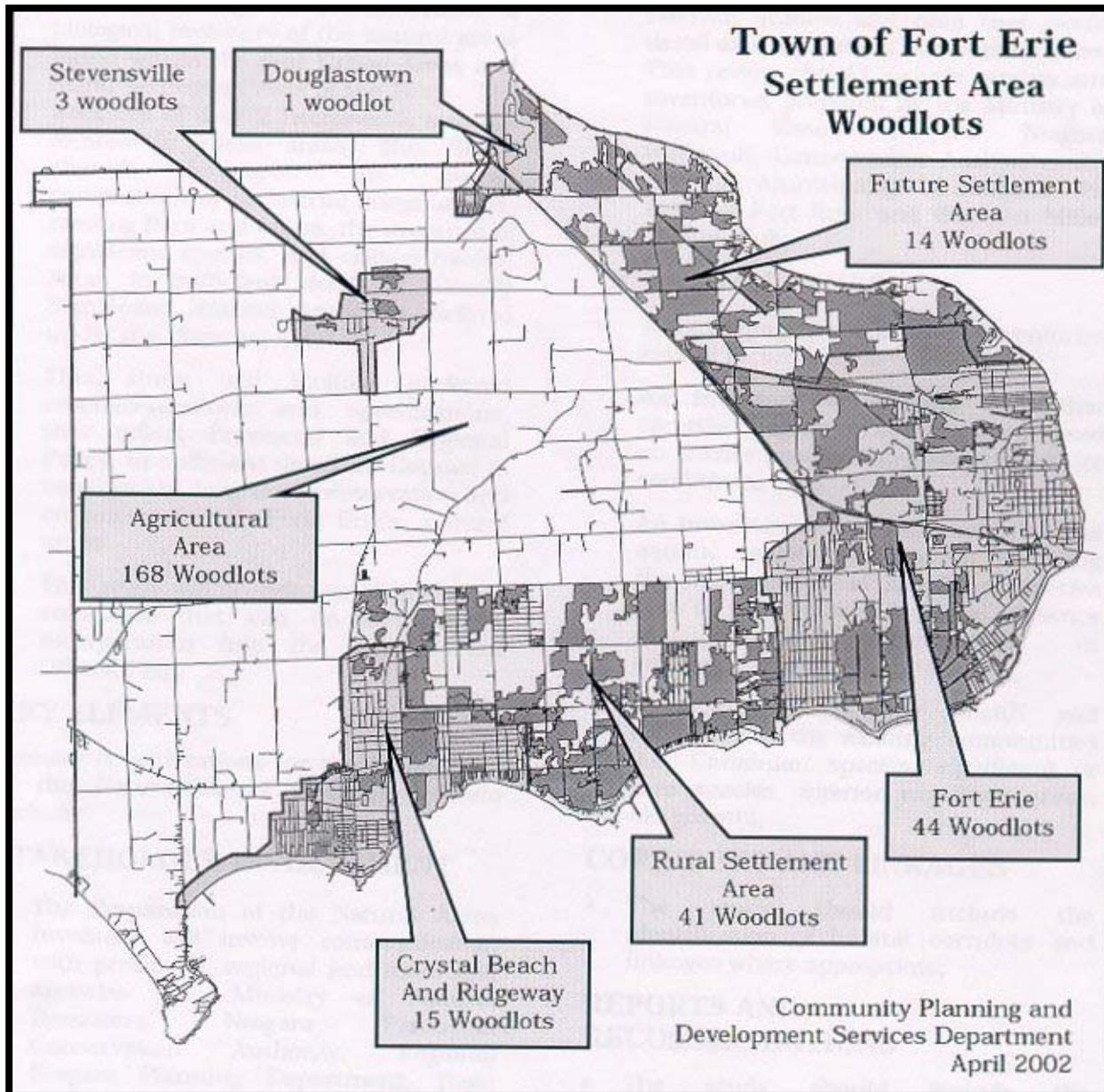


Figure 1: Town of Fort Erie’s Settlement Areas and municipally recognized woodlots therein as of spring 2002.

Ongoing consultation with various stakeholders has been a key component to this study and has involved liaison with individuals at the Ontario Ministry of Natural Resources (OMNR), the Region of Niagara, the Ontario Breeding Bird Atlas (OBBA), the Natural Heritage Information Centre (NHIC), the Bert Miller Nature Club, Friends of Fort Erie Creeks, and, of course, the Town of Fort Erie. These agencies and organizations have provided an abundance of background and secondary source data that has been integrated into this study. Consultation with specialists on local wildlife was instrumental in developing our list of significant bird species for the Town.

In order to support the development of a Natural Heritage System and related policies within the New Official Plan, a system for ranking the significance of the 117 identified habitat blocks was developed along with a preliminary system of corridors and linkages, and recommendations relating to mechanisms for how best to protect the Fort Erie's locally significant habitats. The ranking system has been based on 7 commonly applied Natural Areas Designation Criteria (NADC). Summary sheets for each habitat block showing which of the 7 criteria they fulfilled as well as a summary of their biophysical features are provided in the Appendix I.

1.2 Study Objectives

The overall objective of this Natural Areas Inventory was to document and characterize the natural areas (i.e., terrestrial, wetland and aquatic communities) in the Town's four urban and one rural Settlement Areas in sufficient detail to allow Council to decide whether or not a given natural area should be designated as locally significant.

The specific Study objectives were to:

1. Document the overall composition of terrestrial communities (i.e., existing vegetation and wildlife, the presence of significant species and critical habitat for vulnerable, threatened or endangered species) using current standard methodologies for natural habitat (i.e., the Ecological Land Classification [ELC] system) and wildlife (i.e., OBBA methods) assessment.
2. Consult with and integrate information from a wide range of stakeholder groups and agencies to enhance our databases.
3. Provide a ranking system of the natural areas that recognizes Provincial and Regional Policies as well as the Town's unique natural heritage.
4. Develop a preliminary system of corridors and linkages that can be readily translated into a Natural Heritage System in the Town's New Official Plan.
5. Provide recommendations that can serve as the basis for development of natural heritage policies in the Town's New Official Plan.

2 Biophysical & Historical Setting

The Town of Fort Erie is situated within the Regional Municipality of Niagara which ranks among the most biologically diverse regions in Ontario (Brady 1980). Located on the shores of Lake Erie at the mouth of the Niagara River, the Town is bounded to the east by the Niagara River, to the south by Lake Erie, to the west by the City of Port Colborne, and to the north by the City of Niagara Falls.

The Town covers 168.3 km² and boasts a greater proportion of natural cover than most municipalities in southern Ontario (Larson et al. 1999; Holland-Hibbert 1996), with approximately 30% mature tree cover consisting of 133 forested units greater than 2 ha in its Settlement Areas alone. Although the Town's population is still relatively small (28,143 as of the 2001 Census with a seasonal influx of over 10,000 summer residents [Town of Fort Erie NAI Terms of Reference 2002]), this is expected to change over the next decade, putting more pressure on the extensive natural heritage that Fort Erie has to offer.

The Town of Fort Erie is situated at the eastern limit Canada's Carolinian life zone, an area known for its mild climate and home to 40% of Ontario's provincially rare plants, the Southern Flying Squirrel (*Glaucomys volans*), designated as "Special Concern" in Canada, a wide variety of significant breeding birds, and a number of amphibians and butterflies of conservation interest (Allen et al. 1990). Given its location in Carolinian Canada and the relatively good proportion of natural cover in the Town of Fort Erie, it would be surprising if its natural heritage did not include many habitats and species of provincial and regional significance, and of conservation interest.

2.1 Physiography & Topography

The physiography of the Regional Municipality of Niagara is shown in Figure 2 and has been described by Chapman and Putnam (1984) and Kingston and Presant (1989). The topography can be characterized as generally flat, and limited to a relief of only a few metres with some relief associated with current and former shorelines, small moraines and bedrock outcrops.

The bedrock of the Niagara Region is of sedimentary origin, deposited during the Ordovician, Devonian and Silurian Periods of the Paleozoic Era, placing its age between 400 and 500 million years (Brady 1980). These sedimentary rocks were formed from clay, sand and lime deposited in warm, shallow seas over the igneous and metamorphic rocks of the Canadian Shield. The bedrock exhibits a slight (<1°) dip to the south, exposing various strata as east-west trending bands on the bedrock surface.

The physiography of Fort Erie is flat and dominated by the Haldimand Clay Plain with some relief provided by the Fort Erie Moraine, the Crystal Beach Moraine, and the Onondaga Escarpment (Figure 2). In the Fort Erie area, the bedrock includes the Bois Blanc, Bass Island and Salina formations. The Bois Blanc limestone of the Devonian series is exposed in numerous locations in the southernmost sections of the Niagara Peninsula. To the southwest, the outcrop forms a low ridge called the Onondaga Escarpment. In the southeast, the limestone is exposed only in very small outcrops between Fort Erie and

the mouth of the Grand River. Elsewhere it is buried by till and lacustrine deposits. The Salina formation of the Silurian system underlies the Haldimand Clay Plain, but has little influence over its soils (Chapman and Putnam 1984).

The Haldimand Clay Plain, deposited during the era of glacial Lake Warren, lies between the Niagara Escarpment and Lake Erie (Figure 2). The topography of the Haldimand Clay Plain is basically flat, apart from the low morainic ridges and a few shallow river valleys. The area is underlain by Paleozoic bedrock which dips to the south under Lake Erie. The overburden is glacio-lacustrine clay and silt. The soils of this region have heavy texture and poor, uneven drainage, and include numerous isolated wetland and low wet areas (Chapman and Putnam 1984).

The Onondaga Escarpment crosses the Niagara Peninsula from Fort Erie to Hagersville. This low escarpment is capped by limestone of the Bois Blanc formation of the Devonian system, and includes small outcrops of bedrock along the crest. To the north of the Onondaga Escarpment is a lowland worn in the Salina Formation, consisting of interbedded limestone, shale and sandstone (Chapman and Putnam 1984). The north-facing ridge of the Escarpment prevents drainage to the south towards Lake Erie, except for a few small short creeks. As a result, the land to the north is wet and swampy (Brady 1980). The Escarpment forms the foundation for the Ridge Road (and former Aboriginal-pioneer route) along the top from Ridgeway to the Bowen Road and Ridgemount area (Landscapes 1997).

Between the Onondaga Escarpment and the Lake Erie shoreline lie the Crystal Beach and Fort Erie Moraines, shown in Figure 2. These are composed of predominantly clay and silt tills, and result in gently rolling landforms.

The dominant clay-based physiography is interrupted in a few areas near of the Town's shoreline where gravel and sand deposits exist. A gravel bar at Ridgeway, (elevation 657 feet above sea level) represents a remnant of a temporary beach shoreline of glacial Lake Warren. The road from Crystal Beach to Sherkston also follows a conspicuous beach formation (elevation 618 feet above sea level on the crest at Crystal Beach) (Chapman & Putnam 1984). The gravelly streak at Ridgemount is also a lacustrine beach.

The shore of Lake Erie is low and is controlled by the surface of the underlying limestone. Resistant beds of limestone form headlands, the most prominent of which is Point Abino. The Lake Erie shoreline is characterized by points, bays and a narrow ridge of sand dunes. The sand is highly alkaline, derived from the Bois Blanc limestone that forms the floor of the northern section of Lake Erie. There is a wide sand beach at Crystal Beach while between Ridgeway and Fort Erie, the coastline is dominated by a rocky interface, backed by clay till and controlled by surface limestone where 9 miles of low bluffs can be seen (Brady 1980). East of Windmill Point, a line of sand dunes parallels almost the entire remaining length of the shoreline. The dunes are higher and more extensive in the east, with the largest, at Point Abino, rising to 75 feet above the lake level.

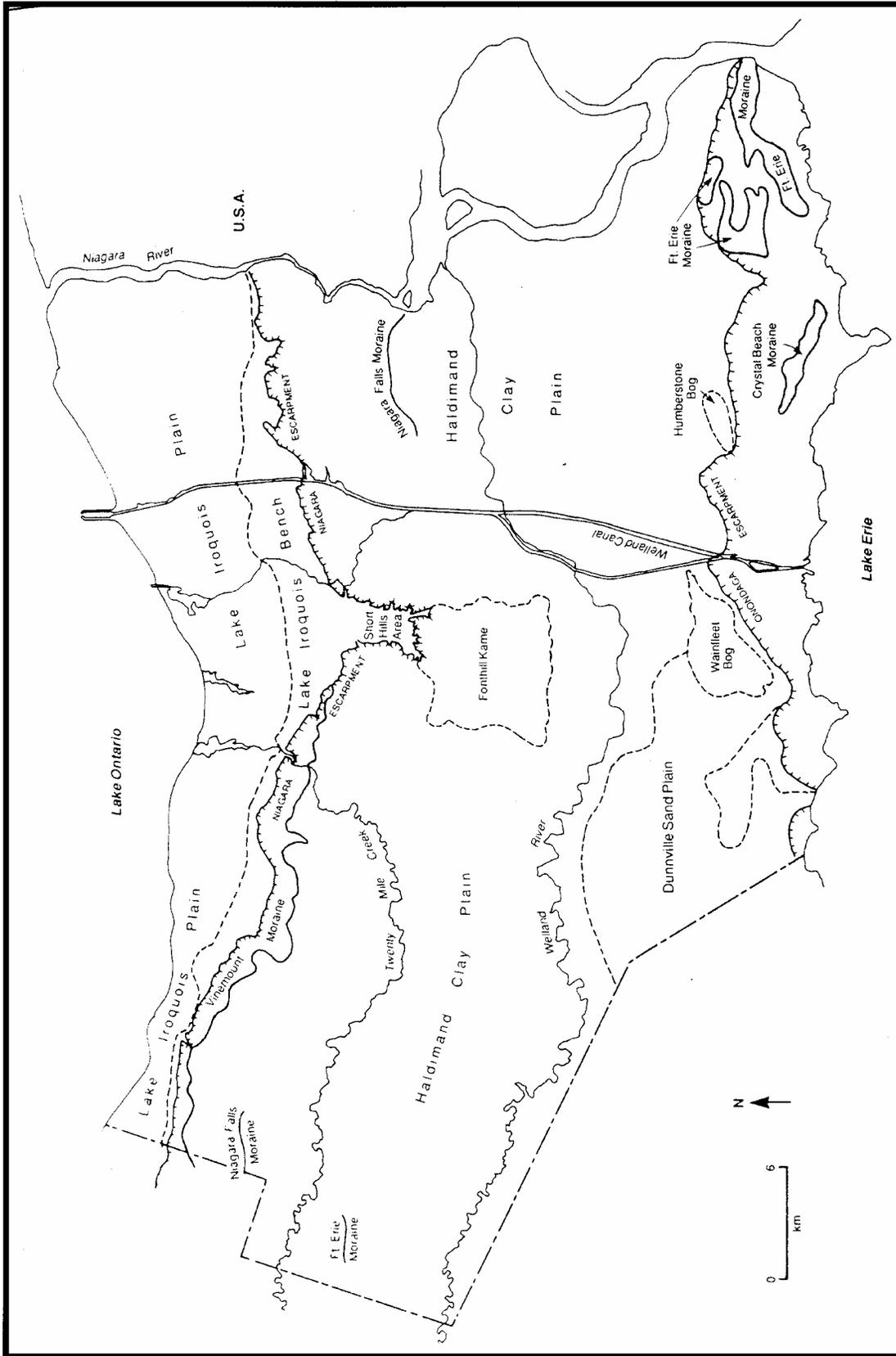


Figure 2: Geologic and physiographic features in the Regional Municipality of Niagara (modified from Kingston and Present 1989).

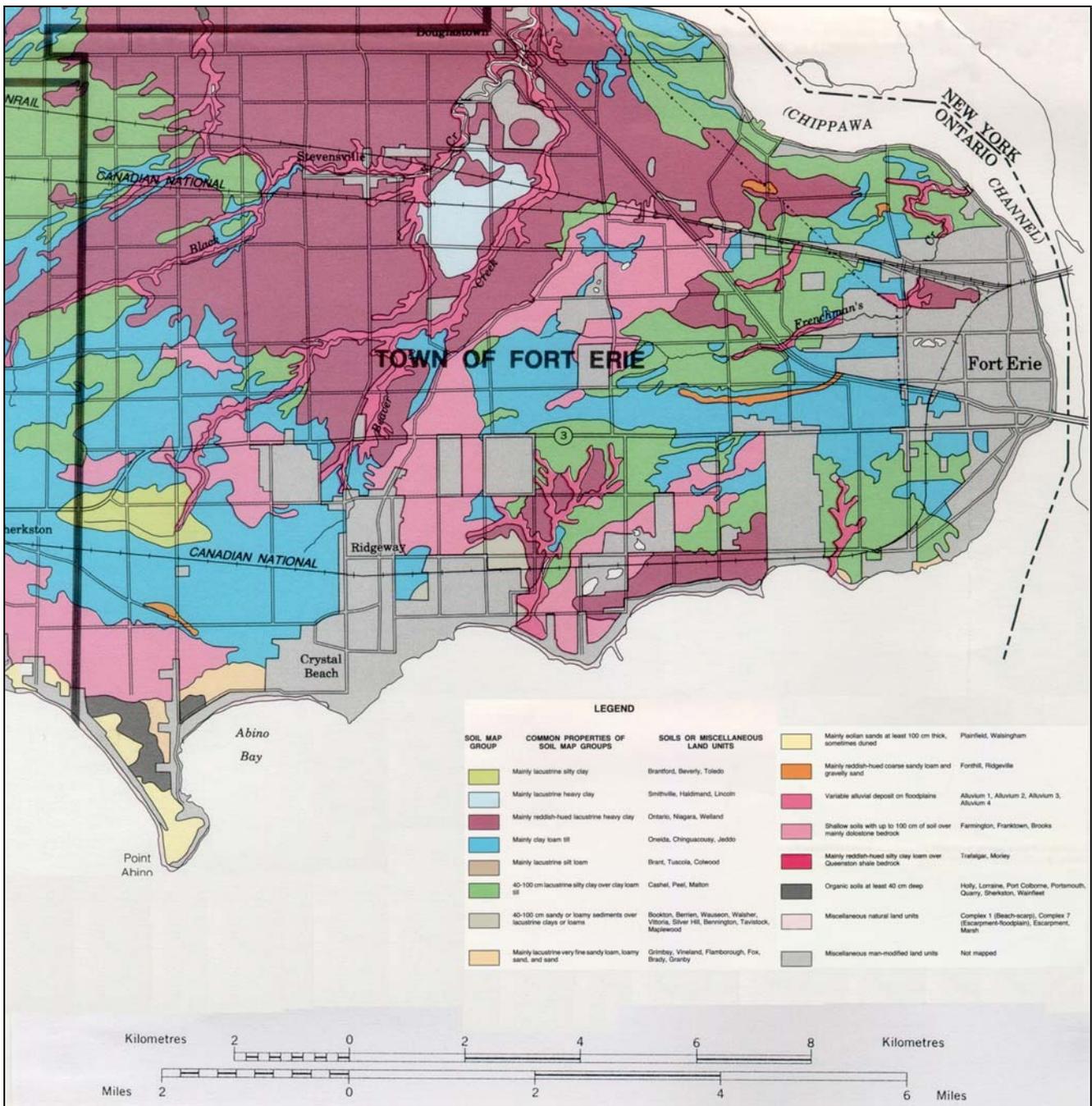


Figure 3: Generalized soil map, Town of Fort Erie (derived from Ontario Institute of Pedology 1989).

2.2 Soils

The soils of the Niagara Region have developed in soil parent materials ranging in texture from heavy clays to coarse gravels, and most variations in soil types are related to these textural differences, as well as different types of drainage, topography, climate and vegetation. Most of the original soil parent materials in the area are highly calcareous and alkaline (Kingston and Present 1989).

In Fort Erie, clay is prevalent in the soils with a few pockets of eolian sands in Ridgemount and Point Abino. Historically, the Haldimand Clay Plain was submerged by glacial Lake Warren creating the stratified clay deposits over glacial till. Drift thickness is generally 5 m or less, but is upwards of 10 m along the crest of the Fort Erie Moraine where the buried till comes to the surface on the low morainic ridges. Presently, the dominant soils in the Town are reddish-hued lacustrine heavy clays, lacustrine silty clays over clay loam, clay loam till, and variable alluvial deposits on floodplains (shown in Figure 3).

Table 2.1: Soil Series in the Town of Fort Erie (Kingston and Present 1989).

Soil Series by Drainage			Soil Type	Base Material	Physiographic Region / Location
Well-drained	Imperfectly drained	Poorly drained			
	Beverly	Toledo	Lacustrine silty clay	Lacustrine deposits	South of Onandaga escarpment
Ontario	Niagara	Welland	Reddish-hued lacustrine heavy clay	Lacustrine deposits	Haldimand Clay Plain
Oneida	Chinguacousy	Jeddo	Clay loam till	Glacial till deposits	South of Onandaga escarpment
Cashel	Peel	Malton	Lacustrine silty clay over clay loam till	Glacial till deposits	Haldimand Clay Plain
	Tavistock, Berrien	Maplewood	Sandy or loamy sediments over lacustrine clays or loams	Glacial till deposits	Predominantly south of Onandaga escarpment
Fox		Granby	Lacustrine very fine sandy loam, loamy sand and sand	Lacustrine deposits	North of Erie Beach, Crescent Beach, Bay Beach, Point Abino
Plainfield			Mainly eolian sands, sometimes duned	Eolian deposits	Point Abino
Fonthill			Reddish-hued coarse sandy loam and gravelly sand	Glaciofluvial deposits	Fort Erie Moraine, Crystal Beach Moraine
Alluvium – variable drainage			Variable alluvial deposit on floodplains	Recent alluvial deposits	Black Creek, Beaver Creek, Frenchman’s Creek, Six Mile Creek.
Farmington	Franktown	Brooke	Shallow soils over dolostone bedrock	Limestone and dolostone bedrock	South of Onandaga escarpment
		Holly (very poorly drained)	Organic soils	Organic deposits	Point Abino
			Complex I – Beach Scarp		Pleasant Beach, Bay Beach, Thunder Bay Beach, Windmill Point Beach, Crescent Beach

Given the dominance of clay soils over the Haldimand Clay Plain, it is not surprising that the drainage in most of Fort Erie is poor. The numerous farmers who laboured to cleared the land only to ultimately

abandon perpetually wet fields can attest to this poor drainage (Gartshore et al. 1987). The soil series in the Town are listed in Table 2.1 by drainage class and general physiographic location.

2.3 Hydrology

Topographic features divide the Niagara peninsula into three drainage basins: Lake Ontario, the Niagara River and Lake Erie, of which the latter two influence the drainage of the Town of Fort Erie. The Onondaga Escarpment and Fort Erie Moraine separate the Lake Erie and Niagara River watersheds within the Town (Limnoterra and Yagi 1994). The largest stream flowing into the Niagara River Drainage Basin is Black Creek, which has a drainage area of 40 square miles (Brady 1980). Frenchman and Miller Creeks, with drainage areas of about 10 square miles each, are also included in the Niagara River Basin. Map 1 shows the small drainage basins of the Town of Fort Erie.

The main creek systems are Black Creek, Beaver Creek, Miller Creek, Frenchman's Creek draining into the Niagara River, and Six Mile Creek draining into Lake Erie. Associated with the drainage corridors are a number of wetlands, some of which form part of the headwaters and others that occur along the riparian zones of the creeks (Landscapes 1997). Isolated wetlands also occur in the flat, poorly drained clay soils of the Haldimand Clay Plain.

2.4 Climate

The Town of Fort Erie lies within the Lake Erie Counties Climatic Region. Estimated climatic means and ranges for this area (from Kingston and Presant 1989, derived from Brown et al. 1968) are as follows:

- Mean Daily Temperature: 8° - 9° C
- Mean Daily Minimum Temperature for January: -7° - -8° C
- Mean Daily Maximum Temperature for July: 28° C
- Frost Free Days: 150
- Mean Date of Last Occurrence of Frost in Spring: May 10 - May 15
- Mean Date of First Occurrence of Frost in Fall: October 8
- Corn Heat Units: 3000 - 3300
- Mean Annual Precipitation: 79 - 89 cm
- Mean May to September Precipitation: 33 - 35 cm

2.5 Overview of Changes in Land Uses

“In the Niagara region, as a result of deforestation, cultivation, industrial expansion, railway transportation and urban development, the works of man have wrought great changes in the natural environment of plants” (Zenkert 1934). This statement certainly applies to Fort Erie since most of the Town's original woodlands were cleared for agriculture and homesteading, and subsequent urban development led to the establishment and growth of four urban settlements within the Town. However,

for a variety of reasons (e.g., abandonment of agricultural lands due to poor drainage, limited urban and industrial expansion due to the Town's distance from major markets), since its original settlement in the late eighteenth and early nineteenth centuries, many areas in the Town of Fort Erie have been allowed to regenerate naturally. Consequently, even though the Town's natural heritage has been irrevocably altered in so far as it contains few pockets of old growth or other undisturbed habitats, it is still rich in habitat diversity and abundance because of the number of areas that have been allowed to naturally regenerate relatively free of major disturbances, in many cases for well over a century.

2.5.1 Aboriginal & European Settlement & Agriculture

Because of its geographic position, relatively mild climate and the richness of its natural features, the region bordering Lakes Erie and Ontario witnessed several periods of aboriginal occupation dating as far back as 7500 B.C. (Archeological Services Inc. and Cuesta Systems Inc. 2003). Starting in the Iroquoian Period (900 - 1650), there is evidence of increased reliance on agriculture with cultivation of corn, beans, squash, tobacco and Jerusalem artichoke, as well as relatively extensive orchards. Land for cornfields was cleared by girdling trees, followed by burning the underbrush the following year, and settlement areas of 4 ha or larger were not uncommon towards the end of this period (Archeological Services Inc. and Cuesta Systems Inc. 2003; Zenkert 1934). The extent of the impact these activities had on the area's natural heritage is not known with any certainty but presumed to be relatively minor compared to the extensive clearing of forests and draining of wetlands to come with European settlement.

In 1764, the British built Fort Erie. Colonizing settlers arrived soon after and over the next thirty to eighty years proceeded to cut the forests in order to clear homesteads and sell the lumber or charcoal. In 1800 "almost the entire western shore of the Niagara, from Lake Erie to Lake Ontario, was settled and cultivated, while the forest remained almost entirely unbroken upon the eastern side..." (Ketchum, cited from Zenkert 1934), but by the turn of the century these forests were almost completely replaced by farmland. Unfortunately for the aspiring farmers in Fort Erie, but fortunately for the Town's natural heritage, many of the fields painstakingly cleared for farming were ultimately abandoned because of the difficulty in working the soils in this area. Poor drainage was and continues to be a major limitation to agriculture on the Haldimand Clay Plain, while some of the soils are low in organic matter and high in clay, presenting problems in tillage, limiting the agriculture in much of the Town to dairying, corn, hay and pasture (Gartshore et al. 1987).

Currently, over half of the greater Fort Erie landscape consists of a complex of agricultural fields, woodlots, hedgerows and meandering drainage courses (Landscapes 1997).

2.5.2 Urban & Industrial Expansion

In 1750, the French built a stockade and established a trading point where the Town of Fort Erie stands today. In 1857, it was incorporated as a village and in 1927, with the completion of the Peace Bridge to the United States, commercial activity grew considerably (Brady 1980).

Mills and manufacturing of raw materials such as wood or wheat were the primary industries in the Town and the Region for most of the nineteenth century (Archeological Services Inc. and Cuesta Systems Inc. 2003).

In 1875, the Town of Ridgeway was settled in an agricultural district as the first of the four urban settlements (Brady 1980). In 1890, Mr. J. E. Rebstock, who owned property near Point Abino Bay, conceived the idea of making a summer resort area patronizing Canadian and American citizens. Out of this, the town of Crystal Beach grew and today it is know as the “Atlantic City” of the Great Lakes.

The Town of Fort Erie is currently comprised of four separate urban settlements; Fort Erie, Ridgeway and Crystal Beach, Stevensville and Douglstown. Although the Town’s population is still relatively small (28,143 as of the 2001 Census with a seasonal influx of over 10,000 summer residents [Town of Fort Erie 2002]), this is expected to change over the next decade.

In addition to the tourist industry, one of the most long-standing industries in the Town is quarrying. Several types of sand and limestone quarrying have historically existed in Fort Erie, and currently the most extensive operation exists at the Ridgemount Quarry. Although this quarry is outside our current Study Area, it is notably considered an Earth Science ANSI (i.e., Area of Natural and Scientific Interest) because of the 4 m of Late Silurian Formation, 3 m of Middle Devonian Blanc Formation and 8.4 m of Onondaga Formation it contains, with the latter including biostromal and reefal facies of fossiliferous bioclastic limestones (NHIC 2002). Sand quarrying also occurred along Lake Erie’s exposed beaches, and in the nineteenth century Point Abino, a site of current conservation interest (see Table 2 below), was a prime source with many of its hills reduced to wetlands (Archeological Services Inc. and Cuesta Systems Inc. 2003).

2.5.3 Recreational & Conservation Land Use

The loss and degradation of both wetlands and woodlands in the Region of Niagara on the whole over the past 2 centuries has been extensive. As a result, the pressure on the remaining natural areas for recreation and conservation land uses has intensified dramatically, and progressive steps need to be taken by municipalities in the Region to ensure the protection of the remaining natural areas.

Wetlands play important roles in the landscape of southern Ontario, and their loss and degradation over the past few centuries has been significant. This loss has had numerous impacts in the Niagara Region since wetlands perform many water quantity and quality improvement functions, dampening peak flows and impounding water during storm events to reduce downstream flooding, and also host a high proportion of Great Lakes basin fish and wildlife species for at least parts of their life cycles. The original pre-settlement extent of wetlands within the Niagara River South subwatershed (total subwatershed area 18,518 hectares, which encompasses the north-eastern portion of the Town of Fort Erie), is estimated to have been at least 60.14% and the current wetland extent is estimated to be 10.84% (Snell et al. 1998).

The Federation of Ontario Naturalists’ publication Woodland Heritage of Southern Ontario (Larson et al. 1999), presents percentages of woodland extent and loss for counties/regional municipalities across

southern Ontario. According to this document the Region of Niagara has lost 76.2% of its pre-settlement non-wetland woodland and scrubland (more than the average of 75.2% for southern Ontario) and, in 1978, the Region only has 15.1% non-wetland woodland/scrubland cover (less than the average of 17.4% for southern Ontario). Holland-Hibbert (1996) reports 14.7% forest coverage for watersheds in the Niagara River Areas of Concern, and suggests this should be at least 30%.

Currently, the Town of Fort Erie is different from most other municipalities in the Region because it still has a significant number of low-impact recreational and conservation areas. The northern shore of Lake Erie contains numerous natural areas which are used almost exclusively for recreation activities (Brady 1980). The municipality has a long history of resorts and cottage settlement of various types within the bay communities of Lake Erie, including beach resorts, cottages and private estates (Landscapes 1997). Several former resorts exist at Crystal Beach and at the old Erie Beach/Waverly Beach sites. Crystal Beach has some public beach front backed with cottages with the former amusement park site converted to a private cottage enclave. The Erie Beach Resort no longer exists, although the site is connected physically to Waverly Beach, a sand embayment and public park. Numerous private cottage enclaves also exist along the shoreline of Fort Erie.

Recreational opportunities include the parkway, a scenic drive and trail system stretching from the historic Fort Erie site to Black Creek/Douglastown and Niagara Falls, the 'rails to trails' hiking/biking route from Ridgeway to Waverly Beach, several local or community based parks and beaches, and several golf courses and recreational marinas. Two small conservation areas, the Stevensville Conservation Area and the United Empire Loyalists Conservation Area (Landscapes 1997) are present along Black Creek.

Many of the Town's woodlots are also used by the local aboriginal people as well as farmers for hunting, fishing and firewood collection (M. Benner, pers. comm. 2002).

In addition to the natural recreational areas described above, there are a number of natural areas that have been designated as provincially or regionally significant from a natural heritage perspective. Notably, many of these designated areas are also recognized for their recreational and, in some cases, economic value. The designated natural areas within the Study Area are described later in this report in our study findings (see Section 4.2 and Map 2). The designated areas, as well as other natural areas, located in the Town of Fort Erie but outside of our Study Area are summarized in Table 2.2 below.

Table 2.2: Natural areas and areas of conservation interest in the Town of Fort Erie outside the Study Area (NHIC 2002).

Natural Area			Status	Notes
Name	Type	Size		
Rigemount Quarry	Earth Science ANSI	2.3 ha	Provincially Significant	Currently an active quarry.
Ridgewood Raised Beaches	Earth Science ANSI	71.0 ha	Provincially Significant	
Point Abino Sand Hills	International Biological Program Site	28.3 ha	none	One of the most extensive and diverse woodlands remaining on the Lake Erie shore.
Point Abino Peninsula Sandland Forest	Carolinian Canada Site	209.6 ha	none	An extensive and diverse representation of Lake Erie coastal shoreline. Privately owned.
Dr. G. H. Marcy's Property	International Biological Program Site	67.0 ha	none	Rolling ancient dune and sand beach on Lake Erie coast with an excellent almost pure stand of yellow birch.
Stevensville Conservation Area	Conservation Authority Area	49.0 ha	none	Several areas of natural vegetation cover with some reforestation efforts underway.
United Empire Loyalist Conservation Area	Conservation Authority Area	N/A	none	Limited natural cover along Black Creek floodplain; primarily covered by children's playground and lawn.
Beaver Creek ESA (FE04)	Environmentally Sensitive Area	187 ha	Regionally Significant	Important recharge area, habitat for rare tree species, and used for recreational hiking and horseback riding.
Ridge Road Woodlot ESA (FE08)	Environmentally Sensitive Area	51 ha	Regionally Significant	One of the few remaining natural ecosystems along the Onondaga Escarpment, a recharge area for Frenchman Creek, and habitat for rare tree species.
Frenchman Creek Bush ESA (FE09)	Environmentally Sensitive Area	17 ha	Regionally Significant	Vegetation along Frenchman Creek provides erosion control and is also habitat for rare tree and shrub species.
Nigh Road Woodlot ESA (FE10)	Environmentally Sensitive Area	73 ha	Regionally Significant	Contains a high diversity of vegetation communities and is habitat for deer, wolves and rare species of trees and shrubs.

2.6 Historical Records of Flora & Fauna

Although an exhaustive search of all historical floral and faunal records for the Region of Niagara was beyond the scope of this study, several notable studies of the Region's vascular plants and birds have been published over the past century. Notably, there are no known studies of the flora or fauna of Fort Erie prior to this study.

The flora of the Regional Municipality of Niagara has been studied by botanists from both sides of the Canada-U.S. border. One of the most comprehensive floras was published in 1934 by C. A. Zenkert and called "The Flora of the Niagara Frontier Region". This study encompassed an 80 km radius around Buffalo and New York, including the entire Regional Municipality of Niagara. This flora was updated by Zenkert and Zander in 1975, by Zander and Pierce in 1979, and the Buffalo Museum of Science continues to update this flora periodically. In addition, Gustave Yaki published an annotated checklist of 1368 species from the Niagara Peninsula in 1970.

Historical faunal records for the Region are less abundant and appear to be limited to an annotated checklist called "Birds of the Niagara Frontier Region" (Beardslee and Mitchell 1965) published in 1965

by the Buffalo Society of Natural Sciences. This publication includes lists of permanent resident species, as well as summer resident species, summer visitants, winter visitants, transients and accidental visitants, for a total of 372 bird species (excluding hypothetical, extinct and extirpated species).

2.7 Overview of Vegetation Zones & Communities

One of the best descriptions of the Niagara Peninsula's vegetation zones and communities is found in the OMNR's biological inventory of the Point Abino Area of Natural and Scientific Interest (ANSI) (Macdonald 1990), and all of the following descriptions are drawn from this report. Notably, this study pre-dates the development of the ELC system (Lee et al. 1998) and so different conventions are used for describing vegetation communities than those used in this report.

The Region of Niagara vegetation is located within the influence of four distinctive forest regions or vegetation zones. The best known is the Carolinian (also known as the Deciduous – Hardwood Forest Region) Zone, but the Town's vegetation also encompasses species from the Northern Deciduous – Evergreen Forest Region, the Northern Hardwood Forests Region, and where habitats are in the proximity of the shoreline, the Great Lakes Basin Region.

The Carolinian Zone extends from the southeastern United States northward, entering Canada only as a well-defined band to the north of Lake Erie, and stretching between southern Lake Huron and western Lake Ontario. Characteristic Carolinian plant species include Cucumber Tree (*Magnolia acuminata*), Tulip Tree (*Liriodendron tulipifera*), Sassafras, (*Sassafras albidum*), Pignut Hickory (*Carya glabra*), Eastern Flowering Dogwood (*Cornus florida*), Hop Tree (*Ptelea trifoliata*), Wild Crab Apple (*Malus coronaria*) and Yellow Mandarin (*Disporum lanuginosum*). The characteristic Carolinian fauna includes many bird species, such as the Red-bellied Woodpecker (*Melanerpes carolinus*), Hooded Warbler (*Wilsonia citrina*), Yellow-breasted Chat (*Icteria virens*) and Acadian Flycatcher (*Empidon virens*).

The Northern Deciduous – Evergreen Forest Region ranges from the eastern half of the U.S. into eastern Canada, and extends somewhat north of the Carolinian Zone. Representative plant species include White Trillium (*Trillium grandiflorum*), Shagbark Hickory (*Carya ovata*), White Oak (*Quercus alba*), Indian Cucumber-root (*Medeola virginiana*), Wild Geranium (*Geranium maculatum*), Yellow Pimpernel (*Taenidia integerrima*) and Blue-stemmed Goldenrod (*Solidago caesia*). Typical bird species of this affinity include Northern Cardinal (*Cardinalis cardinalis*), Eastern Wood Pewee (*Contopus virens*), Eastern Bluebird (*Sialia sialis*) and Indigo Bunting (*Passerina cyanea*). Several faunal species which have ranges in larger portions of the United States, and extend into the southern portions of Ontario include Southern Flying Squirrel (*Glaucomys volans*), Virginia Opossum (*Didelphus virginiana*) and Eastern Fox Snake (*Elaphne vulpine gloydii*).

The third group of species evident in the Region are those characteristic of the Northern Hardwood Forests of the province of Ontario. Plant species of this affinity include several which are common to thinly widespread within the Niagara Region, including Red Maple, (*Acer rubrum*), Eastern Hemlock (*Tsuga canadensis*), Eastern White Pine (*Pinus strobus*), Beaked Hazel (*Corylus cornuta*), Blue-bead Lily (*Clintonia borealis*), Goldthread (*Coptis trifolia*) and Twinflower (*Linnaea borealis*). Many of the faunal

species extend into this zone, including Eastern Garter Snake (*Thamnophis sirtalis sirtalis*), Northern Leopard Frog (*Rana pipiens*), American Bittern (*Botaurus lentiginosus*), American Woodcock (*Scolopax minor*), Downy Woodpecker (*Dendrocopos pubescens*), House Wren (*Troglodytes aedon*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Red Squirrel (*Tamiasciurus hudsonicus*) and White-tailed Deer (*Odocoileus virginianus*).

The Great Lakes Basin supports a distinctive complement of endemic and disjunct species, occupying habitats associated with the coastal environments of the lakes, including Lake Erie. Notable plant species include Beach Grass (*Ammophila breviligulata*), Crawe Sedge (*Carex crawei*), Sand-dune Willow (*Salix cordata*), Bugseed (*Corispermum villosum*), Sea-rocket (*Cakile edentula var. lacustris*), Beach Pea (*Lathyrus japonicus*), Seaside Spurge (*Euphorbia polygonifolia*), Shrubby St. John's-wort (*Hypericum kalmianum*), Beach Heath (*Hudsonia tomentosa*), Bird's-eye Primrose (*Primula mistassinica*) and Low Calamint (*Calamintha arkansana*). Other notable influences include plant species with prairie affinities, including Hill's Oak (*Quercus ellipsoidalis*), Side-oats Grama (*Bouteloua curtipendula*), Prairie Buttercup (*Ranunculus rhomboideus*), and Horsemint (*Monarda punctata*).

The Niagara Peninsula supports a variety of upland and lowland habitats, including forest, thicket, meadow and aquatic communities, also described in Macdonald (1990). An overview of the characteristic plant species in these habitats is provided below.

Drier forests on upland sites are generally dominated by Northern Red Oak (*Quercus rubra*), White Oak (*Q. alba*), Black Oak (*Q. velutina*), Shagbark Hickory (*Carya ovata*), Red Maple (*Acer rubrum*) and Eastern White Pine (*Pinus strobus*), while circum-mesic forests are dominated generally by Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), Northern Red Oak (*Q. rubra*), White Ash (*Fraxinus americana*) and American Basswood (*Tilia americana*). Thickets tend to be successional, and are dominated generally by Grey Dogwood (*Cornus foemina* subsp. *racemosa*), Staghorn Sumac (*Rhus typhina*), Hawthorn (*Crataegus* sp.) or raspberry/blackberry (*Rubus* sp.), but may also include Smooth Sumac (*Rhus glabra*), Prickly Ash (*Zanthoxylum americanum*), Flowering Crab Apple (*Malus coronaria*), and others.

Meadows also tend to be successional, and include various native remnant and introduced invasive species, such as Canada Blue Grass (*Poa compressa*), Timothy Grass (*Phleum pratense*), Winter Cress (*Brassica vulgaris*), Field Strawberry (*Fragaria virginiana*), Red clover (*Trifolium pratense*), Common Evening Primrose (*Oenothera biennis*), Canada Goldenrod (*Solidago canadensis*), and Arrow-leaved Aster (*Aster urophyllus*). Certain upland meadows support prairie-like communities which often include significant western and southern species, such as Big Bluestem (*Andropogon gerardii*), Dillen's Tick-trefoil (*Desmodium paniculatum* var. *dillenii*), Round-headed Bush-clover (*Lespedeza capitata*), Wild Bergamot (*Monarda fistulosa*), Northern Bedstraw (*Gallium boreale*), Smooth Aster (*Aster laevis*) and others. Local rocklands support barrens and open meadows.

Wetter lowland forests are generally dominated by Red or Green Ash (*Fraxinus pennsylvanica*), Silver Maple (*Acer saccharinum*), White Elm (*Ulmus americana*), Pin Oak (*Quercus palustris*) or Black Willow (*Salix nigra*), accompanied by a variety of tree species such as Black Gum (*Nyssa sylvatica*), Swamp White Oak (*Q. bicolor*), and Black Ash (*F. nigra*). Thicket swamps are diverse, and are dominated by Red-osier

Dogwood (*Cornus stolonifera*), Pussy Willow (*Salix discolor*), Narrow-leaved Meadowsweet (*Spiraea alba*), Buttonbush (*Cephalanthus occidentalis*), Poison Sumac (*Toxicodendron vernix*) and others. Marshes and wet meadows may be dominated by Broad-leaved Cattail (*Typha latifolia*), Reed Canary Grass (*Phalaris arundinacea*), Canada Blue-joint (*Calamagrostis canadensis*), sedges (*Carex crinita*, *C. lacustris*) and others, accompanied by a host of wetland species, such as Rice Cut Grass (*Leersia oryzoides*), Wild Mint (*Mentha arvensis*), Spotted Joe-pye Weed (*Eupatorium maculatum*) and others.

The coastal environment of Lakes Ontario and Erie supports meadows and thickets with distinctive Great Lakes species. This is particularly notable where there is development of sand dune or limestone habitats which support Eastern Red Cedar (*Juniperus virginiana*), Common Juniper (*J. communis*), Shrubby St. John's-wort (*Hypericum kalmianum*), Sand Cherry (*Prunus depressa*), Sand-dune Willow (*Salix cordata*), Beach Grass (*Ammophila breviligulata*), Knotted Rush (*Juncus nodulosus*), Great Lakes Rush (*J. balticus* var. *littoralis*), sedge (*Carex crawei*), Sea-rocket (*Cakile edentula* var. *lacustris*), Seaside Spurge (*Euphorbia polygonifolia*), Beach Pea (*Lathyrus japonicus*) and others.

3 Methods

3.1 Background Review & Stakeholder Consultation

The background review encompassed a wide range of sources including databases, species checklists, technical reports, scientific studies, and personal communications with local naturalists.

The following sources of information and databases were used to develop baseline datasets for both vegetation and wildlife:

- Second Ontario Breeding Bird Atlas database (2001–2002)
- OMNR wetland evaluations (Thomas et al. 1985 – 1988)
- OMNR Natural Resources Values Information System (NRVIS) database of provincially rare species
- Environmentally Sensitive Area (ESA) reports
- ONTBIRDS listserv (administered by the Ontario Field Ornithologists)
- Western New York (WNY) “Dial-a-Bird” telephone hotline (sponsored by the Buffalo Museum of Science and the Buffalo Ornithological Society)
- The Flora of the Niagara Frontier Region (Zenkert 1934)
- Flora of the Niagara Frontier Region, Supplement (Zenkert and Zander 1975)
- Distribution and Status of the Vascular Plants of Central Region, Ontario Ministry of Natural Resources (Riley 1989)
- Birds of the Niagara Frontier Region. An Annotated Check-list (Beardslee and Mitchell 1965)
- Ontario Herpetofaunal Summary (Atlas) database information for mercator squares 17PT54, 17PT55, 17PT64, and 17PT65 (NAD27)
- 2002 Hooded Warbler and Acadian Flycatcher Survey (administered by Bird Studies Canada)

A number of other studies and publications provided supplementary background on the Niagara Region and Fort Erie’s natural heritage:

- Conserving Carolinian Canada: Conservation Biology in the Deciduous Forest Region (Allen et al. 1990)
- The Archeological Master Plan of the Town of Fort Erie Planning Report, Draft (Archeological Services Inc. and Cuesta Systems Inc. 2003)
- Regional Municipality of Niagara Environmentally Sensitive Areas (Brady 1980)
- The Physiography of Southern Ontario (Chapman and Putnam 1984)
- The Soils of the Regional Municipality of Niagara (Kingston and Presant 1989)
- Fort Erie Heritage Master Plan Phase One Report (Landscapes 1997)
- The Woodland Heritage of Southern Ontario: A Study of Ecological Change, Distribution and Significance (Larson et al. 1999)
- A Biological Inventory and Evaluation of the Point Abino Peninsula Area of Natural and Scientific Interest (Macdonald 1990)

Although historical data for Beaver Creek, French Creek, Black Creek, Miller Creek, Six Mile Creek and Kraft Drain, as well as a fluvial geomorphic and biophysical study of French Creek (Limnoterra and Yagi 1994) was provided by Friends of Fort Erie Creek, this data was beyond the scope of this Study. This data and report will be kept on file should the Town wish to use them in future studies.

In tandem with the background review, attempts were made to contact and elicit data from all potential stakeholders (see Table 3.1 below). Maps of the Study Area with numbered natural areas along with standardized data sheets for vegetation and wildlife (see Figures 4 and 5) were distributed via email to the local stakeholders (i.e., Bert Miller Nature Club, Friends of Fort Erie’s Creeks, MNR, NPCA, Town Staff, local naturalists) in June of 2002 with the request that data be returned by the end of September 2002.

The Town was responsible for informing landowners of the Study and provided the Study Team with letters explaining the Study’s intent on the Town’s letterhead to hand out to landowners and any other interested stakeholders encountered during the field investigations. In addition to the informal contact of various individuals via email, fax and phone, an Open House to inform Town Staff and interested stakeholders of the general intent and status of the study was scheduled for the fall and to be followed by a public presentation upon completion of the final report.

Table 3.1: Summary of stakeholder contact during the background review stage of the Study.

Organization or Affiliation	Individual Contacted	Information Provided
Bert Miller Nature Club	Rob Eberly	incidental observations of noteworthy species and habitats
	Deanna Lindblad	no information provided at time of publication
Brock University	K. Brown	wildlife information
Friends of Fort Erie's Creeks	Yvonne Hopkins	fisheries habitat data for major creek systems
Niagara Peninsula Conservation Authority (NPCA)	Kim Frolich	no information provided at time of publication
Growth Forests Researcher	Bruce Kerschner	two potential old growth forest sites in Study Area
Natural Heritage Information Center (NHIC)	Wasył Bakowsky	no information provided at time of publication
	Mike Oldham	Ontario Herpetofaunal Summary database records for Fort Erie
Niagara College	Al Unwin	no information provided at time of publication
Ontario Ministry of Natural Resources (OMNR)	Kim Barrett	rare species records
	Donald Kirk	no information provided at time of publication
	Marlene Ross	updated wetland data
	Anne Yagi	Fowler’s Toad habitat
Regional Municipality of Niagara	Don Campbell	ESA records for Town of Fort Erie
	Ken Forgeron	regional perspective on NAI

3.2 Preliminary Natural Areas Mapping & Creation of Habitat Blocks

The Town of Fort Erie provided digital orthogonally rectified aerial photo imagery from spring 2000 for the entire Town, as well as a digital base map with mature woodlots identified and numbered for use in developing a GIS database. Other GIS layers provided by the Town included NRVIS layers for woodlots, wetlands (both Provincially Significant [PSW] and Locally Significant [LSW]) and ANSIs, as well as drainage mapping, elevation contours at 5 m intervals, ESA mapping and floodline mapping.

As part of the preliminary mapping exercise, all areas which appeared to support “Natural” and “Semi-natural” habitats were identified and delineated through interpretation of aerial photography. “Natural” habitats were defined as those which appear to be unmodified or only marginally impacted by human activities. This includes most of the mature forest, wetlands and shoreline communities. “Semi-natural” habitats were defined as those which have been sufficiently altered by human disturbances such that no natural analogue is known (i.e., abandoned fields and invasive communities such as Common Buckthorn thickets). In general, the “Natural” and “Semi-natural” designation includes all habitats which occur spontaneously without regular human management, maintenance, or planting, and which supports a strong component of native species. These habitats represented the primary focus of the NAI. In contrast, “Artificial” or “Planted/Cultivated” habitats such as constructed environments, cultivated agricultural fields and open spaces such as golf courses were excluded from the NAI. It should nevertheless be recognized that even these environments can provide important ecological functions, albeit at a reduced level.

During the preliminary mapping exercise, it became apparent that the natural areas interpreted by the Town through an initial assessment (based on LANDSAT satellite imagery), were limited to mature wooded features such as forests and swamps. None of the intervening natural or semi-natural habitats in the landscape such as meadows, swamp thickets, marshes, or even significant Great Lakes coastal communities had been mapped. In order to address this oversight, mature forested blocks identified by the Town were merged with adjacent natural and semi-natural communities to form contiguous *habitat blocks*. The boundaries of these habitat blocks were determined by artificial communities (i.e., cultivated fields, golf courses, urban areas) and/or artificial barriers (i.e., roads, rail lines, and utility corridors).

Habitat blocks represent the key components to this Study and have been used as the base reference units for field reconnaissance, data collection, and Natural Areas Designation Criteria evaluation. Most habitat blocks are comprised of several or more discrete ELC polygons. **It should also be noted that while an entire habitat block may be shown as fulfilling a particular Natural Areas Designation Criteria, the criteria may only be applicable to a portion of the block.**

Habitat blocks that include different ELC communities as part of a Natural Heritage System in the Town of Fort Erie provide a number of benefits including:

1. protection of the Town’s intrinsic habitat diversity
2. protection of non-forested natural and semi-natural areas that may provide habitat for significant plant or wildlife species that have not yet been identified
3. provision of habitat for a greater range of wildlife species, since many wildlife species rely on several types of habitat to complete their life cycle
4. establishment of a more sustainable natural heritage system by preserving microcosms that contain more of the range and variation that would actually be found in a predominantly natural system

3.3 Field Reconnaissance

3.3.1 Vegetation Resources

Vegetation surveys of the Town of Fort Erie's Settlement Areas were conducted between August 6, 2002 and October 25, 2002. Vascular plant species were documented according to the nomenclature of the Ontario Plant List (Newmaster *et al.* 1998), and their status was verified using NHIC and OMNR rankings. Vegetation communities within each habitat block were mapped as polygons onto a 1:5,000 scale black and white aerial photograph. Field data for the vegetation communities was recorded on a standardized data sheet that contained sufficient fields to characterize the general biophysical conditions, disturbance history, dominant species in the canopy, understorey and ground layers, and relative maturity of the vegetation on the site (see Figure 4).

The data sheets were designed so that the data collected could be used to classify each identified polygon according to the ELC system for Southern Ontario (Lee *et al.* 1998). The ELC system is a tool for classifying natural heritage features; it provides a standardized sampling method for ecosystem description, inventory and interpretation that is applicable across Ontario. An ecological approach is used that is based on the most stable and consistent characteristics of ecosystems.

The ELC system can be used to classify land at various spatial scales. For the purposes of a Natural Areas Inventory, the ecosite and ecoelement scales are the most appropriate. The ecosite applies to a mapping scale of approximately 1:10,000 – 1:20,000, and is meant to describe features of roughly 10 – 100 ha in size. Polygons were classified to the ecosite level as a minimum standard. Where possible, classifications were made to the ecoelement (vegetation type) level. The ecoelement is the finest level of resolution within the ELC and applies to the site or stand level of research, at a mapping scale of 1:2000 – 1:10,000 or habitats ranging 1 – 10 ha in size. Names applied at the ecoelement level relate more detailed information about the dominant species in the plant community, according to relative cover. For example, a Cultural Thicket on a mineral substrate is described at the ecosite level as a “Mineral Cultural Thicket Ecosite” (CUT1), however at the ecoelement level it might be described as a “Gray Dogwood Cultural Thicket Type” (CUT1-4). It is not always technically possible to classify habitats to ecoelement, even when detailed information about species composition is available. This is because not all of the possible habitats in southern Ontario have been formally described and adopted into the ELC system to the finest level of resolution.

During the most intensive field visits, polygons were sampled in depth and all or most the data fields were filled on the data sheet, and many more species were documented than simply the dominant species. Large habitat blocks, consisting of multiple polygons that were not associated with PSWs or ESAs were often sampled to this level of intensity, and duration of sampling time was anywhere from 1 to 5 hours. Other habitats were not sampled as intensively, and primarily dominant species were recorded. The duration of these visits was typically shorter and usually less than one hour.

For other habitat blocks, often the smaller and/or inaccessible fragments of habitats, dominant species were documented by driving by as much of the perimeter of the habitat as possible, using binoculars if

necessary. Occasionally, if these units were accessible from the road a few minutes would be spent within the habitat to see beyond the perimeter and document some of the ground cover. This method of surveying was referred to as “Windshield” in summary sheets in Appendix I.

Habitats blocks associated with previously documented features such as ESA’s and PSW’s, or highly inaccessible blocks, were subjected to “Remote Sensing” using available data. This method consisted of interpreting aerial photography in conjunction with available soils and drainage mapping to classify ELC polygons. In the cases of previously documented communities, it was necessary to translate vegetation community nomenclature to ELC. This approach was limited to only a few habitat blocks and was used primarily for the purposes of classification to the ecosite level. Table 3.2 provides a summary of when each ELC polygon was inventoried and by whom.

Table 3.2: ELC polygons inventoried for vegetation in 2002.

Date	Observer(s)	Polygons surveyed
August 6, 2002	KU, MD	127, 134, 143, 144, 147, 149
August 14, 2002	KU, MD	35, 500, 503, 512, 516, 518, 704, 711
August 15, 2002	KU, MD	108, 140, 157, 191, 192, 359, 367, 395, 403, 412, 419, 420, 421, 422, 427
August 27, 2002	MD	169c, 215a-j, 221, 222, 223
August 28, 2002	MD	168, 169b, 187, 171, 212a, 212b, 414a, 414b,
August 29	MD	212, 215a, 414c, 414d, 219a, 219c, 219d
October 9, 2002	KU, MD	70, 589, 608, 630, 634
October 17, 2002	KU	150, 151, 219a, 224, 225a, 225c, 226, 237, 246, 247, 248, 313, 336, 337, 338, 353, 358, 360, 362, 363, 1006
October 22, 2002	KU	2, 5, 15, 38, 562, 577, 581, 587, 588, 593, 603, 623, 626, 627, 638, 642, 643, 644, 646, 651, 657, 660, 662, 668, 669, 670, 672, 673, 685, 740, 1003
October 24, 2002	KU	67, 68, 255, 256, 257, 261, 278, 282, 285, 290, 299, 301, 302, 309, 311, 321, 1006
October 25, 2002	KU	225b, 225d, 251, 258, 265, 268, 270, 286, 287, 288, 293, 294, 295, 296, 297, 561, 596, 605, 607, 629, 741, 1000

Limitations and/or Biases

The Study Area of 7527 ha was found to include 3268 ha (i.e., 43.4%) of natural or semi-natural habitat requiring assessment, with very little of this area ever having been field surveyed for natural heritage purposes before. Our approach was to maximize coverage of the Study Area and classify all natural and semi-natural areas to the ecosite level as a minimum, although from the outset of the study, it was decided that more effort should be dedicated to previously undocumented or under-documented areas (i.e., natural areas outside of ANSIs, PSWs, and ESAs). Ultimately, due to factors such as late project startup, difficulty traversing dense shrub thickets, site inaccessibility, and limited resources it was not possible to inventory all of the identified habitat blocks to the desired level of detail. Consequently, the level of data collected through field reconnaissance, windshield surveys and remote sensing is variable among the 117 habitat blocks. Despite these constraints, it was possible to determine with some degree of confidence from the limited data available, which Natural Areas Criterion were fulfilled by a particular habitat block.

NATURAL AREAS INVENTORY - TOWN OF FORT ERIE

SITE #:	SITE NAME:	WEATHER:
MAP UNIT #:	DATE:	TEMP:
OBSERVER(S):	START TIME:	END TIME:

UNIT DESCRIPTION

SYSTEM	SUBSTRATE	PLANT FORM	COMMUNITY
TERRESTRIAL	MINERAL SOIL	DECIDUOUS	LAKE/ POND
WETLAND	PARENT MIN	CONIFEROUS	RIVER/ STREAM
AQUATIC	BEDROCK	GRAMINOID	FOREST (> 60 %)
LANDSCAPE POSITION / FEATURE	ORGANIC	FORB	WOODLAND (35-60)
LACUSTRINE	TOPOGRAPHY	MIXED	SAVANNAH (25-35)
RIVERINE	UNIFORM/LEVEL	FLOATING LVD.	REGENERATING FOREST
FLOODPLAIN/BOTTOMLAND	UNEVEN	LICHEN	PLANTATION
VALLEY TERRACE	HIGHLY VARIABLE (hummocky)	BRYOPHYTE	THICKET
VALLEY SLOPE	SLOPE	COVER	PRAIRIE
TABLELAND	0-10%	OPEN	MEADOW
ROLLING UPLAND	10-25%	SHRUB	SWAMP
ROCKLAND	> 25 %	TREED	MARSH
BEACH / BAR	DRAINAGE	CANOPY CLOSURE	BOG
SAND DUNE	WELL	<25%	FEN
BLUFF	IMPERFECT	25-50%	BARREN
CLIFF/TALUS	POOR	>50%	ALVAR
CREVICE/CAVE	SEASONAL PONDING	RELATIVE AGE	BEACH / BAR
HISTORY	SOIL TEXTURE:	IMMATURE	SAND DUNE
NATURAL/SEMI-NATURAL	MOISTURE REGIME:	MATURE	BLUFF
CULTURAL	STAND AGE TYPE: UNEVEN / EVEN	OLD GROWTH	CLIFF

VEGETATION DESCRIPTION

LAYER	CANOPY LAYER.	#	UNDERSTOREY	#	GROUND LAYER	#						
SPECIES CODES												
HEIGHT												
COVER												
DIAMETER RANGE												
ABUNDANCE CODES (#): D=DOMINANT; A=ABUNDANT; F=FREQUENT; O=OCCASIONAL; S=SPARSE HEIGHT CODES: 1 = >25 m 2 = 10<HT≤25 m 3 = 2<HT≤10 m 4 = 1<HT≤2 m 5 = 0.5<HT≤1 m 6 = 0.2<HT≤0.5 m 7 = HT>0.2 m (MULTIPLE CODES AND RANGES ARE ACCEPTABLE) COVER CODES: 0= NONE 1= 0% < CVR ≤ 10% 2= 10 < CVR ≤ 25% 3= 25 < CVR ≤ 60% 4= CVR > 60%												

ELC COMMUNITY CLASSIFICATION

COMMUNITY CLASS:	ELC CODE
COMMUNITY SERIES:	
ECOSITE:	
ECOELEMENT:	

WILDLIFE HABITAT DESCRIPTION

SPECIES CODE	BREEDING EVIDENCE	#	REMARKS: (UTM FOR SAR, ETC)	SPECIES CODE	BREEDING EVIDENCE	#	REMARKS (UTM FOR SAR, ETC)

DISTURBANCE OBSERVATIONS:

Figure 4: Standardized Natural Areas Inventory (NAI) data collection sheet.

3.3.2 Wildlife Resources

Wildlife surveys were conducted primarily between July 10 and July 27, 2002. One unrelated visit was made to two wooded units in Ridgeway on June 18, 2002. Table 3.3 summarizes all the dates visits were made.

Table 3.3: ELC polygons inventoried for wildlife in 2002.

Date	Observers	ELC Polygons surveyed
June 18, 2002	KK	150, 151
July 10, 2002	DM, PR, RS, LW	15, 38, 561, 562, 577, 581, 588, 593, 643, 644, 646, 651, 657, 660, 662, 668, 669, 670, 673, 685, 740
July 11, 2002	KK, DM, PR, RS, LW	2, 33, 68, 70, 140, 143, 144, 149, 157, 168, 169, 171, 209, 278, 282, 301, 302, 309, 367, 419, 420, 577, 587, 589, 603, 604, 605, 607, 608, 614, 615, 623, 626, 627, 629, 630, 635, 638
July 12, 2002	KK	127, 134, 212, 214, 215, 222, 223, 224, 225, 336, 358, 359, 360, 362, 363
July 18, 2002	AW	1, 31, 147, 192, 359, 395, 403, 412
July 19, 2002	AW	35, 209, 214, 219, 223, 337, 338, 427
July 20, 2002	AW	67, 215, 221, 222, 226, 237, 311
July 25, 2002	KK	225, 255, 256, 257, 258, 261, 265, 268, 270, 285, 286, 287, 288, 294, 295, 296, 299
July 27, 2002	KK	187, 237, 246, 247, 248, 293, 321, 353, 414, 421, 422, 518, 704, 741

Wildlife inventories focused on woodlands identified by the Town of Fort Erie. Of the 133 woodlands in the Town's Settlement Areas larger than 2 ha in size, 121 of these were visited (Table 3.3). In total, 80.3 hours were spent surveying wildlife. This does not include time spent driving or walking between units. This works out to an average of 39.8 minutes in each surveyed polygon.

Field surveys did not follow a predefined inventory procedure. Visits simply involved covering as much suitable habitat in each polygon as possible. All wildlife species encountered, be they birds, mammals, amphibians, reptiles or insects, were recorded and later transcribed on to Data Summary Sheets (see Figure 5 below). Basic information recorded for each polygon included: surveyors name, date, start time and finish time, total hours spent surveying, percent estimate of coverage, habitat type (general), name of species, breeding evidence, number of individuals (or breeding pairs) encountered, as well as general notes/comments.

Limitations and/or Biases

Although most woodland polygons were surveyed, the amount of time spent inventorying each unit varied considerably. For example, as little as 5 minutes were spent surveying some woodlots, while others took over two hours to cover. The amount of time spent in each depended on a combination of the following:

- Size of the unit - In general the larger the unit the more time was spent.
- Units designated to be wetlands or ESAs - In order to maximize coverage, only those parts of the unit that were not designated wetland or ESA were surveyed.
- Time of day - In general, the later in the day, the less time was spent surveying since wildlife activity generally declines from early morning to afternoon.
- Weather conditions - In general, wildlife activity is retarded by hot and humid weather. Less time was spent surveying when conditions were poor.
- Quality of the habitat - Higher 'quality' units tended to receive more attention since their ability to support a greater diversity of species is also greater.
- Site conditions - If the unit was composed largely of thickets, especially those containing thorns, less time was spent surveying them. In some cases units were surveyed entirely from recreational trails or from along roadways.
- Accessibility - Those units that proved difficult to access (i.e., surrounded by private residences) or those signed "no trespassing" did not receive as much coverage.

Notably, while almost all of the wooded polygons were surveyed at least once, multiple visits to the same units at different times of the day and season would have helped to ensure that all wildlife groups present were properly detected. For example, it is not accurate to imply that no frogs or toads were present when only visit was conducted in the middle of the summer and during the day, as was the case for most of this Study's inventories, since frogs and toads are best detected at night from the early spring to the middle of summer. Furthermore, it is not possible to detect all species on a single given night. Some frogs call only in the early spring, whereas others do not start calling until late May or June at the earliest. Usually, between two and three visits are required over a season simply to detect calling amphibians.

Comparable reasoning applies to other wildlife groups such as birds, butterflies and dragonflies. For example, in order to maximize the effort expended to detect birds, surveys should have been conducted in June when birds are most vocal. The later in the season surveys are conducted, the less reliable the data gathering becomes, even though young of the year may be more evident. Some bird species become increasingly quiet and may potentially go unnoticed. Similarly, if one wishes to properly survey for butterflies or dragonflies, the best time to detect them is between late morning and late afternoon. In addition, the flight periods vary from species to species. Some are strictly spring species, whereas other are present only from the middle of the summer to autumn. Unless, specific trapping surveys are conducted, small mammals are always difficult to detect.

There has been a definite bias to surveying 'wooded' units during this Study. This is primarily a reflection of the fact that specific woodland polygons had already been identified based on aerial photo interpretation. Fortunately, the majority of natural areas present within the study area corresponded with these wooded units. Nevertheless, many other potentially significant natural areas received scant

attention as part of this study. A prime example would be the shoreline habitats that are known to support the provincially and nationally 'Threatened' Fowler's Toad (*Bufo woodhousei fowleri*). Other areas that could have received greater attention are earlier successional areas such as wet meadows and old fields/grasslands.

3.4 Development of Natural Areas Designation Criteria

In addition to the actual inventory and assessment of the Study Area's natural habitats, the other critical component of this Study was the development of appropriate and scientifically defensible Natural Areas Designation Criteria that would be used to evaluate the relative significance of the 117 identified habitat blocks.

One of the basic objectives in selection of the Natural Areas Designation Criteria was to ensure inclusion of natural areas that are identified for protection under provincial and federal legislation in southern Ontario. This includes:

- Habitat for Threatened and Endangered species in Canada- *Species at Risk Act* (to be proclaimed in June 2003)
- Habitat for Endangered species in Ontario- *Endangered Species Act*
- Provincially Significant Wetlands (PSWs) and Significant Wildlife Habitat - Policy 2.3 of the Provincial Policy Statement issued under the *Planning Act*

General consideration was also given to Significant Woodlands and Significant Valleylands (as defined under Policy 2.3 of the Provincial Policy Statement). Formal designation or assessment of these natural heritage features is typically conducted in association with the Ministry of Natural Resources while preparing watershed or subwatershed-scale studies.

To assist in the development of these criteria for the Town of Fort Erie, criteria used for designating significant natural areas in ten other Ontario Municipalities were reviewed (see Appendix A).

Considerations for selecting Natural Areas Designation Criteria for this Study included:

- Criteria capable of filtering out habitat blocks containing ecological features and/or functions considered significant at the local level for the Town of Fort Erie.
- Criteria based on defensible ecological or landscape ecology theory and concepts.
- Criteria appropriate to the type and quality of data collected by the Fort Erie NAI.
- Criteria that could be applied to all habitat blocks equally given the variable level of detail at which data had been collected for the various polygons within the blocks.
- Criteria that are easy to understand and relatively transparent in terms of their application.

A preliminary list of 10 NADC was then submitted to Town Staff, the Region of Niagara, the NPCA and the local OMNR office for review in September of 2002. Although all the feedback received concerning the preliminary list was positive, this list was further refined and simplified to include the final 7 Natural Areas Designation Criteria used in this report and summarized in Table 3.4 below. The change from 10 to 7 criteria was a result of eliminating some and combining some criteria for which there was insufficient data to provide an even assessment of all habitat blocks. For example, "Educational,

Recreational or Spiritual Value” was combined with “Economic Value” to create “Socio-Economic Value” since there was limited data with respect to educational and spiritual use of natural areas. Similarly, “Diversity” was changed to “Habitat Diversity” since insufficient species data was available for all habitat blocks and so diversity needed to be measured on a community rather than a species level. The criteria “Key Natural Heritage System Components” was eliminated entirely in the final analysis because it was felt that this criteria was redundant given that a number of the other criteria (i.e., “Site Condition”, “Habitat Diversity”, “Special Features” and “Representation”) would filter habitat blocks for the presence or absence of comparable ecological attributes.

The final criteria system developed for this Study gives each habitat block a ranking ranging from 0 (lowest) to 7 (highest) depending on the number of criteria the block has fulfilled and ultimately provides some options for natural heritage protection. A specific rationale and more detailed explanation of the measures for each criterion are provided in the subsequent text.

Table 3.4: Natural Areas Designation Criteria for the Town of Fort Erie Natural Areas Inventory.

Criteria		Description	Measure(s)
1.	Designated Environmental Areas	Habitat blocks containing areas designated as Regional Environmentally Sensitive Areas (ESAs), Provincially Significant Wetlands (PSWs), Locally Significant Wetlands (LSWs), Provincially, Regionally and Locally Significant Areas of Natural or Scientific Interest (ANSIs) or other protective environmental designations (i.e., regulatory floodlines, shoreline protection areas and hazard lands).	<ul style="list-style-type: none"> • presence or absence of recognized designated environmental protection areas
2.	Hydrological Importance	Habitat blocks containing areas having important hydrological functions including flood control, maintenance of water quality and natural hydrologic balance, groundwater discharge/recharge, and sediment and erosion control	<ul style="list-style-type: none"> • blocks with greater than 50% coverage by poorly drained soils fulfilled this criteria • blocks with greater than 50% coverage by well-drained soils fulfilled this criteria • blocks supporting floodplains, ponds or discharge zones also fulfilled this criteria
3.	Site Condition	Habitat blocks containing relatively undisturbed natural communities.	<ul style="list-style-type: none"> • level of observed disturbance • relative proportion of native species
4.	Habitat Diversity	Habitat blocks supporting a relatively high proportion of natural communities.	<ul style="list-style-type: none"> • the top 25% of all the habitat blocks with respect to numbers of natural ELC communities per block
5.	Special Features	Habitat blocks containing significant landforms, species, communities or wildlife habitats.	<ul style="list-style-type: none"> • significant landforms • significant species • significant communities • significant wildlife habitat
6.	Representation	Habitat blocks that contain good examples of the typical as well as less common array of fauna, flora, communities, soils and landforms present in the Town.	<ul style="list-style-type: none"> • gap analysis
7.	Socio-Economic Value	Habitat blocks utilized by individuals or organizations for recreational, commercial, or spiritual activities.	<ul style="list-style-type: none"> • reports or evidence of activities

Criterion #1: Designated Environmental Areas

This criterion was selected to recognize the ecological importance of natural areas previously identified as significant at the Provincial, Regional and Local levels. The protection of these features is mandated by Provincial Policy, and therefore protection of them should form the basis of any Natural Heritage System developed for the Town.

Designated Environmental Areas (as listed in Section 4.2) include Regional Environmentally Sensitive Areas (ESAs), as identified in Brady (1980); Provincially and Locally Significant Wetlands (PSWs and LSWs), as determined in the OMNR; Provincially, Regionally and Locally Significant Areas of Natural or Scientific Interest (ANSIs) (NHIC 2002), and other protective environmental designations (regulatory floodlines, shoreline protection areas and hazard lands).

Habitat blocks containing ELC polygons that fall entirely or partially within these designated areas fulfil Criterion #1.

Criterion #2: Hydrological Importance

Natural areas play a critical role in limiting soil erosion, attenuating runoff, controlling groundwater discharge and recharge, and maintaining water quality and quantity. This role is all the more important in an urbanizing area where the hydrologic balance is being altered by the replacement of natural cover with impervious surfaces. For example, the ability of forested areas to reduce stormwater runoff has been examined extensively in the United States where studies have shown that leaving forested areas intact as a “non-structural stormwater management strategy” reduces the need for stormwater retention ponds and saves regions millions of dollars in infrastructure costs (American Forests 1999). The recommendations of these studies include recognizing the potential economic value of natural landscapes and incorporating natural resource information into the planning process. The application of this criterion recognizes their ecological importance and potential economic benefits in protecting natural areas with high water retention capacity.

Habitat blocks (a) with greater than 50% coverage by poorly drained soils, (b) with greater than 50% coverage by well-drained soils, or (c) supporting floodplains, ponds or discharge zones fulfilled Criterion #2. The biophysical characteristics of these areas serve to maintain hydrological balance, natural water storage, function in local or regional groundwater recharge, discharge and contribute to maintaining groundwater and surface water quality. These areas may also function in sediment, erosion and flood control. Specifically, areas with well-drained soils are considered to function as potential recharge areas, while areas with poorly drained soils are considered to function as potential discharge areas.

Criterion #3: Site Condition

Natural areas of “good condition” typically refer to sites in a relatively natural condition exhibiting a low level of disturbance (due to logging, agriculture, mineral extraction, utility corridors, residential development, industrial uses, recreational facilities, or other forms of development) and containing a relatively high proportion of native flora and fauna (Heagy 1995). These areas tend to be limited in urbanizing settings, particularly in southern Ontario where the overall landscape has been dramatically altered by agricultural and urban expansion over the past two centuries (Larson et al. 1999; Holland-Hibbert 1996). Protection of these areas is central to the creation of a sustainable Natural Heritage

System because these are the unique habitats that define Fort Erie's natural heritage. These habitats also serve as sources for desirable vegetation and wildlife that could move into nearby natural areas that are not of such good condition. Finally, these areas could serve as living "references" or "models" for any planned habitat creation and/or restoration.

Habitat blocks containing one or more ELC polygons of "high" site condition were considered to fulfil Criterion #3. Site condition was considered "high" if the relative proportion of non-native species was very low and the degree of human disturbance (e.g., number of trails, vehicle tracks, refuse dumping, and evidence of logging) was also very low.

Criterion #4: Habitat Diversity

Preservation of habitat diversity is recognized as another cornerstone in building a sustainable Natural Heritage System. The same rationale extends to this criterion as to the use of habitat blocks (rather than ELC polygons of distinct ecological communities) in a Natural Areas Inventory. Basically, protecting a mosaic of natural habitat types in contiguous blocks in a given landscape ensures protection of the range of natural ecological communities in the Town and thereby ensures habitat for a broader range of plant and wildlife species.

Habitat blocks containing a relatively high proportion (i.e., 3 or more) natural ELC communities were determined to have a high degree of natural habitat diversity and to fulfil Criterion #4. Notably, ELC polygons classified as semi-natural were excluded from this analysis. Although 3 may not seem like a high number of communities, given the relative homogeneity of ELC communities in the Study Area this number was determined to be appropriate.

Criterion #5: Special Features

Habitat blocks containing one or more significant landforms, species, communities or wildlife habitats fulfil Criterion #5.

Significant Landforms

Significant landforms are defined as unique or poorly represented on a national, provincial or regional basis, and include landforms that have a high potential for supporting important biotic features (provide ref). They include locally uncommon or rare features, such as dunes, beach ridges, springs, seeps, cliffs, and caves.

Significant Species

Significant species are all listed in the Plant Species List (Appendix B1) and the Significant Wildlife Species List (Appendix C) compiled for this Study. Both lists are based on the following selection criteria:

- designated as Vulnerable, Threatened or Endangered in Ontario (OMNR 2002)
- designated as Special Concern, Threatened and Endangered in Canada (COSEWIC 2002)
- have a global rank between G1 and G3 (NHIC 2002; NatureServe.org 2003)
- have an Subnational rank (S-rank) of S3 or lower (NHIC 2002)

The Plant Species List also includes those species:

- identified as Nationally, Provincially, or Regionally rare in OMNR Central Region (Riley 1989)

- restricted geographically within Central Region (Riley 1989)

The Plant Species List lists all vascular plant species identified in the Study Area. Sources of information included field data collected by Dougan & Associates during the summer and fall of 2002, as well as species occurrence data gathered from ESA studies and wetland evaluations. All plant species that meet one or more of the criteria are considered significant in the Town of Fort Erie and are depicted in bold type.

In addition to the global, national and provincial-scale criteria listed above, all wildlife species that the Ontario Ministry of Natural Resources tracks (ONHIC, 2002) were also included. Species actively tracked generally have fewer than 100 recent occurrences in Ontario, or are highly ranked globally. Some of them are only known historically and may be extirpated from the province.

Regional-scale criteria were only utilized for the selection of amphibians, reptiles and birds. An absence of documented information did not allow other wildlife groups to be assessed at this scale. For amphibians and reptiles, those species listed as “uncommon”, “rare” or “very rare” in the former MNR ‘Central Region’ were included as significant species (Plourde et al., 1989). Both regional-scale and local-scale information was utilized in the selection of significant bird species. Local scale information was derived primarily from the 2002 wildlife inventories. For a complete discussion on which bird species were included and why, please refer to Appendix D. All wildlife species that meet one or more of the criteria, occur or potentially occur within the study area, are considered significant in the Town of Fort Erie and depicted in bold type.

Significant Communities

Significant communities include species assemblages or associations that are classified as Globally, Nationally, Provincially or Regionally Rare by COSEWIC/COSSARO/ NHIC/OMNR/ NatureServe.org. Communities which ranked S3 or lower (NHIC 2002) were considered to fulfill this criterion.

Forested units comprised of some proportion of ‘old-growth’ or mature forested areas were also considered to be significant communities. Although definitions of old-growth forest may vary depending upon tree species, generally these sites are characterized by having a large proportion of trees in older age classes, many of them over 120 years old. Other features of ‘old-growth’ communities include: a broad spectrum of tree sizes, an uneven canopy with scattered gaps, and abundant fallen logs in various stages of decomposition. These older, relatively undisturbed forests have the potential to support a high diversity of wildlife species (OMNR 2000). The following definitions were provided by Bruce Kershner (pers. comm., Nov 2002):

- Primary Old Growth forest is a site that has been continually forested since pre-settlement times, where trees greater than 150 years represent a significant percentage of the canopy.
- Secondary Old Growth forest is a site that has been settled or cleared and the regenerating forest now supports trees 100–200 years in age.

Significant Wildlife Habitat

Significant wildlife habitat is defined by the OMNR Significant Wildlife Habitat Technical Guide (OMNR 2000) as habitat that is “ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System” and is protected under the Provincial Policy Statement. Section 2.3 of the Provincial Policy Statement requires that “natural heritage features and areas will be protected from incompatible development” and that development and site alteration will be permitted on or adjacent to these areas “if it can be demonstrated that there will be no negative impact on the natural features or ecological functions for which the area is identified”. Since significant wildlife habitat has been identified as a “natural heritage area” it is protected under the Provincial Policy Statement.

For the purposes of this Study, significant wildlife habitats were those falling into any one of the following four categories:

1. seasonal concentration areas
2. rare vegetation communities and specialized habitats for wildlife
3. habitats for species of conservation concern, excluding the habitats of endangered and threatened species
4. animal movement corridors

Appendix E provides a more detailed list of features that may be present in the Town of Fort Erie that are considered Significant Wildlife Features.

Sources of information used in the identification of significant wildlife habitats included field data collected in 2002 by Dougan and Associates as well as information gathered from OMNR wetland evaluations, the OMNR NRVIS database, ANSI reports, ESA reports, Ontario Herpetofaunal Summary database, and 2002 Hooded Warbler and Acadian Flycatcher Survey data.

Criterion #6: Representation

From a conservation perspective it is sound practice to protect examples of some of the most common as well as the least common communities to ensure protection of the full range of habitat and species diversity.

Habitat blocks considered to fulfill Criterion #6 were representative of at least one, and sometimes an array of biotic community and/or landform types considered typical or characteristic of the natural heritage in the Town of Fort Erie. These blocks contain good examples of the typical as well as less common array of fauna, flora, communities, soils and landforms present in the Town. This criterion refers to the existing range of habitats, natural features, landforms and species within the Town, with the primary goal of protecting as complete a representation of them as possible. As such, it applies to both rare and common species and habitats.

Criterion #7: Socio-Economic Value

In addition to recognizing the inherent ecological value of natural heritage features in the Study Area, it is important to recognize the recreational, educational, spiritual and commercial values natural areas may hold for people. Ultimately it is people who are the stewards of these natural areas, and it is only by

engaging in low-impact activities in these natural areas that people will come to appreciate and understand them.

Evidence or reports that the habitat block is utilized by individuals or organizations for the purposes of education (e.g., nature walks), recreation (e.g., hiking, biking, boating, fishing, horseback riding), spiritual (e.g., prayer, religious ceremonies) or commercial (e.g., firewood collection, seed collection) activities was required for fulfillment of Criterion #7.

3.5 Database Development & GIS Mapping

All maps for this Study were generated using ArcView™ Ver. 8.2. This software interfaces data and mapping software so that any changes made to the data automatically get changed in the maps as well. Data lists can also be used to generate tables and conduct basic analyses. Data sets were developed for both wildlife and vegetation integrating both original field data collected over the 2002 season and other secondary source data to track species presence or absence in each ELC polygon.

A separate database was developed using MS Access™ (2000) relational database management software using the habitat blocks as the base unit for data entry. The primary purpose of this database was to generate summary sheets for each habitat block (as provided in Appendix I), however it is also a very useful tool for the Town since it establishes a framework that can be modified and built upon as additional data is collected. The database includes all the data related to each habitat block (i.e., Natural Areas Designation Criteria Fulfilled with Rationale, Recommended Environmental Designation, Physical Description, Ecological Communities, Summary Description, Inventory Details and Comments). This database, upon completion, was imported into ArcView™ in order to generate the maps associated with the various criteria.

4 Findings

4.1 Overview of Extent & Type of Natural Cover

Based on digital map analysis, the Fort Erie Study Area (shown in Map 1) covers 7527 ha. The vegetation polygons delineated by Dougan & Associates for study in the NAI cover 3268 ha (43.4% of the Study Area). Of these, 1763 ha (53.9% of the natural cover and 23.4% of the Study Area) are considered to be Forest (i.e., Deciduous Forest, Deciduous Swamp, and Cultural Woodlot). The other dominant type of natural cover is Swamp and/or Marsh (including wet forested complexes and cultural communities), accounting for 1508.71 ha (46.2% of the natural and semi-natural area, and 20% of the Study Area). The other group of communities in the Study Area fall into the mixed category of Beach Bar/Tallgrass Prairie/Sand Dune but only account for 37.01 ha (1.1% of the natural and semi-natural area, and only 0.5% of the Study Area).

Our study identified a total of 455 ELC polygons (see Map 3) ranging in size from 0.3 to 106 ha, and 117 habitat blocks ranging in size from 2.4 ha to 155 ha. As described in the Methods section, many of the habitat blocks include a number of ELC polygons, but what all the habitat blocks have in common is that they are contiguous areas of natural and/or semi-natural habitat bounded by anthropogenic land cover (i.e., urban areas, cultivated fields, golf courses, lawns) and anthropogenic breaks in the landscape such as roads, utility corridors and rail lines.

4.2 Designated Environmental Areas

Map 2 shows all the designated environmental areas within the Study Area.

The most abundant category of designated area in the Study Area are significant wetlands. A total of 45 wetlands or wetland complexes were evaluated by the Niagara District Ministry of Natural Resources in 1985–1986 within the Study Area, including 23 Provincially Significant Wetlands (PSWs) and 13 Locally Significant Wetlands (LSWs).

Of the 3 Areas of Natural and Scientific Interest (ANSIs) within the Town of Fort Erie only the Point Abino ANSI touches the Study Area boundary at its southwestern limit. Despite its near-exclusion from the Study Area, this large tract of wooded landscape and dune formation is worthy of mention since it is a unique geomorphological and biological area of Ontario and one of the most significant natural areas in the Region. The Point Abino ANSI consists of sandy soils and high dunes with wetlands behind the dunes, forming an internationally recognized wildlife refuge and providing habitat for Provincially Significant wildlife and plant species.

Brady (1980) has identified eleven Environmentally Sensitive Areas (ESAs) in the Fort Erie NAI Study Area, as described in Table 4.1 below. Although these ESAs do not currently have any official status, they are still key components of the Town’s natural heritage and should be recognized as such.

Table 4.1: Environmentally Sensitive Areas (ESAs) within the Study Area (Brady 1980).

Name	Size	Comments
Erie Beach (FE01)	15	Disturbed Oak-Hickory /Maple-Beech woodlot with rare tree species and Successional Meadow.
Ridgemount Road Woodlot (FE02)	46	Slough forest with upland and swamp species, including rare tree species; connected to larger woodlot (FE05) via hydro corridor-potential corridor for large deer population
Fox Street Woodlot (FE03)	37	Ridge formation with poorly-drained and well drained wooded areas; tributaries of Black Creek are important drainage features.
Summer Street Woodlot (FE05)	134	Woodlot with upland and rare wetland species and extensive successional meadow. Supports large deer population and well used recreational trails; area is drained by Miller and Baker Creeks.
Miller Creek Woodlot (FE06)	113	Sites with variable topography and canopy cover containing ponds, sloughs, swamps and intermittent streams. Habitat for rare species, deer and potentially waterfowl.
Thompson Woodlot (FE07)	89	Recharge area for Frenchman’s Creek with swamps and sloughs; supports rare tree and shrub species and habitat suitable for deer and waterfowl
Point Abino (FE11)	396	Large block of habitat that is mostly outside of Study Area. Dune habitat is a rare geological and biological feature that supports old growth forest and rare species. Marsh area is an IBP wildlife refuge.
Wavecrest Bush (FE12)	43	Lake Erie Shoreline complex of dunes and wetlands is an unusual landform with a high diversity of biological communities which are habitat for rare plant species and function as a migratory stopover route for waterfowl.
Rose Hill Bush (FE13)	32	A young successional forest with a creek and intermittent sloughs. Habitat suitable for deer and Red-tailed Hawks and supports a rare shrub species.
Crescent Estates (FE14)	24	Site is along a wooded creek which is bounded by successional meadow that supports a rare species.
Helena Road Woodlot (FE15)	33	Disturbed area with multiple habitat types including mature forest, successional brush with abundant vegetation and open meadow. Habitat for rare tree species.

4.3 Vegetation Resources

4.3.1 ELC Vegetation Communities

The ELC system is based on a hierarchy whereby the broadest level is “Community Class” followed by “Community Series” and “Ecosite”. Tables 4.2, 4.3 and 4.4 below provide summaries of the coverage of for each of these levels of ELC types in the Study Area. ELC Community Series are shown in Map 3.

The 2 overwhelmingly dominant ELC Community Classes in the Study Area are Swamp, covering 14.56% of the Study Area and accounting for 33.54% of the natural areas, and Cultural Communities, covering 14.44% of the Study Area and accounting for 33.27% of the natural areas. The dominant Swamp Communities are Deciduous Swamps while the dominant Cultural Communities are Cultural Thickets. Given the Study Area’s flat topography and poorly drained soils, it is not surprising to find a

predominance of Swamp Communities and Cultural Communities where land was cleared for wood and agriculture, then later abandoned because it was too difficult to farm.

Table 4.2: Summary of ELC Community Classes within the Study Area.

ELC Community Class Code	ELC Community Class	Area (ha)	% of Natural & Semi-Natural Areas	% of Study Area
BB/TP/SD	Beach Bar/Tallgrass Prairie/Sand Dune Complex	24.47	0.75%	0.33%
CU	Cultural	1087.27	33.27%	14.44%
FO	Forest	536.77	16.43%	7.13%
FO/CU	Forest/Cultural Complex	88.80	2.72%	1.18%
FO/MA	Forest/Marsh Complex	9.48	0.29%	0.13%
FO/SW	Forest/Swamp Complex	136.43	4.17%	1.81%
MA	Marsh	153.52	4.70%	2.04%
MA/CU	Marsh/Cultural Complex	2.98	0.09%	0.04%
OA	Aquatic	9.33	0.29%	0.12%
SW	Swamp	1096.22	33.54%	14.56%
SW/CU	Swamp/Cultural Complex	51.20	1.57%	0.68%
SW/MA	Swamp/Marsh Complex	14.67	0.45%	0.19%
SW/MA/CU	Swamp/Marsh/Cultural Complex	44.21	1.35%	0.59%
TP	Tallgrass Prairie	12.54	0.38%	0.17%

Table 4.3: Summary of ELC Community Series within the Study Area.

ELC Community Series Code	ELC Community Series	Area (ha)	% of Natural & Semi-Natural Areas	% of Study Area
BBO/TPO/SDO	Open Beach Bar/Open Tallgrass Prairie/Open Sand Dune Complex	24.47	0.75%	0.33%
CUM	Cultural Meadow	199.33	6.10%	2.65%
CUM/CUT	Cultural Meadow/Cultural Thicket Complex	14.66	0.45%	0.19%
CUP	Cultural Plantation	71.2	2.18%	0.95%
CUS	Cultural Savannah	27.18	0.83%	0.36%
CUT	Cultural Thicket	718.13	21.97%	9.54%
CUW	Cultural Woodland	56.77	1.74%	0.75%
FOD	Deciduous Forest	536.77	16.43%	7.13%
FOD/CUM	Deciduous Forest/Cultural Meadow Complex	9.35	0.29%	0.12%
FOD/CUP	Deciduous Forest/Cultural Plantation Complex	4.18	0.13%	0.06%
FOD/CUP/CUW	Deciduous Forest/Cultural Plantation Complex/Cultural Woodland Complex	49.09	1.50%	0.65%
FOD/CUT	Deciduous Forest/Cultural Thicket Complex	18.43	0.56%	0.24%

Table 4.3 cont'd: Summary of ELC Community Series within the Study Area.

ELC Community Series Code	ELC Community Series	Area (ha)	% of Natural & Semi-Natural Areas	% of Study Area
FOD/CUW	Deciduous Forest/Cultural Woodland Complex	7.74	0.24%	0.10%
FOD/MAM	Deciduous Forest/Meadow Marsh	9.47	0.29%	0.13%
FOD/SWD	Deciduous Forest/Deciduous Swamp Complex	136.43	4.17%	1.81%
MAM	Meadow Marsh	144.38	4.42%	1.92%
MAS	Shallow Marsh	6.02	0.18%	0.08%
MAS/MAM	Shallow Marsh/Meadow Marsh Complex	3.11	0.10%	0.04%
MAM/CUM	Meadow Marsh/Cultural Meadow Complex	2.98	0.09%	0.04%
OAO	Open Aquatic	9.33	0.29%	0.12%
SWD	Deciduous Swamp	806.46	24.68%	10.71%
SWD/SWT	Deciduous Swamp/Thicket Swamp Complex	109	3.34%	1.45%
SWT	Thicket Swamp	155.28	4.75%	2.06%
SWT/CUT	Thicket Swamp/Cultural Thicket Complex	51.2	1.57%	0.68%
SWT/MAM	Thicket Swamp/Meadow Marsh Complex	40.15	1.23%	0.53%
SWT/MAM/CUM/CUT	Thicket Swamp/Meadow Marsh/Cultural Meadow/Cultural Thicket Complex	44.21	1.35%	0.59%
TPO	Open Tallgrass Prairie	12.54	0.38%	0.17%

Table 4.4: Summary of ELC Ecosites within the Study Area.

ELC Ecosite Code	ELC Ecosite Description	Area (ha)	% of Natural & Semi-Natural Areas	% of Study Area
BBO1/TPO2/SDO1	Mineral Open Beach/Fresh to Moist Tallgrass Prairie/Open Sand Dune Complex	24.47	0.75%	0.33%
CUM1	Mineral Cultural Meadow	198.95	6.09%	2.64%
CUM2	Bedrock Cultural Meadow	0.38	0.01%	0.01%
CUM1/CUT1	Mineral Cultural Meadow/Mineral Cultural Thicket Complex	14.67	0.45%	0.19%
CUP3	Coniferous Plantation	59.81	1.83%	0.79%
CUP3/CUT1	Coniferous Plantation/Mineral Cultural Thicket Complex	11.39	0.35%	0.15%
CUS1	Mineral Cultural Savannah	27.18	0.83%	0.36%
CUT1	Mineral Cultural Thicket	706.61	21.62%	9.39%
CUT1/CUW1	Mineral Cultural Thicket/Mineral Cultural Woodland Complex	4.86	0.15%	0.06%
CUT2	Bedrock Cultural Thicket	6.66	0.20%	0.09%

Table 4.4 cont'd: Summary of ELC Ecosites within the Study Area.

ELC Ecosite Code	ELC Ecosite Description	Area (ha)	% of Natural & Semi-Natural Areas	% of Study Area
CUW1	Mineral Cultural Woodland	42.07	1.29%	0.56%
CUW1/CUP3	Mineral Cultural Woodland/Coniferous Plantation Complex	4.74	0.14%	0.06%
CUW1/CUP3/CUT1	Mineral Cultural Woodland/Coniferous Plantation/Mineral Cultural Thicket Complex	9.96	0.30%	0.13%
FOD	Deciduous Forest	27.75	0.85%	0.37%
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest	3.40	0.10%	0.05%
FOD5	Dry-Fresh Sugar Maple-Oak Deciduous Forest	8.30	0.25%	0.11%
FOD6	Fresh-Moist Sugar Maple Deciduous Forest	123.70	3.79%	1.64%
FOD7	Fresh-Moist Lowland Deciduous Forest	251.73	7.70%	3.34%
FOD9	Fresh-Moist Oak-Maple-Hickory Deciduous Forest	89.36	2.73%	1.19%
FOD9/FOD7	Fresh-Moist Oak - Maple Deciduous Forest/Fresh-Moist Lowland Deciduous Forest Complex	32.54	1.00%	0.43%
FOD/CUM1	Deciduous Forest/Mineral Cultural Meadow Complex	9.35	0.29%	0.12%
FOD7/CUP3	Fresh-Moist Lowland Deciduous Forest/Coniferous Plantation Complex	4.18	0.13%	0.06%
FOD/CUP3/CUW1	Deciduous Forest/Coniferous Plantation/Mineral Cultural Woodland Complex	39.19	1.20%	0.52%
FOD7/CUP3/CUW1	Fresh-Moist Lowland Deciduous Forest/Coniferous Plantation/Mineral Cultural Woodland Complex	9.91	0.30%	0.13%
FOD7/CUT1	Fresh-Moist Lowland Deciduous Forest/Mineral Cultural Thicket Complex	18.43	0.56%	0.24%
FOD9/CUW1	Fresh-Moist Oak-Maple-Hickory Deciduous Forest/Mineral Cultural Woodland Complex	7.74	0.24%	0.10%
FOD7/MAM2	Fresh-Moist Lowland Deciduous Forest/Mineral Cultural Meadow Complex	9.48	0.29%	0.13%
FOD/SWD	Deciduous Forest/Deciduous Swamp Complex	22.80	0.70%	0.30%
FOD7/SWD4	Fresh-Moist Lowland Deciduous Forest/Mineral Deciduous Swamp Complex	10.99	0.34%	0.15%
SWD3/FOD7	Maple Mineral Deciduous Swamp/Fresh-Moist Lowland Deciduous Forest	14.42	0.44%	0.19%
FOD9/SWD1	Fresh-Moist Oak-Maple-Hickory Deciduous Forest/Oak Mineral Deciduous Swamp Complex	88.22	2.70%	1.17%
MAM2	Mineral Meadow Marsh	38.63	1.18%	0.51%

Table 4.4 cont'd: Summary of ELC Ecosites within the Study Area.

ELC Ecosite Code	ELC Ecosite Description	Area (ha)	% of Natural & Semi-Natural Areas	% of Study Area
MAM6/MAM4	Tallgrass Meadow Marsh/Great Lakes Coastal Meadow Marsh Complex	105.76	3.24%	1.41%
MAS	Mineral Shallow Marsh	3.76	0.11%	0.05%
MAS2	Mineral Shallow Marsh	2.26	0.07%	0.03%
MAS2/MAM2	Mineral Shallow Marsh/Mineral Meadow Marsh Complex	3.11	0.10%	0.04%
MAS2/MAM2	Mineral Shallow Marsh/Mineral Meadow Marsh Complex		0.00%	0.00%
MAM2/CUM1	Mineral Meadow Marsh/Mineral Cultural Meadow Complex	2.98	0.09%	0.04%
OAO	Open Aquatic	9.33	0.29%	0.12%
SWD	Deciduous Swamp	43.00	1.32%	0.57%
SWD1	Oak Mineral Deciduous Swamp	147.29	4.51%	1.96%
SWD1/SWD2/SWD3	Oak Mineral Deciduous Swamp/Ash Mineral Deciduous Swamp/Maple Mineral Deciduous Swamp Complex	27.40	0.84%	0.36%
SWD1/SWD3	Oak Mineral Deciduous Swamp/Maple Mineral Deciduous Swamp Complex	233.09	7.13%	3.10%
SWD2	Ash Mineral Deciduous Swamp	142.48	4.36%	1.89%
SWD2/SWD3	Ash Mineral Deciduous Swamp/Maple Mineral Deciduous Swamp Complex	60.62	1.85%	0.81%
SWD3	Maple Mineral Deciduous Swamp	149.94	4.59%	1.99%
SWD4	Mineral Deciduous Swamp	2.64	0.08%	0.04%
SWD1/SWD3/SWT2	Pin Oak Mineral Deciduous Swamp/Maple Mineral Deciduous Swamp/Mineral Thicket Swamp Complex	67.19	2.06%	0.89%
SWD1/SWT2	Oak Mineral Deciduous Swamp/Mineral Thicket Swamp Complex	37.43	1.15%	0.50%
SWD3/SWT2	Maple Mineral Deciduous Swamp/Mineral Thicket Swamp Complex	4.38	0.13%	0.06%
SWT2	Mineral Thicket Swamp	155.28	4.75%	2.06%
SWT2/CUT1	Mineral Thicket Swamp/Mineral Cultural Thicket Complex	51.20	1.57%	0.68%
SWT2/MAM2	Mineral Thicket Swamp/Mineral Meadow Marsh Complex	40.15	1.23%	0.53%
SWT2/MAM2/CUM1 /CUT1	Mineral Thicket Swamp/Mineral Meadow Marsh/Mineral Cultural Meadow/Mineral Cultural Thicket Complex	44.21	1.35%	0.59%
TPO2	Fresh-Moist Tallgrass Prairie	12.54	0.38%	0.17%

The 455 ELC polygons in the Study Area can be broadly classified into 8 ELC Community Classes and associated complexes thereof. The classes are: cultural, forest, tallgrass prairie, beach bar, sand dune, swamp, marsh and open aquatic. The Community Classes were further categorized into 55 different

Ecosites and complexes of Ecosites. The predominant community types are briefly described below under the headings that describe the type of system they are found in: “Terrestrial Communities” (Cultural and Non-Cultural), “Wetland Communities” and “Aquatic Communities”. Significant vegetation communities are discussed in Section 4.3.2.

4.3.1.1 Terrestrial Communities

Cultural Communities

Cultural sites make up one third (33.3%) of the natural cover within the various habitat blocks in the Fort Erie NAI study area. This represents 14.4% of the total landmass (natural + urbanized areas) within the boundaries of the study area as illustrated in Map 1.

The term “Cultural” is used in the ELC system to describe sites that clearly exist because of anthropogenic disturbances such as planting, agriculture, clearing, recreation, substrate movement, grazing or mowing. They are classified according to the amount of tree and shrub cover present and for the most part represent the various successional stages of regenerating forest cover. Cover of woody species gradually increases as cleared areas go through different successional stages, starting with Cultural Meadows, which have the lowest cover of woody species, through to Cultural Thickets, Cultural Savannahs, and Cultural Woodlands. Plantations are another cultural community, and this category has the highest cover of trees. Cultural sites in the Fort Erie study area are described briefly below.

Cultural Meadow

Both tree cover and shrub cover are less than 25% in Cultural Meadows and they are usually dominated by exotic and disturbance tolerant native species. Cultural Meadows make up 6.1% of the natural cover within the habitat blocks in the Fort Erie NAI study area, and 2.7% of the total landmass within the study area boundary. Many cultural meadows in the study area are abandoned or fallow farmlands or maintained areas such as hydro corridors and manicured parklands. Where there is sufficient mineral soil, the site conditions vary between dry and moist and the ecoelement classification is Dry-Moist Old Field Meadow Type (CUM1-1). Where soils are shallow (less than 15 cm on average) and often exposed bedrock is found, the classification currently can be taken the ecosite level and it is termed a Bedrock Cultural Meadow Ecosite (CUM2).

Many of the abandoned agricultural meadows in the study area are highly diverse, supporting numerous native and exotic species. Old furrows were evident and on wetter sites the furrows were damp and various sedges and rushes were found. These wet meadows often supported small to large populations of Swamp Agrimony (*Agrimonia parviflora*), a species which is ranked as S3S4 by the NHIC; they also supported abundant *Potentilla simplex*, as well as occasional *Pycnatheum virginianum*, and various species of Aster and Goldenrod (*Solidago* spp.). Scattered Dogwoods (*Cornus* spp.), Buckthorn (*Rhamnus cathartica*), and Hawthorn (*Crataegus* spp.) shrubs and American Elm (*Ulmus Americana*) trees were present in some meadows. Drier meadows were dominated by typical old species such as Queen Anne’s Lace (*Daucus carota*), Brome grass (*Bromus inermis* ssp. *inermis*), and Goldenrods (*Solidago* spp.).

Cultural Thicket

Cultural Thickets are dominated by shrub species, having greater than 25% shrub cover but less than 25% tree cover. These are the second most common habitat type in study area, representing 22.0% of the natural cover in the habitat blocks and 7.1% of the total landmass. In many thickets the sites are so productive that the thickets are virtually impenetrable masses of shrubs with scattered clumps of trees, all enveloped in a covering of vines. The most common shrubs were Gray Dogwood (*Cornus foemina* ssp *racemosa*) with Silky Dogwood (*Cornus amomum* ssp *oblique*) and Red-Osier Dogwood (*Cornus stolonifera*) on wetter sites. Some thickets were very diverse, with the full complement of wet meadow species as ground cover. These sites likely provide substantial shelter and forage for wildlife species, because of the various shrub species and the volume of berries that are produced. It should be noted that Cultural Thickets often occurred as complexes with other habitats such as Swamp Thickets, Cultural Meadows and Deciduous forests.

Cultural Savannah

These habitats are characterized as having between 25-30% tree cover and variable amounts of shrub cover, though shrubs were not as vigorous as in the thickets. This community was not very common in the study area, consisting of only 0.8 % of the natural cover in the habitat blocks. One Cultural Savannah was unusual as it supported Red Cedar (*Juniperus virginiana* var. *virginiana*), which was not encountered elsewhere in the study area. This site in habitat block 627 requires further investigation as it may harbour other unusual species.

Cultural Woodland

Woodlands have between 35% and 65% tree cover. They were not common in the study area and mostly consisted of regenerating forest cover of usually Green Ash (*Fraxinus pensylvanica*) and American Elm (*Ulmus americana*).

Cultural Plantation

A Cultural Plantation has tree cover of 60% or greater. All of the plantations encountered in the study area were coniferous plantation (CUP3) ecosites because they had greater than 75% cover of coniferous trees. Commonly planted trees included Scotch Pine (*Pinus sylvestris*), Norway Spruce (*Picea abies*), White pine (*Pinus strobus*) and Colorado Spruce, (*Picea pungens*).

Trees are planted for a variety of reasons. Some trees are planted for the purposes of harvesting them as lumber or firewood, or they may be planted in reforestation or erosion control programs. Plantations can be easily recognizable on aerial photographs and in the field because the trees occur in distinct linear rows, a distribution never seen in a natural setting. Some plantations have very low species diversity, particularly where conifers are planted close together and very little light penetrates the canopy. As plantations age and some trees fall or removed, species diversity may increase and this type of forest become less recognizable as plantations, depending on the density of the understorey, the species of trees that were planted, and the manner in which they were planted. In the Niagara region, however, deciduous species are the dominant form and congregations of conifer species do not commonly occur naturally. Despite low species diversity of some plantations, they have ecological value because they provide cover and for wildlife species and nesting and roosting sites for owls and raptors.

Non-Cultural Communities

Forest

Forests are upland communities that have greater than 60% tree cover. All of the forests in the study area have over 75% cover of deciduous species (with the exception of some plantations), so they are classified in the ELC system as Community Series Deciduous Forest (FOD). They are the third most common Community Class in the study area, covering 16.4% of the natural cover in habitat blocks. The Deciduous Forests were classifiable into numerous Ecosites and Ecoelements as there were a high number of different vegetation associations, such as Oak-Maple-Hickory, Sugar Maple-Hardwood, Sugar Maple-Oak (usually Red Oak), White Elm Lowland, and Ash Lowland Forest, to name a few. The latter two ecoelements were the most prevalent in the study area. The forests ranged in maturity from young regenerating forest to mature forests.

Open Beach

Open Beach in the Fort Erie NAI study area is restricted to the shoreline of Lake Erie, which is a long narrow strip at the water's edge at the southern edge of the town. North of the Peace Bridge the shoreline of the Niagara River has steep banks and the shoreline tends to be more flooded. The land above the banks of the Niagara River the land is mostly manicured parkway.

The Lake Erie shoreline is subject to ongoing disturbance by wind, waves, storm events, seasonal flooding, ice scour and long-term cyclical fluctuations in lake levels. Consequently erosional and depositional processes are in a constant state of flux and much of the habitat can be classified as Open Beach/Bar (BBO) ecosite in the ELC system. This community is characterized by sparse vegetation cover, with tree cover less than 10%, shrub cover less than 25%, and herbaceous vegetation occurring in patches. At the ecoelement level Open Beach is classified according to substrate type, either as Mineral Open Beach/Bar (BBO1) or Bedrock Open Beach/Bar (BBO2). On the shorelines that were visited in 2002, the shoreline substrate consists of deposits of sand or gravel (both mineral substrates) with exposed limestone pavement (bedrock substrate). The shoreline area is therefore a complex with pockets or stretches of all three substrates. Open beach was documented in the Fort Erie NAI study area at Erie Beach, Stonemill Rd. Beach, and Windmill Point. A provincially and globally rare Open Beach habitat, Sea Rocket Sand Beach (BBO1-1) exists at Erie Beach.

Many species on open beaches of the Great Lakes are significant because they are endemic or restricted to shorelines of the Great Lakes. Within the study area, "Great Lakes Shoreline Species" (Riley 1989) include Sea-Rocket (*Cakile edentulata* var. *lacustris*), Wormwood (*Artemisia campestris* ssp. *caudata*) and Beach Grass (*Ammophila breviligulata*). Other rare species encountered include Wild Bean (*Strophostyles helvula*) and Walter's Barnyard Grass (*Echinochloa walteri*). Species that thrive on open beach habitats have developed mechanisms to maintain their population levels despite the high levels of disturbance; they are often annuals, which rely on seeds for reproduction or they produce tillers, a form of growth that is readily replaced when it is grazed or sheared off.

4.3.1.2 Wetland Communities

The ELC system closely follows the Southern Ontario Wetland Evaluation System (OWES 1993) definition of a wetland and classifies sites as wetland when the water table is either seasonally at or above

the substrate surface, and there is a predominance of water tolerant or hydrophytic plants. Water depth of wetlands can be up to 2m over a hydric soil or bedrock substrate. (Systems that are permanently flooded and have a water depth greater than 2m classified are classified as Aquatic Systems). Presence of standing water, pools or vernal pooling that represents greater than 20% of ground coverage are also classified as wetland in the ELC system. Wetlands are common in the Fort Erie study area and consist of Deciduous Swamps, Marsh, and Swamp Thicket communities. The predominance of impermeable clays in the soils and the unsuitability of these sites for farming means they tend to remain in the landscape.

Marsh

Marsh communities have less than 25% cover of trees and shrubs and are dominated by emergent hydrophytic macrophytes. Water depth is variable but it must be less than 2m to be classified as a marsh in the ELC system. Shallow Marshes (MAS) are flooded for most or all of the growing season, so they are populated with species that can withstand prolonged flooding. Meadow Marshes (MAM) are only seasonally flooded, and occur at the interface of wetland and terrestrial systems. Meadow Marshes were more common in the study area than Shallow Marshes and they were usually dominated by graminoids such as Reed Canary Grass (*Phalaris arundinacea*) and Red Top (*Agrostis gigantea*). Rare Great Lakes Coastal meadow marsh habitats were encountered on the Lake Erie Shoreline and are discussed in section Section 4.3.2.

Swamp Thicket

Swamp thickets (SWT) have tree cover less than 25% and are dominated by hydrophytic shrubs (cover greater than 25%). They represent 4.75% of the natural cover in the habitat blocks. In essence they are similar in species composition to Cultural Thickets, except there is a higher proportion of hydrophytic species as conditions are wetter. Within the Study Area it is likely that they are also cultural in origin, and if left to successional processes they will eventually become deciduous swamps.

Deciduous Swamps

Deciduous Swamps were the most common type of habitat in the study area, representing 24.75% of the natural cover in the habitat blocks and 10.7% of the entire landmass within the study area boundary. Deciduous Swamps (SWD in the ELC system) have greater than 25% tree cover, of which greater than 75% are deciduous trees that are tolerant of wet conditions. A number of different vegetation associations were documented and often there were complexes of the different types. Pin Oak Swamps (SWD1-3), and Green Ash Swamps (SWD2-2) are common, and can occur independently or as part of complexes with each other or Silver Maple Swamps (SWD3-2). Less common were Swamp Maple (SWD3-3) and Red Maple Swamp (SWD3-1).

Some deciduous swamp habitat occurs as a complex with upland forest species where differences in elevation and drainage patterns lead to the formation of swamp habitats in the depressions and wetter areas of deciduous forests. This forest/swamp habitat is sometimes referred to as slough forest.

4.3.1.3 Aquatic Habitats

Open Water

Bodies of water that are greater than 2m deep and do not support macrophytic vegetation, tree or shrub cover are classified as Open Aquatic (OA) systems in the ELC classification scheme. There were only 3 open water communities in the study area. These appear to be associated with former quarries which have filled to form ponds.

4.3.2 Significant Vegetation Communities

Significant vegetation communities are those that have status at the Regional, Provincial or National level. These communities are very restricted in their abundance and range, and require protection.

Tallgrass Prairie

Tallgrass Prairie Vegetation Types are found on sandy soils. Open Tallgrass Prairies (TPO), have tree and shrub cover less than 25% and can occur on dry to moist sites. Wetter conditions in these sites are usually attributable to fluctuation in water levels of adjacent lakes or rivers, or poor drainage because of an impermeable layer of clay in the soil. The hallmark of a tallgrass prairie are the presence of tall grass species which characterize Midwestern prairies such as Little Bluestem (*Schizachyrium scoparium*), Big Bluestem (*Andropogon gerardii*), Switch Grass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*).

Elements of Fresh-Moist Tallgrass Prairie (TPO2-1) were found in isolated pockets within a mosaic of dune and coastal marsh habitats at Windmill Point and Erie Beach. The Tallgrass Prairie (TPO2-1) vegetation type is both globally (G3) and provincially rare (S1). Species such as Switch Grass (*Panicum virgatum*), Little Bluestem (*Schizachyrium scoparium*), Big Bluestem (*Andropogon gerardii*) were documented as well as occasional Sycamore (*Platanus occidentalis*) and Black Oak (*Quercus velutina*) trees and Southern Arrow-wood (*Viburnum recognitum*) Shrubs.

Pin Oak Swamp (S2S3)

Pin Oak has a limited distribution in Ontario, occurring only in the Lambton, Essex, Kent and Niagara Regions. [Section to be supplemented with additional text as part of Final version]

Great Lakes Coastal Marsh and Prairie Meadow Marsh

Great Lakes coastal wetland communities are considered “very rare” at the global level. The Ontario Natural Heritage Information Centre (NHIC) has tentatively assigned a ranking of “G2” to these communities. This ranking is assigned to communities that are represented globally by less than twenty occurrences and/or are subject to external factors making them vulnerable to extinction. Development of coastal areas and shoreline stabilization are considered to be the primary threats to coastal wetlands.

Great Lakes coastal wetlands differ from isolated inland (palustrine) wetlands in that they are maintained primarily by lake water levels as opposed to surface runoff or groundwater discharge conditions. These wetland communities also differ from other lake associated (lacustrine) wetlands in that they are exposed to more pronounced water level fluctuations due to cyclical fluctuations in water levels, which result in extended periods of inundation followed by periods of dryness.

In the Fort Erie NAI study area, coastal wetlands consisted of Meadow Marsh Community Types. At Fort Erie Beach, Bertie Bay and Windmill Point, Graminoid Coastal Meadow Marshes (MAM4-1) exist in wetter areas along the shoreline. This vegetation type is ranked as provincially rare (S2) and has been tentatively assigned a globally rare status (G2). In addition, pockets of Bluejoint-Prairie Slough Grass. Tallgrass Meadow Marsh (MAM6-1) habitat (S1, G2G3) were found at Prospect Point.

Great Lakes Dune

Sand Dunes occur infrequently on Great Lakes shorelines; many sand dune habitats have been ranked by the NHIC as provincially rare and some ecosites and ecoelements are ranked as globally rare. Sand dunes are rolling sand hills with discernable ridges and troughs that have been deposited along shorelines by coastal and aeolian (wind-related) processes. Conditions on sand dunes can be harsh, so plant species on dunes tend to be tolerant of drought, extreme temperatures and low nutrient availability and shifting substrate. Typically Sand Dunes become more stable as woody vegetation starts to accumulate with increasing distance from the active shoreline. Open Sand Dunes Ecosites (SDO1), for example, occur closest to the active shoreline area and are usually dominated by graminoid species. Shrub Sandune Ecosites (SDS1) have greater than 25% shrub cover and tree cover less than 25%. Dunes are considered "Treed" (SDT1) when tree cover is between 25% and 60%. Although no such classification currently exists in the ELC system, presumably forested dunes have greater than 60% tree cover.

In the Fort Erie NAI study area, old growth forest occurs on dunes in Point Abino and forested dunes are described as being interspersed with wetlands at Wavecrest Bush ESA (Brady 1980). Pockets of Little Bluestem-Switchgrass - Beach Grass Open Dune Type (SDO1-1) were encountered in the current study. This is a provincially rare (S2S3) and possibly globally rare (G2G4) habitat.

Sea Rocket Sand Beach Type (S2S3)

See description of Open Beach.

Southern Arrow-wood Thicket Swamp (S3)

[Section to be supplemented with additional text as part of Final version]

Black Walnut Deciduous Forest (S2-S3)

[Section to be supplemented with additional text as part of Final version]

Swamp White Oak Deciduous Swamp (S2-S3)

[Section to be supplemented with additional text as part of Final version]

Bur Oak Deciduous Swamp (S3)

[Section to be supplemented with additional text as part of Final version]

Buttonbush Thicket Swamp (S3)

[Section to be supplemented with additional text as part of Final version]

4.3.3 Floristic Diversity

A total of 486 vascular plant species have been recorded from the Ft. Erie settlement area to date. This figure is based on observations made during the NAI and data from prior studies. The NAI study confirmed the presence of at least 454 species during the 2002 field season. A complete listing of all

vascular plant species and their rarity status is presented in Appendices B1 and B2. Nine of the species included in the listing based on historical observations. Historical observations were retained in the list as there is insufficient data available to confirm that populations have indeed been extirpated. In fact, the NAI study reconfirmed the presence of several species which had not been reported in Niagara Region since 1949.

A total of 382 or 78% of the species identified in the NAI are considered native or indigenous to Ontario, while 104 (22%) are considered adventive or introduced to the province.

A relatively high proportion of the species recorded from the study area are considered “Carolinian Species” (Riley, 1989). These species have a range distribution which is restricted to the area south of a line from Toronto to Cambridge to Grand Bend.

Many of the species recorded from the study area are considered significant at the National, Provincial, and Regional levels. The status of the individual species is denoted in Appendix B1 and B2. A summary of the significant species is provided in the Table 4.5 below.

Table 4.5: Number of significant vascular plant species according to various selection criteria.

Level	Designation Authority	Regulation	Number of Species	Comments
National	COSEWIC	Bill C-5 (Species at Risk Act)	5 Endangered 2 Threatened 5 Special Concern	Historical Current 4 Current; 1 Historical
Provincial	COSSARO	Ontario Endangered Species Act	1 Endangered 1 Threatened	Historical Historical
Provincial	NHIC	Planning Act	48 Provincially Rare	9 Historical
National	Argus et al. (1982-1987)	None	35 Species	9 Historical
Regional	OMNR	Planning Act	36 Species	9 Historical

At the National level, or level to be regulated under Bill C-5 (Species at Risk Act), there are total of 12 COSEWIC listed species. Half of these represent what are considered historical observations. In total, some 35 species are considered to be Nationally Rare (Argus *et al.* 1987).

At the Provincial level, or level regulated under the Ontario Endangered Species Act, there are two species, both of which are considered historical records.

4.4 Wildlife Resources

Wildlife surveys focused on woodlands identified by the Town of Fort Erie. Of the 133 ‘original’ woodlands identified in the Study Area larger than 2 ha in size (as shown in Figure 1), 121 of these were visited (see Table 3.3 for breakdown).

In total, 80.3 hours were spent surveying wildlife. This does not include time spent driving or walking between units. This works out to an average of 39.8 minutes in each surveyed polygon.

4.4.1 Background Review

A substantial component of the wildlife data was collected from secondary sources. The following text presents a summary of the results of this extensive background review.

4.4.1.1 Second Ontario Breeding Bird Atlas database

The Second Ontario Breeding Bird Atlas (OBBA) began in 2001, twenty years after the initiation of the first Ontario Breeding bird Atlas (Cadman et al., 1987). Therefore, only two years of data (2001–2002) was available to be reviewed. All of this review was conducted by accessing the Ontario Breeding Bird Atlas website located at <http://www.birdsontario.org/atlas/atlasmain.html>. More specifically, the Atlas Data Summary page was queried. The highest breeding evidence of each species listed in each square was reviewed. However, site specific location information was not available for most species.

The Fort Erie study area is located in or partially in five 10 x 10 km atlas squares (17PH54, 17PH55, 17PH64, 17PH65, and 17PH75). However, little natural habitat exists in atlas square 17PH75. All of it is located in the downtown core of Fort Erie. Little information for this square was available, and almost none of any significant bird species. In addition, atlas squares 17PH54 and 17PH55 also contain only a small portion of the study area. Atlas data for these two squares was not reviewed because the natural areas found in these squares were adequately surveyed for birds as part of the 2002 Natural Areas Inventory. That is, the only two atlas squares for which the species lists were scrutinized were 17PH64 and 17PH65. Fortunately, all of 17PH64 is contained within the study area, whereas only part of the study area is located within 17PH65.

Eighty-seven (87) bird species were on record for atlas square 17PH64, including observations made as part of the 2002 Natural Areas Inventory. However, only 71 exhibited breeding evidence. Of these 71, 28 are considered to be significant in the Town of Fort Erie according to this study (see Appendix D). Six of the 28 significant bird species were not recorded during the 2002 Natural Areas Inventory. They are: Northern Shoveler (*Anas clypeata*), Northern Harrier (*Circus cyaneus*), American Kestrel (*Falco sparverius*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Purple Martin (*Progne subis*), Tree Swallow (*Tachycineta bicolor*), Eastern Bluebird (*Sialia sialis*), and Bobolink (*Dolichonyx oryzivorus*). Red-headed Woodpecker is designated as “Vulnerable” in Ontario (OMNR, 2002) and “Special Concern” in Canada (COSEWIC, 2002). It should also be pointed that it is unclear whether or not the Purple Martin or Tree Swallow bred under natural conditions. If they did use human-built structures, then they would not be considered significant species in the Town of Fort Erie (see Appendix D).

One-hundred and one (101) bird species were on record for atlas square 17PH65, including observations made as part of the 2002 Natural Areas Inventory (NAI). However, only 91 exhibited breeding evidence. Of these 91, 44 are considered to be significant in the Town of Fort Erie according to this study (see Appendix D). Thirteen of the 44 were not recorded the 2002 NAI. However, only 7 were not recorded during the 2002 NAI or OBBA. They are: American Bittern (*Botaurus lentiginosus*), Great Egret (*Casmerodius albus*), Sandhill Crane (*Grus canadensis*), Upland Sandpiper (*Bartramia longicauda*), Wilson’s Snipe (*Gallinago delicata*), Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), and Eastern Meadowlark (*Sturnella magna*). Again, it is important to emphasize that these 7 species may or may not breed within the NAI study area. This information may or may not be confirmed since the atlas’s name associated with the data is hidden.

In addition to the above species information, the atlas website shows that 14 point counts were conducted in atlas square 17PH65. At least nine of the roadside point counts conducted are located in the study area. They are point count stations 2, 6, 7, 10, 12, 16, 18, 19, 21. Two other off-road counts were also conducted, but specific location information is currently unavailable. Specific species information for each point count station was also unavailable from the atlas website.

4.4.1.2 Ontario Ministry of Natural Resources (OMNR) wetland evaluations

All wetland evaluation summaries were reviewed for wildlife information. Unfortunately, very little species data was present. In total only 6 species of amphibian and reptiles, 13 species of birds and 5 species of mammals were on file, and not all of the species were observed. Some only reported that the habitats encountered were suitable for a given species. The reason so few wildlife species were on record is not clear. Perhaps some of the evaluations were made outside of the breeding season or the level of experience was low. For example, it is curious that no Green Frogs (*Rana clamitans*) were noted in all of the surveys yet the typically rarer Bullfrog (*Rana catesbeiana*) was repeatedly observed. In any case, none of the species listed were remarkable. Table 4.6 lists all 24 species.

Table 4.6: Wildlife species recorded in the evaluated wetlands present in the Fort Erie Study Area.

	Common Name	Scientific Name		Common Name	Scientific Name
1	Northern Redback Salamander	<i>Plethodon cinereus</i>	13	American Woodcock	<i>Scelopax minor</i>
2	American Toad	<i>Bufo americanus americanus</i>	14	Mourning Dove	<i>Zenaida macroura</i>
3	Bullfrog	<i>Rana catesbeiana</i>	15	Hairy Woodpecker	<i>Picoides villosus</i>
4	Northern Leopard Frog	<i>Rana pipiens</i>	16	Blue Jay	<i>Cyanocitta cristata</i>
5	Snapping Turtle	<i>Chelydra serpentina</i>	17	American Crow	<i>Corvus brachyrhynchos</i>
6	Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>	18	Black-capped Chickadee	<i>Poecile atricapillus</i>
7	Great Blue Heron	<i>Ardea herodias</i>	19	American Robin	<i>Turdus migratorius</i>
8	Green Heron	<i>Butorides virescens</i>	20	Virginia Opossum	<i>Didelphis virginiana</i>
9	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	21	Eastern Cottontail	<i>Sylvilagus floridanus</i>
10	Wood Duck	<i>Aix sponsa</i>	22	Gray Squirrel	<i>Sciurus carolinensis</i>
11	Mallard	<i>Anas platyrhynchos</i>	23	Muskrat	<i>Ondatra zibethicus</i>
12	Killdeer	<i>Charadrius vociferus</i>	24	Mink	<i>Mustela vison</i>

4.4.1.3 OMNR NRVIS database of provincially rare species

Kim Barrett (Ontario Ministry of Natural Resources) extracted all records of provincially rare fauna for the Town of Fort Erie (including Point Abino) from the OMNR NRVIS database. The search yielded 66 observations of 15 species. The majority of the records on file were not from the last 15 years and a few of the observations were from the late 1800's. The most recent observation on record was from 1998. Only 8 of the 15 species are known to have occurred in the Study Area.

The 15 species for which information was on file are listed below. Those species known to have occurred in the study area are marked in bold text.

1. Acadian Flycatcher *Empidonax vireescens*
2. Blanding's Turtle *Emydoidea blandingi*
3. Cerulean Warbler *Dendroica cerulea*
4. Eastern Hognose Snake *Heterodon platyrhinos*
5. **Fowler's Toad** *Bufo woodhousei fowleri*
6. Grey Fox *Urocyon cinereoargenteus*
7. Hooded Warbler *Wilsonia citrina*
8. King Rail *Rallus elegans*
9. **Loggerhead Shrike** *Lanius ludovicianus*
10. **Piping Plover** *Charadrius melodus*
11. Prothonotary Warbler *Protonotaria citrea*
12. Spotted Turtle *Clemmys guttata*
13. **Spring Salamander** *Gyrinophilus porphyriticus*
14. **Tufted Titmouse** *Baeolophus bicolor*
15. Woodland Vole *Pitymys pinetorum*

4.4.1.4 Environmentally Sensitive Area (ESA) reports

The study area contains or partially contains 11 Environmentally Sensitive Areas (ESAs). The following wildlife information was extracted from the original reports. All fieldwork was conducted in 1980. It is very likely that conditions have changes since this time.

In total, only 25 wildlife species were on file for the various ESA. Of course there were also references to "many songbird", "frogs", and "snakes". Nevertheless, given that that so few wildlife species were on record, documenting wildlife resources was clearly not a priority or the level of expertise inadequate.

Erie Beach (FE01) - The report states that the woods are home for numerous songbirds including American Robin (*Turdus migratorius*), Gray Catbird (*Dumetella carolinensis*), and Red-winged Blackbird (*Agelaius phoeniceus*).

Ridgemount Road Woodlot (FE02) - According to the report, wildlife in the area includes Killdeer (*Charadrius vociferous*), Gray Catbird (*Dumetella carolinensis*), Northern Cardinal (*Cardinalis cardinalis*), Red-winged Blackbird (*Agelaius phoeniceus*), Gray Squirrel, (*Sciurus carolinensis*) and White-tailed Deer (*Odocoileus virginianus*). The woodlot was thought to provide a link to FE05 thereby facilitating deer movement via the hydro corridor and successional meadows.

Fox Street Woodlot (FE03) - Wildlife on record includes: Red-tailed Hawk (*Buteo jamaicensis*), owls, American Robin (*Turdus migratorius*), Red-winged Blackbird (*Agelaius phoeniceus*), and other songbirds. Mammals included: Muskrat (*Ondatra zibethicus*), Raccoon (*Procyon lotor*), and Striped Skunk (*Mephitis mephitis*). No other wildlife-related comments are on file.

Summer Street Woodlot (FE05) - The report noted the presence of Red-tailed Hawk (*Buteo jamaicensis*), and various songbirds including Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Red-

winged Blackbird (*Agelaius phoeniceus*). Mammals on file included Gray Squirrel, (*Sciurus carolinensis*), Raccoon (*Procyon lotor*), and White-tailed Deer (*Odocoileus virginianus*). In addition to the above species, the area was thought to support a “large deer population”. No estimates of the actual size of the population were revealed.

Miller Creek Woodlot (FE06) – The following species were observed during the 1980 survey: Turkey Vulture (*Cathartes aura*), American Crow (*Corvus brachyrhynchos*), Bobolink (*Dolichonyx oryzivorus*), Red-winged Blackbird (*Agelaius phoeniceus*), Raccoon (*Procyon lotor*), and White-tailed Deer (*Odocoileus virginianus*). In addition to the above, the report considered the area to be “an excellent site for wildlife since it contains woodland, successional meadow and pond habitats.” It was also considered “excellent deer and waterfowl habitat.”

Thompson Woodlot (FE07) – Wildlife on record for the area include: “snakes”, “frogs”, Gray Catbird (*Dumetella carolinensis*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Red-winged Blackbird (*Agelaius phoeniceus*), Eastern Cottontail (*Sylvilagus floridanus*), Raccoon (*Procyon lotor*), and White-tailed Deer (*Odocoileus virginianus*). Similar to the Miller Creek Woodlot ESA, the woodlot was believed to provide “suitable habitat for deer and waterfowl.”

Point Abino (FE11) – This ESA barely reaches the extreme south-western portion of the study area. It contains the largest assemblage, greatest diversity and highest quality of natural habitats in the Fort Erie vicinity. As recently as 1999, it has supported many rare species of breeding birds such as: Red-headed Woodpecker (*Melanerpes erythrocephalus*), Pileated Woodpecker (*Dryocopus pileatus*), Acadian Flycatcher (*Empidonax virescens*), Tufted Titmouse (*Baeolophus bicolor*), Carolina Wren (*Thryothorus ludovicianus*), Winter Wren (*Troglodytes troglodytes*), Golden-crowned Kinglet (*Regulus satrapa*), Blue-winged Warbler (*Vermivora pinus*), Black-throated Green Warbler (*Dendroica virens*), Cerulean Warbler (*Dendroica cerulean*), Black-and-white Warbler (*Mniotilta varia*), Northern Waterthrush (*Seiurus noveboracensis*), and Hooded Warbler (*Wilsonia citrina*). Also found there is the Southern Flying Squirrel (*Glaucomys volans*), designated as “Special Concern” in Canada. The sandy beach habitats also support Fowler’s Toads, “Threatened” in Ontario and Canada.

Wavecrest Bush (FE12) – Wildlife sighted during the 1980 field survey included Great Blue Heron (*Ardea herodias*), Blue Jay (*Cyanocitta cristata*), Meadow Vole (*Microtus pennsylvanicus*), Eastern Cottontail (*Sylvilagus floridanus*), and White-tailed Deer (*Odocoileus virginianus*). Apparently the area just north of the lake is designated as an International Biological Program (IBP) wildlife refuge area.

Rose Hill Bush (FE13) – The woodlot was thought to support suitable habitat for White-tailed Deer (*Odocoileus virginianus*). Deer tracks were present. Red-tailed Hawk (*Buteo jamaicensis*) was also noted.

Crescent Estates (FE14) – No wildlife species were on file for the 1980 inventory. Neither were any comments related to wildlife or wildlife habitat.

Helena Road Woodlot (FE15) - According to the summary report, Ruffed Grouse (*Bonasa umbellus*) was observed during the 1980 field inventory. It is very unlikely that this species still occur today (2002). Various songbirds were also believed to inhabit the area.

4.4.1.5 ONTBIRDS listserv and WNY Dial-a-Bird hotline

During the course of the Natural Areas Inventory (June 2002 – March 2003), the online listserv ONTBIRDS was monitored for reports pertaining to the Fort Erie area. All observations contained in these reports were compiled and are presented in Appendix F. ONTBIRDS is administered by the Ontario Field Ornithologists. Similarly, all Western New York “Dial-a-Bird” reports were reviewed and incorporated into Appendix F. This was done in February and March 2003 by searching the archives of the BIRDEAST listserv, administered by the National Birding Hotline Cooperative (East) (birdeast@listserv.arizona.edu). All records between March 2002 and March 2003 were reviewed.

These online bird reports yielded observation information for at least 38 different species from the Fort Erie area. Most reports pertained to non-passerines, especially waterfowl, shorebirds, and gulls and terns, a clear reflection of the Fort Erie’s strategic location on the Lake Erie shoreline. Observations of species considered to be at risk in Ontario or Canada included Harlequin Duck (*Histrionicus histrionicus*), Bald Eagle (*Haliaeetus leucocephalus*), Red-shouldered Hawk (*Buteo lineatus*), and Red-headed Woodpecker (*Melanerpes erythrocephalus*).

The Harlequin Duck is designated a species of “Special Concern” in Canada (ONHIC, 2002). It is an occasional winter resident in Fort Erie. The Bald Eagle is designated as “Endangered” in Ontario. Wintering individuals are now regularly observed along the length of the Niagara River. The Red-shouldered Hawk is designated as “Vulnerable” in Ontario and “Special Concern” in Canada. Although this species does not regularly nest along the Niagara Peninsula, it does irregularly winter in low numbers across southern Ontario, including Niagara Region. Red-headed Woodpecker is also designated “Vulnerable” in Ontario and “Special Concern” in Canada. Once considered a common species across southern Ontario, its numbers have declined in recent years.

4.4.1.6 “Birds of the Niagara Frontier Region. An Annotated Check-list”

Although this book was published in 1965 (Beardslee and Mitchell), it remains the only comprehensive source of information on the region’s bird life. Not only does the book provide an annotated checklist of all species know to occur in the Niagara Frontier Region, it also devotes text to describing locations of special ornithological interest. Several of these locations are found along the Lake Erie shoreline. Those mentioned between the Town of Fort Erie and Point Abino include:

- Niagara River shoreline near the Peace Bridge
- Erie Beach
- Waverly Beach
- Crescent Beach
- Rose’s Point
- Windmill Point

- Thunder Bay
- Yacht Harbour
- Crystal Beach

In general, the text suggests that these areas are significant to migrating shorebirds, waterfowl, and landbirds. Little if any discussion relates to the types and significance of breeding habitat.

4.4.1.7 Ontario Herpetofaunal Summary (Atlas)

The following text describing the Ontario Herpetofaunal Summary Atlas was taken from its website at <http://www.mnr.gov.on.ca/MNR/nhic/herps/ohs.html>.

The Ontario Herpetofaunal Atlas (or Summary) (OHS) project began in 1984 as an attempt to consolidate existing information and gather new data on Ontario's amphibians and reptiles. The primary purpose of the OHS project was to produce detailed distribution maps of the province's amphibians and reptiles.

In order to complement records gathered by volunteers, an effort was made to compile historic distribution data on Ontario's amphibians and reptiles. Specimen records from museum and university collections in Ontario (e.g. ROM, NMC, University of Guelph) and elsewhere (e.g. University of Michigan) were entered into the OHS database. In addition, records were extracted from published (e.g. journal articles) and unpublished (e.g. theses, park and natural area inventory reports) literature. OHS volunteers were also asked to submit pre-1984 records as well as current sightings.

Records for the four 10 x 10 km atlas squares that encompass Fort Erie were reviewed. All observations recorded from outside the study area were excluded. In total, 157 records, spanning 22 species were on file for the urban settlement area. Records for two additional species, Pickeral Frog (*Rana palustris*) and Mink Frog (*Rana septentrionalis*) were excluded based on uncertainty regarding their identification. A list of the species on file is presented in Table 4.7.

Table 4.7: Ontario Herpetofaunal Summary (OHS) database records for the Town of Fort Erie Study Area.

	Common Name	Scientific Name	17PT54†	17PT55	17PT64	17PT65
1	Mudpuppy	<i>Necturus maculosus</i>	1			
2	Jefferson Salamander	<i>Ambystoma jeffersonianum</i>				1
3	Northern Dusky Salamander	<i>Desmognathus fuscus fuscus</i>				1
4	Spring Salamander	<i>Gyrinophilus porphyriticus</i>				1
5	Northern Redback Salamander	<i>Plethodon cinereus</i>				1
6	American Toad	<i>Bufo americanus americanus</i>			28	5
7	Fowler's Toad	<i>Bufo woodhousei fowleri</i>			9	1
8	Tetraploid Gray Treefrog	<i>Hyla versicolor</i>			5	
9	Spring Peeper	<i>Pseudacris crucifer crucifer</i>			39	2
10	Western Chorus Frog	<i>Pseudacris triseriata</i>			6	2
11	Bullfrog	<i>Rana catesbeiana</i>			17	2
12	Green Frog	<i>Rana clamitans melanota</i>			11	2
13	Northern Leopard Frog	<i>Rana pipiens</i>			3	3
14	Wood Frog	<i>Rana sylvatica</i>			4	

15	Midland Painted Turtle	<i>Chrysemys picta marginata</i>				1
16	Wood Turtle	<i>Clemmys insculpta</i>				1
17	Blanding's Turtle	<i>Emydoidea blandingi</i>				1
18	Eastern Box Turtle	<i>Terrapene carolina carolina</i>				2
19	Eastern Hognose Snake	<i>Heterodon platyrhinos</i>	1			
20	Milk Snake	<i>Lampropeltis t. triangulum</i>				2
21	Brown Snake	<i>Storeria dekayi</i>				1
22	Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>				4
		TOTAL	2	0	122	33

† Records are organized according to 10 x 10 km Mercator squares. The names of the squares correspond with the 1927 North American Datum (NAD27). The database was current as of February 28, 2003.

Of the 22 species known to have occurred in the urban settlement area 6 species are recognized to be “Species at Risk” in Ontario or Canada (OMNR, 2002; COSEWIC, 2002). Jefferson Salamander (*Abystoma jeffersonianum*) is designated as “Threatened” in Canada. Spring Salamander (*Gyrinophilus porphyriticus*) is designated as “Special Concern” in Canada. Fowler’s Toad (*Bufo woodhousei fowleri*) is designated as “Threatened” in Ontario and Canada. Wood Turtle (*Clemmys insculpta*) is designated “Special Concern” in Canada. Eastern Hognose Snake (*Heterodon platyrhinos*) is designated “Vulnerable in Ontario and “Threatened” in Canada. Lastly, Milk Snake (*Lampropeltis t. triangulum*) is designated “Special Concern” in Canada. Specific location information cannot be released due to the sensitivity of these species. However, this information can be accessed with permission by contacting the Natural Heritage Information Centre in Peterborough, Ontario.

Based on communications with staff at the Natural Heritage Information Centre, it is unlikely that Northern Dusky Salamander (*Desmognathus fuscus fuscus*) and Spring Salamander still occur in the Fort Erie area (M. Oldham, Herpetologist, pers. comm., 2003). In fact, the Spring Salamander has likely been extirpated from Ontario. It was last reported “opposite Buffalo” in 1877. The Northern Dusky Salamander is still present in only a couple places in Ontario, further downstream along the Niagara River.

It was also the opinion of the staff that records associated with Wood Turtle or Box Turtle probably pertained to escaped or released captives. It was thought to be very doubtful that there are currently natural populations of either species.

4.4.1.8 2002 Hooded Warbler and Acadian Flycatcher Survey

Both the Hooded Warbler (*Wilsonia citrina*) and Acadian Flycatcher (*Empidonax vireescens*) are recognized to be “Species at Risk” in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Hooded Warbler is currently designated as “Threatened” whereas the Acadian Flycatcher is currently designated as “Endangered” (COSEWIC 2002). Recovery plans are required for their protection. However, the preparation of an effective recovery plan is dependent on knowing where the species is present. To this end, surveys are conducted across southern Ontario every five years, the latest taking place in 2002.

Bird Studies Canada was contacted for the results of the 2002 survey. They had on record six observations of Hooded Warbler for our study area (D. Badzinski, Volunteer Projects Biologist, pers. comm., 2003). Five of the observations were made by Dougan & Associates staff as part of the 2002 Natural Areas Inventory. This data is contained within the Wildlife Data Summary sheets. The six observation was southeast of Oakhill Forest. The observers name was not on file. No Acadian Flycatchers were on record for the Fort Erie study area.

Neither the Hooded Warbler or Acadian Flycatcher are recognized to be “Species at Risk” in Ontario (OMNR 2002).

4.4.1.9 Miscellaneous wildlife observations

Although the Bert Miller Nature Club and Friends of Fort Erie Creeks were solicited for wildlife information, none was received. The only wildlife observation submitted to us came from Mike Benner, senior policy planner for the Town of Fort Erie. He provided observation data for the Common Map Turtle (*Graptemys geographica*). Map Turtles are designated as species of ‘Special Concern’ by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2002). The observation was made from along the Mann Drain in ‘Dominion Woods’, east of Ridgeway in August 2002.

4.4.1.10 Sources of wildlife information not reviewed

The following sources of information were not reviewed as part of this inventory may provide additional information on Fort Erie’s fauna.

- Ontario Mammal Atlas database (mammal observations)
- The Centre for Biodiversity and Conservation Biology at the Royal Ontario Museum (historic mammal and herpetofaunal records)
- Ontario Nest Records Scheme - administered by the Royal Ontario Museum (bird nest records)
- Second Ontario Breeding Bird Atlas – Specific location information for species observed in atlas squares 17PH64 and 17PH65 could be further reviewed by contacting all individual atlas participants for those squares. Similarly, point count data could be checked by contacting the Ontario Breeding Bird Atlas office.

4.4.2 Significant Wildlife Habitat

4.4.2.1 Seasonal Concentration Areas

Winter deer yards

According to local Ministry of Natural Resources (MNR) staff, Fort Erie woodlots are considered locally significant for deer wintering (A. Yagi, Management Biologist, pers. comm., 2003). This is largely based on the size of the woodlot and not the type of forest habitat. That is to that there are some examples of small pine plantations supporting high numbers of deer, but for the most part significance is associated with forest size.

Based on the analysis of winter deer distribution since the early 1980's, local MNR staff use the following habitat size criteria to describe their relative use in winter.

- Any woodlot \geq 100 ha or woodlot complex \geq 100 ha has a high probability of functioning as winter deer habitat.
- Woodlots (and complexes) between 50 and 99 ha have a moderate probability of having winter deer concentrations
- Woodlots (and complexes) between 20 and 49 ha have a low to moderate wintering deer probability
- Woodlots (and complexes) 5 to 19 ha have a low probability of wintering deer
- Woodlots (and complexes) $<$ 5 ha are not wintering areas for deer.

According to the ESA reports the following ESAs noted White-tailed Deer (*Odocoileus virginianus*): Ridgemount Road Woodlot (FE02), Summer Street Woodlot (FE05), Miller Creek Woodlot (FE06), Thompson Woodlot (FE07), Wavecrest Bush (FE12), and Rose Hill Bush (FE13). In addition, Summer Street Woodlot was supposed to support a large deer population. No abundance estimates were given. Excellent to suitable deer habitat was contained in Miller Creek Woodlot, Thompson Woodlot and Rose Hill Bush. Ridgemount Road Woodlot was thought to provide a link for deer moving to the Summer Street Woodlot. All of the ESA data was current as of 1980.

Colonial bird nesting sites

No colonial bird nesting sites were encountered during the 2002 wildlife inventories. The Ministry of Natural Resources does not specifically track the presence of these features, but incidental observations are recorded in wetland evaluation summary reports, winter deer surveys and former WIA files. The last two sources were not reviewed as part of this inventory. No Colonial Species Report Forms were submitted to the Ontario Breeding Bird Atlas (OBBA) office for the study area (i.e. atlas squares 17PH54, 17PH55, 17PH64, and 17PH65) in 2001 or 2002 (N. Kopysh, OBBA Assistant Coordinator, pers. comm., 2003).

The only colonial bird nesting site for which we have information is the Motor Island heronry, located on the U.S. side of the Niagara River, adjacent to Grand Island, just north of Fort Erie. The island is within 2 km of the Canadian shore. In June 2002, twenty Great Egret (*Casmerodius albus*) nestlings were banded in an attempt to track juvenile dispersal (WNY Dial-a-Bird hotline report for July 11, 2002). In October 2002, two such banded egrets were observed at the Montezuma National Wildlife Refuge, about 160 km east of Buffalo, New York. Given that these birds were found nesting so close to Fort Erie, they are likely regularly found within its borders during the summer months. In fact, three Ontario Breeding Bird Atlas squares in the Fort Erie vicinity recorded Great Egret as a possible breeder. Nevertheless, all four squares may have pertained to breeding birds from the Motor Island heronry. The July 11, 2002 hotline report also stated that Double-crested Cormorant (*Phalacrocorax auritus*) nested successfully on Motor Island. Although it is not mentioned, it is also likely that other colonial breeding bird species nested there in 2002. Great Blue Herons (*Ardea herodias*) and Black-crowned Night-Heron (*Nycticorax nycticorax*) immediately come to mind.

Waterfowl stopover and staging areas

No waterfowl stopover and staging areas were noted during the 2002 wildlife inventories conducted in July. Of course, this is outside of the normal spring and fall migratory periods for this group.

However, large numbers of waterfowl do congregate along the entire length of the Niagara River (including the Fort Erie waterfront), in late fall and winter. In fact, the large congregations of waterfowl, gulls, terns, and other colonial waterbirds such as herons, led to the Niagara River Corridor to be identified as a globally significant “Important Bird Area” (IBA) in 1996. Several species have more than 1% of their entire populations gather together here. For more information on the Niagara River Corridor IBA, please see Appendix H. Recent observations support its significance as a wintering area. Over 200 Tundra Swans were reported just north of Fort Erie in early January 2003 (Western New York Dial-a-Bird hotline). Then on January 12, 2003, the New York State annual waterfowl count was held. Ten thousand Greater Scaup (*Aythya marila*) were estimated inside Donnelly’s Wall off Las Salle Park in Buffalo. This of course is just opposite Fort Erie. Between the ice-boom and the Peace Bridge, 3045 Bufflehead (*Bucephala albeola*) were also counted (Western New York Dial-a-Bird hotline). Later in early February 2003, the Western New York Dial-a-Bird hotline noted that “Large and varied concentrations of waterfowl occur this time at Dunkirk harbour on Lake Erie and at the source of the Niagara River below the ice-boom.” Depending on the severity of the winter (i.e. degree of ice cover) it can be expected that these wintering waterfowl could also be expected to occur along the Fort Erie portion of the Lake Erie shoreline.

There is also one reference to waterfowl in Birds of the Niagara Frontier Region (Beardslee and Mitchell, 1960). It simply states “At Windmill Point flocks of waterfowl are often seen...” This statement seems to suggest that waterfowl regularly occur at this location. If this is true, it is quite likely that adjacent areas are also being used by waterfowl for stopover and staging. No documented information appears to exist that helps define usage by waterfowl (e.g. types of species, numbers involved, timing of usage, or which areas are most attractive to this group) on the Fort Erie section of the Lake Erie shoreline.

Waterfowl nesting areas

No waterfowl nesting areas were discovered during the 2002 wildlife inventories. In fact, very little if any significant waterfowl nesting habitat likely exists within the study area. (i.e. large marshes or areas of wet meadow adjacent to ponds or other small water bodies). Instead, the main habitat features that likely support waterfowl nesting in the Fort Erie area are slough forests for Wood Ducks (*Aix sponsa*). In addition, common species such as Canada Goose (*Branta canadensis*) and Mallard (*Anas platyrhynchos*) nest in Fort Erie. The only waterfowl documented as part of the wetland evaluations were Wood Duck and Mallard.

Migratory stopover areas for shorebirds, landbirds and butterflies

Fort Erie is situated on Lake Erie, a large natural barrier to migrating birds, bats and insects. As a result, stopover habitats along the shore are especially valuable as places to rest, feed and seek shelter. Text taken from pages 33–34 of Birds of the Niagara Frontier Region: An annotated check-list (Beardslee and Mitchell, 1965) supports this view.

The best shorebird area in the territory is along the Canadian Shore of Lake Erie, particularly on the points projecting into the lake. These are also visited at times by large numbers of land birds in both spring and fall. Cardinal are numerous and Blue-gray Gnatcatchers and Orchard Orioles are uncommon but not rare breeding birds.

West of Fort Erie is Erie Beach, where there was formerly an amusement park. It is probable that this is now the best area for cover and variety of habitats in this vicinity; vegetation here ranges from weedy fields to large trees, and provides an attraction to migrant land birds. Along the shore near the old bath house, phalaropes have been seen on more than one occasion. Other shorebirds are quite plentiful both here and farther west at Waverly Beach, Crescent Beach and Rose's Point. The stretch of shore from Jaeger Rocks near old Fort Erie to Waverly Beach is now the best shorebird area close to Buffalo.

At Windmill Point flocks of waterfowl are often seen, and Whimbrels have been frequently observed here during their late May flights. A Wandering Tattler and an American Oystercatcher were seen here and at nearby Thunder Bay in July 1960.

Farther west, beyond Thunder Bay, is Yacht Harbour, a good shorebird area. A Ruff was collected there in the summer of 1957. There is another excellent shorebird location at Crystal Beach, just east of the amusement park. Among the waterfowl most frequently seen off the Canadian shore during the fall migration are Bufflehead, Common Goldeneye, scaups, and scoters.

At Point Abino there is always a chance of seeing some of the more uncommon birds such as Brant, rare gulls, and terns, and shorebirds like Purple Sandpiper and Hudsonian Godwit. Sometimes Whimbrels occur here in large flocks in late May. At Abino Bay Acadian Flycatchers have nested regularly in recent years.

In a personal communication with David Suggs (February 22, 2003), local birdwatcher and compiler of the Western New York "Dial-a-Bird" hotline, he stated that "... the shoreline of Ft Erie is extremely valuable for all types of migrant birds, especially shorebirds." On occasion, the shoreline between Fort Erie and Point Abino is thought to support 500+ individuals at one time during migration (J. Black, Naturalist, pers. comm., 2003).

Aside what was written in Birds of the Niagara Frontier Region, little appears to be on record describing usage by migrating landbirds. In 2000 a study documenting bird migration was conducted at Point Abino (Black, 2000). Results of the study suggest that Point Abino is an important area for migrating songbirds. On occasion, some pretty good 'fallouts' or 'groundings' of birds occurred. Even though Point Abino may concentrate more migrants due to the fact it juts out into Lake Erie, it seems fair to suggest that adjacent lands along the north shore also receive significant numbers. Closer to Fort Erie, there is a woodlot to the east of Waverly Beach which has good numbers of migrants in the fall. Areas along Kraft Road also support fall migrants (J. Black, Naturalist, pers. comm., 2002). One reason the areas along the shoreline may be as attractive to migrants is because properties are generally large in size and because the residents have left so many areas natural or semi natural. In addition many substantial trees are also present. All this combines to provide migrating birds with more opportunities to forage, rest and seek shelter.

Raptor wintering feeding and roosting areas

With the water never freezing, the entire Niagara River functions as Bald Eagle (*Haliaeetus leucocephalus*) wintering habitat. Bald Eagles have been seen hunting waterfowl along the Fort Erie shoreline and inland

up to the QEW area (A. Yagi, Management Biologist, pers. comm., 2003). In fact, several birds were observed in the Fort Erie area as recently as January and February 2003 (see Appendix F). It is quite likely that some of the adjacent woodlots serve as overnight roosting areas. However, no such specific information was available. The closest nesting is at Dunville, Ontario. Bald Eagle is designated as “Endangered” in Ontario (OMNR 2002).

In addition to observations of Bald Eagle, there have been two reports of Red-shouldered Hawk (*Buteo lineatus*) from near the mouth of Black Creek in January and February 2003 (see Appendix F). It is possible that this bird was taking advantage of the open water associated with the mouth of the creek or Niagara River in which to forage. It may have been after animals that were attracted to these features. The Red-shouldered Hawk is designated as “Vulnerable” in Ontario (OMNR 2002) and “Special Concern” in Canada (COSEWIC 2002).

No other documented raptor winter feeding and roosting areas are known to exist. However, communications with local naturalists may provide knowledge of other such sites.

Wild Turkey winter range

Wild turkeys were translocated to the Fort Erie area in the late 1990's. Even though there has only been a few years of reproduction in the area, Ministry of Natural Resources staff can confirm that they stayed in the area and wintered in some of the wooded areas (A. Yagi, Management Biologist, pers. comm., 2003). More detailed winter range information is currently unavailable.

Turkey Vulture summer roosts

According to Ministry of Natural Resources staff, no Turkey Vulture summer roosts are known for the study area (A. Yagi, Management Biologist, pers. comm., 2003). However, on two occasions during the 2002 wildlife inventories, Turkey Vultures were observed other than flying high overhead, as is often the case when this species is seen. In habitat block 151 a Turkey Vulture was observed low over the trees as though it may have been flushed. Then in habitat block 214 a Turkey Vulture was observed sitting in a tree. These are the only reports that may suggest birds were roosting. The regional coordinator for the 2nd Ontario Breeding Bird Atlas was not aware of any Turkey Vulture summer roosts in Fort Erie (J. Black, Naturalist, pers. comm., 2003).

Bat hibernacula/Reptile hibernacula

No bat hibernacula were noted during the 2002 wildlife inventories and no bat hibernacula are on file with the Ministry of Natural Resources (A. Yagi, Management Biologist, pers. comm., 2003).

Evidence of a snake hibernaculum was found in habitat block 420 by Dougan and Associates staff. At least four Eastern Garter Snakes (*Thamnophis sirtalis sirtalis*) were observed together sunning themselves in May 2002. This site is found along the Fort Erie moraine. Glacial deposits of till provide more suitable conditions for such features. Other areas that may harbour snake hibernacula include habitat blocks 419 and 367, both of which are also associated with the Fort Erie moraine, old quarries, as well the embankments of the rail trail and railway line north of the Queen Elizabeth Way. The Ministry of Natural Resources was not aware of any snake hibernacula in Fort Erie (A. Yagi, Management Biologist, pers. comm., 2003). However further a field they did note that Eastern Garter Snake hibernacula have

been verified in Willoughby Marsh. In addition, Black Rat Snake (*Elaphe obsoleta obsoleta*) are suspected in Humberstone Marsh, and Eastern Hognose Snake (*Heterodon platirhinos*) were documented from Pleasant Beach during the summer of 2002. Suspected sighting Eastern Hognose Snake came from near Usshers Creek in the fall of 1999 and Point Abino around 2000.

Bullfrog concentration areas

No Bullfrogs (*Rana catesbeiana*) were observed during the 2002 wildlife inventories. However, several wetland evaluations noted bullfrogs.

4.4.2.2 Rare vegetation communities and specialized habitats for wildlife

Rare Vegetation Communities

In addition to rare plant species, Rare Vegetation Communities often support rare species of invertebrates that depend on such habitats for their survival, and cannot readily move to or find alternative habitats. For this reason, and the fact that no detailed inventories of invertebrates (including insects) were made as part of the 2002 Natural Areas Inventory, rare vegetation communities should be automatically flagged for their potential significance to these lesser groups of 'wildlife'.

Several provincially rare vegetation communities were identified as a result of the field inventories conducted in 2002. According to the categories defined by the Ecological Land Classification System (Lee et al., 1998), these included:

- Sea Rocket Sand Beach Type (S2S3)
- Little Bluestem-Switchgrass-Beachgrass Dune Grassland Type (S2)
- Moist-Fresh Tallgrass Prairie Type (S1)
- Moist-Fresh Black walnut Deciduous Forest Type (S2S3)
- Graminoid Coastal Meadow Marsh Type (S2)
- Wet Bluejoint-Prairie Slough Grass Tallgrass Prairie Meadow Marsh Type (S1)
- Buttonbush Mineral Thicket Swamp Type (S3)
- Southern Arrow-wood Mineral Thicket Swamp Type (S3)
- Swamp White Oak Mineral Deciduous Swamp Type (S2S3)
- Bur Oak Mineral Deciduous Swamp Type (S3)
- Pin Oak Mineral Deciduous Swamp Type (S2S3)

For a more comprehensive discussion please refer to Section 4.3.2.

The following text provides commentary on several specialized habitats for wildlife recognized by the Ontario Ministry of Natural Resources (OMNR, 2000).

Habitat for area-sensitive species

Wildlife species requiring large areas of suitable habitat for their long-term survival are considered 'area-sensitive' (OMNR, 2000). Although this is particularly true of larger mammalian carnivores such as the Gray Wolf (*Canis lupus*), Fisher (*Martes pennanti*), and Lynx (*Lynx canadensis*), it also applies to many breeding bird species. However, because these wildlife groups require large and generally undisturbed areas in which to breed, they are particularly sensitive to habitat loss and habitat fragmentation, an increasingly common phenomenon in and around the built areas of southern Ontario. As a result many

area-sensitive species are experiencing significant population declines. Appendices C and G of the Significant Wildlife Habitat Technical Guide (OMNR, 2000) list area-sensitive wildlife species that occur in Ontario. Table 4.8 lists area-sensitive wildlife species recorded during the 2002 wildlife inventories. The vast majority of the species are forest birds. Only one reptile and three open country species of bird were recorded. However, additional species of open-country area-sensitive bird species would have likely been detected if more emphasis was paid to these habitats during the 2002 wildlife inventories.

Table 4.8: Area-sensitive wildlife species observed in 2002 from the Fort Erie study area.

	Common Name	Scientific Name		Common Name	Scientific Name
	Reptiles & Amphibians			Birds continued	
1	Common Map Turtle	<i>Graptemys geographica</i>	7	Tufted Titmouse	<i>Baeolophus bicolor</i>
			8	White-breasted Nuthatch*	<i>Sitta carolinensis</i>
	Birds		9	Brown Creeper	<i>Certhia americana</i>
1	Northern Harrier	<i>Circus cyaneus</i>	10	Winter Wren	<i>Troglodytes troglodytes</i>
2	Sharp-shinned Hawk	<i>Accipiter striatus</i>	11	Veery	<i>Catharus fuscescens</i>
3	Cooper's Hawk	<i>Accipiter cooperii</i>	12	American Redstart	<i>Setophaga ruticilla</i>
4	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	13	Scarlet Tanager	<i>Piranga olivacea</i>
5	Hairy Woodpecker	<i>Picoides villosus</i>	14	Savannah Sparrow	<i>Passerculus sandwichensis</i>
6	Pileated Woodpecker	<i>Dryocopus pileatus</i>	15	Bobolink	<i>Dolichonyx oryzivorus</i>

* Some authors do not consider the White-breasted Nuthatch to be area sensitive.

Amphibian woodland breeding ponds

Due to the timing of the 2002 wildlife inventories and the dry conditions experienced, the presence of any woodland breeding ponds for use by amphibians could not be confirmed. However, given the fact that most of the forested habitats present within the study area are in fact swamps, many ponds or pools, albeit indiscrete, are likely present and well utilized by both frogs and toads. It should also be noted that the majority of these habitats are ephemeral in nature. Few permanent ponds were noted during the inventories and many of them were not natural in origin.

Although not necessarily wooded, Lake Erie shoreline ponds and pools, (including the rocky pools) are critically important breeding areas for the provincially and federally "Threatened" Fowler's Toad (*Bufo woodhousei fowleri*). Their use was recently confirmed by Ministry of Natural Resources staff in 2001 and 2002 (A. Yagi, Management Biologist, pers. comm., 2003). Apparently, the small ponds in the sandy backshore zones become more important when lake levels rise. A few breeding sites are known to be present within the study area, Erie Beach drawing the most attention of late.

Lastly, the backwater areas of Black Creek, Baker Creek, Miller's Creek, and Frenchman's Creek were all noted by Ministry of Natural Resources staff as potential breeding areas for amphibians (A. Yagi, Management Biologist, pers. comm., 2003) in the Niagara River basin. It also seems plausible that 6 Mile Creek and the Kraft drain are also utilized.

Turtle nesting habitat

No turtle nesting areas were noted during the 2002 wildlife inventories. The Ontario Ministry of Natural Resources was also unaware of such features within the study area. However, the backwater areas in the tributaries along Black Creek, Baker Creek, Miller's Creek, and Frenchman's Creek were though to be possible nesting areas, as were shoreline areas (A. Yagi, Management Biologist, pers. comm., 2003). The

banks of 6 Mile Creek and the Kraft Drain along the Lake Erie shore may also harbour suitable nesting habitat.

Specialized raptor nesting habitat

According to the Significant Wildlife Habitat Technical Guide (OMNR, 2000) several species of raptors require somewhat specialized nesting habitat for their long-term survival. Woodland raptors (members of the genus *Accipiter*), were one of the groups described. Mature trees, large enough to support their nests, full canopy closure and a minimum of trees and shrubs in the understorey are typical requirements. Cooper's Hawk (*Accipiter cooperii*) families were discovered in two such habitat blocks. Due to the sensitivity of the nesting sites, readers are advised to contact the Town of Fort Erie or local office of the Ministry of Natural resources for more detailed location information. Two other accipiters were also observed during the 2002 inventories. However, both were in transit and nesting habitat was never discovered. Both observations were adjacent to wooded habitats close to the Lake Erie shore. One of the observations was of a Sharp-shinned Hawk (*Accipiter striatus*). The other observation couldn't be identified to species but certainly wasn't a Northern Goshawk (*Accipiter gentiles*).

Denning sites for members of the weasel family

No such features or members of this family were noted during the 2002 wildlife inventories. However, several of the wetland inventories reviewed noted the presence of Mink (*Mustela vison*).

4.4.2.3 Habitats for species of conservation concern

Appendix E lists the individual criteria that are used to identify habitats for species of conservation concern. Instead of describing in detail each of the criteria that were fulfilled, the reader is referred to the discussion contained in Section 4.5.4 - Significant Wildlife Species. A Significant Wildlife Species List was developed (see Section 3.4 - Criterion #5) in order to assess the relative significance of one habitat block vs. another, as well as to ensure that significant wildlife species are identified and where possible protected (Appendix C and D).

According to the Significant Wildlife Habitat Technical Guide (OMNR 2000), "the planning authority is urged to protect species of conservation concern and their habitats in the following order of priority:

- globally rare
- nationally rare
- provincially rare
- regionally rare
- locally rare
- species of concern to the planning authority

Appendix C lists all of the significant wildlife species that may occur in the Town of Fort Erie and what scale of significance each species is designated. Those species that were observed or thought to potentially occur in the Town of Fort Erie study area, based on historic information are depicted in bold type.

Forty-seven of the 121 original 'wooded' polygons inventoried in 2002 as part of the Natural Areas Inventory contained locally, regionally, provincially and/or federally significant wildlife species (Table

4.9). This represents almost 39% of all polygons visited. Four additional habitat blocks were also found to have supported significant wildlife species in the past 15 years. This information was obtained from the 2002 Hooded Warbler and Acadian Flycatcher Survey, Ontario Herpetofaunal Summary database and Ontario Ministry of Natural Resources NRVIS database. Therefore, of the 50 polygons/ habitat blocks containing significant wildlife species, 22 contained 2 or more significant wildlife species. The highest number of significant wildlife species on record for a single polygon or habitat block was 8.

Table 4.9: ELC habitat blocks that currently support or may support significant wildlife species*, **

Polygon No.	No. of significant wildlife species***	Polygon No.	No. of significant wildlife species***	Polygon No.	No. of significant wildlife species***
67	1	247	2	604	4
108 ‡§	1	248	1	608 ‡	2
127	2	255	3	623	1
143	1	257	1	627	1
149	1	270	1	638	1
150 •	4	296	1	643	2
151	2	337	5	644 †	1
168	1	338	1	646	1
209	2	359	8	651	1
214	5	363□	3	657	3
215	2	367	2	660	2
219	4	419	2	662	1
222	3	420	1	669	1
224	2	427	1	670	1
225	1	561	1	673	1
237	1	577	1	1004/1005/1006‡§	1
246	1	587	3		

* Significant wildlife species are described in Section 3.4 - Criterion #5.

** All data based on the 2002 Natural Areas Inventory (NAI) unless otherwise indicated

*** Wooded polygons or habitat blocks marked with an † received an additional score of 1 as a result of the fact that three or more significant species were found to be utilizing the polygon for foraging purposes. No evidence of breeding was noted.

• = Information based on 2002 NAI and observation by M. Benner.

‡ = Information based on the Ontario Herpetofaunal Summary database

§ = Information based on the Ontario Ministry of Natural Resources NRVIS database for "Provincially Rare Species"

□ = Information based on the 2002 NAI and 2002 Hooded Warbler and Acadian Flycatcher survey.

4.4.2.4 Animal Movement Corridors

No wildlife corridors were noted during the 2002 wildlife inventories. This is not surprising given the fact that documenting corridor use is a very difficult task. Significant amounts of time, money and expertise would be necessary to track animal movements over an extended period of time. Instead, the identification of wildlife corridors is best achieved through aerial photo interpretation, where these landscape scale features are most obvious. Although speculative, it is reasonable to assume that most natural features that link together core natural habitats would be used by wildlife for dispersal.

Furthermore, the significance of the wildlife corridor (i.e. how effective it is at conveying species from point A to point B) is dependent on a variety of factors, including how many roads bisect it, its overall length and width, and the diversity of habitats present within the corridor. The longer, narrower and more fragmented the corridor, the less effective it is.

4.4.3 Faunal Diversity

One hundred and thirty-three (133) species of wildlife were observed during the 2002 Fort Erie Natural Areas Inventory conducted primarily in July 2002. This includes the following groups:

- 1 species of locust

- 8 species of damselfly and dragonfly
- 25 species of butterfly
- 2 species of moth
- 1 species of crustacean
- 9 species of amphibian and reptile
- 79 species of birds, and
- 8 species of mammal.

With respect to birds, this total should be considered a relatively accurate reflection of the breeding species present in the Town of Fort Erie city limits. However, the other wildlife groups were not as well surveyed. Although the hot and dry conditions experienced during the inventory period likely contributed to the relatively low totals, additional inventory work conducted at other times of the year (and day), and in other habitat types, would yield a more representative list. Appendix H lists all of the individual species of wildlife encountered in 2002, as well as other species documented from other background sources. Most of these supplementary sources of information pertain to records prior to 2002.

A master digital file containing all wildlife observation made during the 2002 Natural Areas Inventory has been created. However, given the sensitive and site-specific information with respect to certain wildlife records, it is recommended that formal requests for this information be directed to the Town of Fort Erie or local office of the Ministry of Natural Resources.

4.4.4 Significant Wildlife Species

Forty-four (44) breeding or resident wildlife species considered significant in the Town of Fort Erie were observed in 2002 as part of the Natural Areas Inventory or Ontario Breeding Bird Atlas. An additional 6 significant wildlife species, although not necessarily seen in 2002, have been reported from the study area over the past 20 years. Since the habitats where these species were reported have not changed too dramatically over the period, it was felt that they quite possibly still occur. This point is important since a few of the records were of specimens. All 50 significant wildlife species can be found in Appendix C. Those species marked in bold are significant.

The 50 significant wildlife species were divided in to following groups:

- 1 species of dragonfly,
- 1 species of butterfly,
- species of amphibian and reptile, and
- 42 species of bird

Additional text to be provided that summarizes which significant wildlife species are involved and their designations.

4.5 Assessment of Locally Significant Natural Areas

The evaluation of biophysical data collected through the course of the Study and from available background sources resulted in the successful application of Natural Areas Designation Criteria to all of the identified habitat blocks. The results of the evaluation are presented in Table 4.10, which lists which criteria were fulfilled for each block. The specific rationale and/or evidence used to justify the application of a particular criterion to a habitat block is provided in the individual Site Summaries in Appendix I. Table 4.11 summarizes the number of habitat blocks fulfilling a particular criteria or range of criteria. Figures 4-1 through 4-7 are a series of maps of the Study Area illustrating how habitat blocks fulfill individual criteria.

A total of 55 habitat blocks fulfilled Criterion 1 (Designated Environmental Areas). Areas that met this criterion overlapped in whole or in part with lands currently designated as PSWs, LSWs, ANSIs, Fill Regulated Areas and Regional ESA's. A total of 96 habitat blocks fulfilled Criterion 2 (Hydrological Importance), a total of 32 habitat blocks fulfilled Criterion 3 (Site Condition), a total of 36 habitat blocks fulfilled Criterion 4 (Habitat Diversity) and a total of 100 habitat blocks fulfilled Criterion 5 (Special Features). Of these 100 blocks, 3 support significant landforms, 93 contain significant plant species, 45 support significant wildlife species and 32 support significant vegetation communities (for definitions of "significant" for each of these categories refer back to Section 3.4 in the Methods). A total of 26 habitat blocks fulfilled Criterion 6 (Representation) and 46 habitat blocks fulfilled Criterion 7 (Socio-Economic Value).

Through a review of Figures 4-1 through 4-7, and summary statistics in Table 4.11, it was possible to evaluate a number of potential scenarios for selection of Locally Significant Natural Areas (LSNAs). **Based on this analysis it was determined that all criterion should be weighted equally, and that habitat blocks fulfilling 3 or more criterion should be used to identify LSNAs.**

The recommended LSNAs capture a total 80 of the 117 habitat blocks (Table 4.11) and cover a total area of 2786 ha. The recommended LSNAs include habitat blocks of variable size and shape, and include blocks from throughout the Study Area, as shown in Map 5. These blocks represent a large component of the total natural and semi-natural areas inventoried (85.25%) but a much smaller proportion of the entire Study Area (37.00%).

Table 4.10: Summary of Natural Areas Designation Criteria fulfilled by Habitat Block.

Habitat Block No.	Size (ha)	Criterion 1 Designated Env. Areas	Criterion 2 Hydrological Importance	Criterion 3 Site Condition	Criterion 4 Habitat Diversity	Criterion 5 Special Features	Criterion 6 Representation	Criterion 7 Social-Economic Value	No. of Criteria Fulfilled
1000	14	NO	YES	NO	NO	YES	NO	NO	2
1001/1002/1003	29	YES	YES	NO	NO	NO	NO	YES	3
1004/1005/1006	130	YES	YES	YES	YES	YES	YES	YES	7
108	3	YES	YES	YES	NO	YES	YES	YES	6
127	6	NO	YES	NO	NO	YES	NO	YES	3
134	4	NO	YES	NO	YES	YES	NO	NO	3
140	4	NO	NO	NO	NO	YES	NO	YES	2
143	10	NO	YES	NO	NO	YES	NO	YES	3
144	5	NO	YES	NO	NO	YES	NO	NO	2
147	6	NO	NO	YES	NO	YES	NO	YES	3
149	19	NO	YES	NO	NO	YES	NO	YES	3
15/38	36	YES	YES	NO	NO	YES	NO	NO	3
150	29	NO	YES	YES	NO	YES	YES	YES	5
151	15	NO	YES	NO	NO	YES	NO	YES	3
157	6	NO	YES	NO	NO	YES	NO	YES	3
168	17	YES	YES	NO	YES	YES	NO	YES	5
169	6	YES	YES	NO	YES	YES	NO	YES	5
171	12	NO	YES	NO	NO	YES	NO	YES	3
172/209/215	55	YES	YES	YES	YES	YES	YES	YES	7
176/184/187/212	36	YES	YES	YES	YES	YES	YES	YES	7
191	3	NO	NO	NO	NO	YES	NO	YES	2
192	3	NO	NO	NO	NO	YES	NO	YES	2
2	25	NO	YES	NO	NO	YES	NO	NO	2
214	28	NO	YES	NO	YES	YES	NO	YES	4
219	24	NO	YES	NO	YES	YES	NO	YES	4
221/222	41	NO	YES	NO	NO	YES	YES	YES	4
223	4	NO	NO	NO	NO	NO	NO	YES	1
224	38	NO	YES	NO	NO	YES	YES	YES	4
225/226	25	NO	YES	NO	NO	YES	NO	YES	3
237	36	YES	YES	YES	YES	YES	NO	YES	6
246	3	NO	YES	NO	NO	YES	NO	YES	3
247	4	NO	YES	NO	NO	YES	NO	YES	3
248/353	47	YES	YES	NO	NO	YES	NO	NO	3
251	9	YES	YES	NO	YES	YES	NO	NO	4
255	21	YES	YES	NO	NO	YES	NO	NO	3
256	4	NO	YES	NO	NO	NO	NO	NO	1
257	16	NO	YES	NO	YES	YES	NO	YES	4
258	8	YES	YES	NO	NO	YES	NO	NO	3

Table 4.10 cont'd: Summary of Natural Areas Designation Criteria fulfilled by Habitat Block.

Habitat Block No.	Size (ha)	Criterion 1 Designated Env. Areas	Criterion 2 Hydrological Importance	Criterion 3 Site Condition	Criterion 4 Habitat Diversity	Criterion 5 Special Features	Criterion 6 Representation	Criterion 7 Social-Economic Value	No. of Criteria Fulfilled
261	4	YES	NO	NO	NO	YES	NO	NO	2
265	4	YES	YES	NO	NO	YES	NO	NO	3
268	9	YES	YES	YES	NO	YES	NO	NO	4
270	3	NO	YES	NO	NO	YES	NO	YES	3
278	9	NO	YES	NO	YES	YES	NO	NO	3
282	5	NO	YES	NO	NO	YES	NO	NO	2
285	6	NO	YES	NO	NO	NO	NO	NO	1
286	9	NO	YES	NO	NO	YES	NO	NO	2
287	7	NO	YES	NO	NO	YES	NO	NO	2
288	19	NO	YES	NO	NO	YES	NO	NO	2
290	25	YES	YES	NO	YES	YES	YES	NO	5
293/741	51	YES	YES	NO	YES	YES	NO	NO	4
294	111	YES	YES	YES	YES	YES	YES	NO	6
295/296	130	YES	YES	YES	YES	YES	YES	NO	6
297	5	YES	YES	NO	NO	YES	NO	NO	3
299	5	NO	YES	NO	NO	NO	NO	NO	1
301	10	NO	NO	NO	NO	NO	NO	NO	0
302	7	NO	NO	NO	NO	NO	NO	NO	0
309	16	NO	YES	NO	NO	NO	NO	NO	1
311	38	NO	NO	YES	YES	YES	YES	YES	5
313	57	YES	YES	YES	NO	YES	YES	NO	5
321	6	NO	NO	NO	NO	NO	NO	NO	0
336	43	NO	YES	NO	NO	YES	NO	NO	2
337	23	NO	NO	NO	NO	YES	YES	YES	3
338	5	NO	YES	NO	NO	YES	NO	NO	2
35/427	54	YES	NO	NO	YES	YES	NO	YES	4
358/359	111	YES	YES	YES	YES	YES	YES	YES	7
360	6	NO	YES	YES	NO	YES	NO	NO	3
362	12	NO	YES	NO	NO	YES	NO	YES	3
363	73	YES	YES	YES	YES	YES	YES	YES	7
367	27	NO	YES	YES	YES	YES	NO	NO	4
395	2	NO	NO	NO	NO	YES	NO	YES	2
403	11	NO	NO	NO	YES	YES	NO	NO	2
412	3	NO	YES	NO	NO	YES	NO	NO	2
414	70	YES	YES	NO	YES	YES	NO	NO	4
419	22	NO	YES	YES	YES	YES	NO	NO	4
420	33	NO	YES	YES	NO	YES	YES	NO	4
421/422	12	YES	NO	NO	NO	YES	NO	NO	2

Table 4.10 cont'd: Summary of Natural Areas Designation Criteria fulfilled by Habitat Block.

Habitat Block No.	Size (ha)	Criterion 1 Designated Env. Areas	Criterion 2 Hydrological Importance	Criterion 3 Site Condition	Criterion 4 Habitat Diversity	Criterion 5 Special Features	Criterion 6 Representation	Criterion 7 Social-Economic Value	No. of Criteria Fulfilled
500/711	24	YES	YES	NO	NO	YES	NO	NO	3
503	9	YES	YES	NO	NO	YES	NO	NO	3
512	10	NO	YES	NO	NO	NO	NO	NO	1
516	13	YES	YES	YES	YES	YES	YES	NO	6
518	21	YES	YES	NO	NO	YES	NO	NO	3
561	17	NO	YES	YES	YES	YES	NO	YES	5
562/581	13	YES	YES	NO	YES	NO	NO	NO	3
577	44	YES	NO	NO	NO	YES	NO	NO	2
587	26	YES	YES	NO	YES	YES	YES	NO	5
587e	4	YES	YES	NO	NO	YES	NO	NO	3
588	16	YES	YES	YES	NO	YES	NO	NO	4
589	155	YES	YES	YES	YES	YES	YES	YES	7
593	7	YES	YES	NO	NO	YES	NO	NO	3
596	12	YES	YES	NO	NO	YES	NO	NO	3
603	36	NO	YES	NO	NO	NO	NO	NO	1
604/614/615	118	YES	YES	YES	YES	YES	YES	YES	7
605	19	YES	NO	NO	NO	NO	NO	NO	1
607	53	NO	NO	NO	NO	NO	NO	YES	1
608/634	144	YES	YES	YES	NO	YES	YES	YES	6
623/627	36	YES	YES	YES	YES	YES	NO	NO	5
626	5	NO	YES	NO	NO	YES	NO	NO	2
629	4	NO	NO	NO	NO	NO	NO	NO	0
630	4	YES	YES	NO	NO	YES	NO	NO	3
638a	22	NO	YES	NO	NO	NO	NO	NO	1
638b	23	YES	YES	NO	NO	YES	NO	YES	4
642	18	YES	YES	NO	NO	YES	NO	YES	4
643	130	YES	YES	YES	NO	YES	YES	YES	6
644/740	17	NO	YES	NO	NO	YES	NO	NO	2
646	46	YES	YES	YES	YES	YES	NO	NO	5
651	37	YES	YES	YES	NO	YES	NO	YES	5
657/662	53	YES	YES	YES	YES	YES	YES	YES	7
660/669	54	YES	YES	NO	YES	YES	NO	YES	5
662e	4	NO	YES	NO	NO	YES	NO	NO	2
668	33	NO	NO	NO	YES	YES	NO	NO	2
67	20	NO	YES	YES	NO	YES	YES	NO	4
670/685	28	YES	YES	NO	YES	YES	NO	NO	4
672/685	102	YES	YES	YES	NO	YES	YES	NO	5
673	40	YES	YES	NO	NO	YES	NO	YES	4

Table 4.10 cont'd: List of Habitat Blocks and Natural Areas Designation Criteria fulfilled.

Habitat Block No.	Size (ha)	Criterion 1 Designated Env. Areas	Criterion 2 Hydrological Importance	Criterion 3 Site Condition	Criterion 4 Habitat Diversity	Criterion 5 Special Features	Criterion 6 Representation	Criterion 7 Social-Economic Value	No. of Criteria Fulfilled
68	3	NO	NO	NO	NO	NO	NO	NO	0
70	6	YES	YES	NO	NO	YES	NO	NO	3
704	18	NO	YES	YES	NO	YES	YES	NO	4
TOTALS	3268	55	96	32	36	100	26	48	

Table 4.11: Summary of Habitat Blocks fulfilling Natural Areas Designation Criteria.

No. of Criteria	Blocks Fulfilling	Criteria	Blocks Fulfilling
none	5	0 or more	117
1	10	1 or more	112
2	22	2 or more	102
3	32	3 or more	80
4	20	4 or more	48
5	13	5 or more	28
6	7	6 or more	15
7	8	7	7

Note: Bolded selections indicate recommendations for Locally Significant Natural Areas.

4.6 Conceptual Natural Heritage System

Significant amounts of habitat loss and habitat fragmentation have occurred in Southern Ontario, including the lands contained in the study area, to the extent that movement of some wildlife and many native plant species has become restricted. Fortunately, the Town of Fort Erie supports a higher percentage of semi-natural and natural cover than most urban areas and fragmentation impacts are less pronounced. As a result, the Town has a unique opportunity to protect and preserve its remaining natural heritage. It should also be recognized that most of these areas are in an advanced state of recovery from past clearing, and that they will only improve over time.

Our current knowledge of how to design sustainable natural heritage systems in urbanizing areas dictates that an "ideal" system includes blocks of natural habitat linked together by corridors of natural or semi-natural habitat (Heagy 1995; Geomatics International 1996). Buffers are typically required to offset impacts from adjacent and incompatible land uses. Buffers can be variable in width depending on the sensitivity of the natural area and the likelihood of impacts from the adjacent land use. Typical buffer widths range from 30-60 metres. Linkages vary in size (width and length) as well as quality (species diversity and structure). For example, linkages can range from very narrow and species poor hedgerows of varying maturity, to larger and wider amalgamations of vegetation communities. Wider linkages are often

referred to as corridors. They are usually more diverse botanically and contain a variety of habitat types. Corridors often follow physiographic features (i.e. landforms) such as valleylands, moraines, eskers etc.

Linkages and corridors help reduce the negative impacts of habitat fragmentation by increasing connectivity. Habitat fragmentation occurs when a large, continuous tract of vegetation is broken into progressively smaller remnants by land uses that are incompatible or hostile to their inhabitants. In general, the wider, shorter and more botanically diverse the linkage or corridor, the better it will convey wildlife through the landscape.

The conceptual Natural Heritage System is shown on Map 6 and is comprised of Core Areas and conceptual linkages. Core Areas are comprised of those habitat blocks (i.e., 80 of them) that met 3 or more of the 7 Natural Areas Designation Criteria. Core Areas represent a total of 2786 ha; 85.25% of the total natural and semi-natural areas inventoried but only 37.00% of the Study Area. All Core Areas are recommended for designation as Locally Significant Natural Areas (LSNAs).

Linkages were selected by identifying the gaps that exist between the Core Areas, ESAs, and other natural habitats. Wherever possible, linkages follow watercourses or the shoreline since these are, in many cases, already associated with some type of natural or semi-natural cover, and are routes that many types of wildlife will tend to utilize. Other linkages were established along utility corridors and rail lines, through "other" natural areas (i.e., those not recommended for Core Area/LSNA status), and agricultural areas. In places, many of the Core Areas are already in close proximity or adjacent to each other and form natural connections so creating linkages between them was not necessary. However, in places where the linkages pass through gaps devoid of natural vegetation, some restoration and/or enhancement may be necessary to make the connection viable. This will be even more important when the surrounding environment becomes urbanized, that is when previously open habitats that also provided opportunities for movement, are transformed and incorporated into the urban fabric.

Linkages were extended throughout the Town, since wildlife do not recognize political boundaries, and since the Town's Agricultural Areas are eventually going to be included in the final Natural Heritage System. Almost all the Town's Regional ESAs, both within and outside of the Study Area, have been connected either by virtue of distinct Core Areas abutting each other, or by the recommended linkages.

Lastly, linkages were determined without regard for land ownership or existing zoning and as a result should be considered preliminary. Specific routing will need to be refined through site specific work in tandem with proposed planning options. Nonetheless, the importance of maintaining linkages between habitat blocks as urbanization proceeds in Fort Erie should not be forgotten, and so the Natural Heritage System developed as part of the new Official Plan should where possible (a) protect series of habitat blocks that are adjacent to each other, and (b) ensure that habitat blocks selected for protection are connected by natural or semi-natural linkages.

5 Recommendations

The recommendations of this study are as follows:

1. It is recommended that the approach adopted by this study be adopted as the basis for designating Locally Significant Natural Areas (LSNAs) within the Town of Ft. Erie. This is particularly relevant to the parallel NAI study which is presently being conducted for the Town's Agricultural Areas by the Bert Miller Nature Club (BMNC).
2. It is recommended that all of the "Habitat Blocks" identified by this study be recognized as "Natural Areas" within the Town Official Plan.
3. It is recommend that the "Conceptual Natural Heritage System" identified by this study be adopted as the template for developing a Natural Heritage or Greenlands System for the Town Official Plan.
4. It is recommended that Locally Significant Natural Areas (LSNAs) identified by this study be recognized as "Core Areas" of the Town's Natural Heritage or Greenlands System.
5. It is recommended that Locally Significant Natural Areas (LSNAs) are protected and enhanced through the implementation of appropriate policies and land use designations within the Town Official Plan.
6. It is recommended that the Town Official Plan incorporate all of the appropriate policies, reflecting Federal, Provincial and Regional legislation, policies and guidelines related to protection of natural heritage resources within a Natural Heritage or Greenlands System.
7. It is recommended that the further detailed studies of identified LSNA's be conducted as part of Subwatershed Studies for the purposed of confirming the Natural Areas Designation Criteria and refining boundaries prior to preparation of Secondary Plans or Neighbourhood Plans.
8. It is recommended that development not be permitted within LSNAs unless it can be clearly demonstrated by an Environmental Impacts Assessment (EIA), that the development will not adversely impact any of the designation criteria for the area; or impair the features functional role in the Natural Heritage or Greenlands System.
9. It is recommended that the Town Official Plan include policies which encourage the restoration, rehabilitation or enhancement of 'Natural Areas" and the Natural Heritage or Greenlands System.

10. It is recommended that the Town Official Plan include policies for encouraging stewardship of “Natural Areas”.
11. It is recommended that the Town Official Plan include a Tree By-law which complements the existing Regional Municipality of Niagara Tree Conservation By-law (No. 8541-960) and considers local scale urban tree conservation issues.
12. It is recommended that the Town Official Plan include general guidelines for the preparation of EIA studies, and that Secondary or Neighbourhood Plans include more detailed and site-specific Terms of Reference for EIA’s.
13. It is recommended that the findings of the current study eventually be integrated with the findings of the NAI for the Towns Agricultural Area currently being conducted by the Bert Miller Nature Club.
14. It is recommended that the information gaps identified by this study be filled through further inventories within the next 2-3 years. Key areas identified for additional work include:
 - a. Linkage analysis
 - b. Fish habitat and aquatic resources assessment;
 - c. Full season mammal surveys
 - d. Seasonal surveys of reptile and amphibians;
 - e. Full season vegetation surveys
15. It is recommended that a Natural Areas Inventory “Update” be conducted at least once every 10 years to ensure data uniformity and accuracy.
16. It is recommended that the Town become the official administrator of the Natural Areas Inventory Database

6 Concluding Remarks

This Natural Areas Inventory study represents a significant achievement for the Town of Fort Erie. The information collected through the current study allows the Town to take stock of its natural heritage resources and begin to better understand their value and significance in an urbanizing landscape. This type of information is critical for long-range planning and management the Town's Natural Areas. The current study identifies all of the semi-natural and natural areas in the Town's Settlement Areas, as well as the biological resources they support. Each natural area was evaluated to identify Locally Significant Natural Areas which form the framework for a proposed Natural Heritage System that represents a locally appropriate template for development of the Town's Natural Heritage or Greenland System.

The proposed Conceptual Natural Heritage System includes a large proportion of the Town's remaining natural areas. It specifically recognizes the ecological, social and economic value of these resources at the local level, but also respects these values at the Federal, Provincial and Regional levels through the recognition of existing policies and legislation. The "Core Area" components of the Natural Heritage System comprise approximately 37% of the Study Area. This level of semi-natural/natural cover is considered satisfactory for the maintenance of basic ecological functions within an urban environment and is within the range of current targets (30 - 40%).

Environment Canada (1998) provides guidelines to be considered as "minimum ecological requirements" using "pre-contact" levels as a reference. These guidelines, based on review of variety of studies, recommend the following:

- coverage for wetlands should be at least 10% of the watershed or pre-contact levels, whichever is greater.
- streams should have 75% of their length naturally vegetated and should have at least a 30 m vegetated buffer on both sides
- forest cover should be at least 30% of a watershed and include at least one 200 ha forest patch that is at least 500 m wide
- corridors designed to facilitate species movement should be at least 100 m wide, or at least 500 m for specialist species
- overall cover should be representative of the diversity and age structure found in that ecoregion.

It is also important to remember that protection of natural heritage features in an urbanizing area also provides economic and social benefits to the town and its residents, including improvements in air quality and reduction in stormwater runoff. For example, studies by forestry scientists in the United States concluded that maintaining an average tree cover of 40% in urban areas would significantly improve the environment in the areas of stormwater management and air quality and save municipalities millions of dollars in related infrastructure costs (American Forests 1999).

The Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement (OMNR 1999) suggests that where woodland cover is between about 15% and 30% for a municipality, woodlands 40 ha in size or larger should be considered for significance. In our Study Area, the 9 habitat blocks containing forested areas greater than 40 ha have all been recommended for LSNA status. Recognizing these 9

blocks as locally significant is certainly a good start since planning for fewer larger natural areas of contiguous habitat is preferable to many smaller areas, if required to choose (Marsh 1997). However, protecting these units alone excludes a number of equally significant natural areas such as the Lake Erie shoreline which is home to many rare and threatened species, including many species which have specialized habitat needs such as shorebirds and migrants.

The findings of this Study, the Town of Fort Erie's first Natural Areas Inventory (NAI), document the unique range and extent of natural habitats in the Town's Settlement Areas. However, ultimately the Town will have to determine whether or not it wants to protect some or all of the habitat blocks recommended for LSNA status in its New Official Plan. Obviously from a natural heritage perspective, protection of all the habitat blocks recommended for LSNA status would be ideal since this would preserve the greatest diversity of habitats and species.

Many challenges and pressures face municipalities trying to integrate Provincial and Regional natural heritage policy directives into their Official Plans. This Study serves as a starting point for this process and provides the background, data and recommendations needed to assist the Town of Fort Erie in developing an ecologically sound and forward-thinking Natural Heritage System that will benefit its current residents and generations to come.

7 Glossary of Acronyms

ANSI: Area of Scientific Interest
BMNC: Bert Miller Nature Club
COSEWIC: Committee on the Status of Endangered Wildlife in Canada
COSSARO: Committee on the Status of Species at Risk in Ontario
ELC: Ecological Land Classification
ESA: Environmentally Sensitive Area
GIS: Geographic Information System
LANDSAT: Land Remote Sensing Satellite
LSNA: Locally Significant Natural Area
LSW: Locally Significant Woodland
NADC: Natural Areas Designation Criteria
NAI: Natural Areas Inventory
NHIC: Natural Heritage Information Centre
NPCA: Niagara Peninsula Conservation Authority
NRVIS: Natural Resources Values Information System
OBBA: Ontario Breeding Bird Atlas
OHS: Ontario Herpetofaunal Summary (Atlas)
OMNR: Ontario Ministry of Natural Resources
PSW: Provincially Significant Wetland

8 References

- Allen, G.M., P.F.J. Eagles and S.D. Price Eds. 1990. Conserving Carolinian Canada: Conservation Biology in the Deciduous Forest Region. University of Waterloo Press, 346 p.
- American Forests. 1999. Regional Ecosystem Analysis Canton-Akron Metropolitan Area: Calculating the Value of Nature. Final Report 2/9/99, sponsored by the USDA Forest Service, 8 p.
- Archeological Services Inc. and Cuesta Systems Inc. 2003. The Archeological Master Plan of the Town of Fort Erie Planning Report, Draft, February 2003, 81 p.
- Austen, J.W. and M.S.W. Bradstreet. 1996. Report on the Effects of Forest Fragmentation on Woodland Biodiversity in southern Ontario and Recommendations for Woodland Conservation. Prepared for the Laidlaw Foundation, National Fish and Wildlife Foundation, Ontario Heritage Foundation, Ontario hydro, Ontario Ministry of Natural Resources, and The Richard Ivey Foundation, November 1996.
- Beardsee, C.S. and H.D. Mitchell. 1965. Birds of the Niagara Frontier Region. An Annotated Checklist. Bulletin of the Buffalo Society of Natural Sciences, Vol. 22.
- Black, J.E. 2000. A Study of the Nocturnal Spring Migration of Birds at Point Abino Based on Radar and Ground Observations. Brock Physics Report, PR-2000-6. Brock University.
- Brady, R.F., Ed. 1980. Regional Municipality of Niagara Environmentally Sensitive Areas. Department of Geography, Brock University, St. Catharines, Ontario, 392 p.
- Brown, D.M., G.A. McKay, and L.J. Chapman. 1968. The Climate of Southern Ontario. Climatological Studies No.5, Meteorological Branch, Ontario Department of Transport.
- Cadman, M.D., P.I.F. Eagles and F.M. Helleiner (Eds.). 1987. Atlas of the Breeding Birds of Ontario. University of Waterloo Press, Waterloo, Ontario. 617pp.
- Chapman, L.J. and D. F. Putnam. 1984. The Physiography of Southern Ontario. 3rd Edition. Ontario Geological Survey, Special Volume 2, 270 p. Accompanied by Map P.2715 (coloured), scale 1:600,000.
- COSEWIC, 2002. Canadian Species at Risk, May 2002. Committee on the Status of Endangered Wildlife in Canada. http://www.cosewic.gc.ca/pdf/English/Species_at_risk_e.pdf
- Couturier, A. 1999. Conservation Priorities for the Birds of Southern Ontario. 14pp + 38pp Technical Appendices, and Priority Species Lists.
- Don Watershed Regeneration Council and the Metropolitan Toronto and Region Conservation Authority. 1997. Turning the Corner: The Don Watershed Report Card, May 1997.
- Don Watershed Regeneration Council and the Metropolitan Toronto and Region Conservation Authority. 1999. The Don Watershed Report Card.

- Environment Canada – Canadian Wildlife Service, Ontario Ministry of Natural Resources, and Ontario Ministry of Environment. 1998. A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Canada-Ontario Remedial Action Plan Steering Committee, March 1998, 76 pp.
- Forman, R.T.T. 1995. Land Mosaics: The Ecology of Landscapes and Regions. Cambridge University Press. Cambridge, Massachusetts. 632 pp.
- Gartshore, M.E., D.A. Sutherland, and J.D. McCracken. 1987. The Natural Areas Inventory of the Regional Municipality of Haldimand-Norfolk 1985-1986. Volume 1: Natural Areas, The Norfolk Field Naturalists, Simcoe, Ontario. 111 pp. + appendices.
- Geomatics International Inc. 1996. City of Mississauga Natural Areas Survey, Final Report, Volumes 1 and 2. Prepared for Planning and Building Department, City of Mississauga, September 1996.
- Heagy, A.E. 1995. Hamilton-Wentworth Natural Areas Inventory, Volume I. Hamilton Naturalists' Club.
- Holland-Hibbert, S. 1996. Evaluation of Upland Habitat in the Niagara River Area of Concern. 31 pp.
- Kingston, M.S. and E.W. Presant. 1989. The Soils of the Regional Municipality of Niagara. Volume 1. Report No. 60 of the Ontario Institute of Pedology. Queen's Printer for Ontario, 138 p.
- Landscapes. 1997. Fort Erie Heritage Master Plan Phase One Report, pp. 4-14 to 4-36.
- Larson, B.M., J.L. Riley., E.A. Snell and H.G. Godschalk. 1999. The Woodland Heritage of Southern Ontario: A Study of Ecological Change, Distribution and Significance. Federation of Ontario Naturalists., 262 pp.
- Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guid FG-02.
- Limnoterra Ltd. and A. Yagi. 1994. Frenchman's Creek Aquatic Assessment, A Fluvial Geomorphic and Biophysical Overview. Internal Draft, September 1994.
- Macdonald, I.D. 1990. A Biological Inventory and Evaluation of the Point Abino Peninsula Area of Natural and Scientific Interest. Parks and Recreation Areas Section, Ontario Ministry of Natural Resources, Central Region, Aurora, Ontario 235 pp.
- Marsh, W. M. 1997. Landscape Planning: Environmental Applications, 3rd Edition. John Wiley and Sons Inc., Toronto, 434 p.
- NHIC 2002. Natural Heritage Information Centre, Ontario Ministry of Natural Resources.
<http://www.mnr.gov.on.ca/MNR/nhic/nhic.cfm>
- Oldham, M.J. 1999. Natural Heritage Resources of Ontario: Rare Vascular Plants. 3rd Edition. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario.
<http://www.mnr.gov.on.ca/MNR/nhic/species/rarevascular.pdf>

Ontario Institute of Pedology. 1989. Generalized Soil Map. Regional Municipality of Niagara, Ontario. Report No. 60. Scale 1:100,000.

Ontario Ministry of Natural Resources (OMNR). 1993. Ontario Wetland Evaluation System: southern manual. Revised 1994. NEST Technical manual TM-002. 173 pp.

Ontario Ministry of Natural Resources (OMNR). 1999. Natural Heritage Reference Manual for Policy 2.3 of the Provincial Policy Statement. June, 1999. 127 pp.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. 151 pp.

Ontario Ministry of Natural Resources (OMNR). 2002. Vulnerable, Threatened, Endangered, Extirpated or Extinct Species of Ontario. List issued September 27, 2002.

Plourde, S.A., E.L. Szepesi, J.L. Riley, M.J. Oldham and C. Campbell. 1989. Distribution and Status of the Herpetofauna of Central Region, Ontario Ministry of Natural Resources. Parks and Recreational Areas Section, OMNR, Open File Ecological Report SR8903, Central Region, Richmond Hill, Ontario. 27pp.

Riley, J.L. 1989. Distribution and Status of the Vascular Plants of Central Region, Ontario Ministry of Natural Resources. Parks and Recreational Areas Section, OMNR, Open File Ecological Report SR8902, Central Region, Richmond Hill, Ontario.

Snell, E. et al. 1998. Wetland Extent Guidelines: Application to the Niagara River Area of Concern.

Thomas, B., Knoll, K., Santarella, N., Berains, M., Littleton, J., Litke, H., Stuve, D., Moraal, G., Smith, E., Hudson, S., Kwincinski, J., Phillips, B., Harden, C. 1985, 1986, 1987, 1988. OMNR-Niagara Wetland Evaluation Records, Beaver Creek, Black Creek, Frenchman's Creek, Miller's Creek, Point Abino Wetlands, Fort Erie - 1A, 1B, 1C, 02, 3A, 3B, 04, 05, 06, 07 (Six Mile Creek Headwaters), 08, 09, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 23, 25, 30, 31, 32, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50, 51.

Toronto and Region Conservation Authority . 1998. State of the Watershed Report: Etobicoke and Mimico Creek Watersheds, December 1998.

Town of Fort Erie. 2002. Natural Areas Inventory Request for Proposals. File No. CPDS-03-2002.

Yaki, G.J. 1970. Plants of the Niagara Peninsula. Niagara Falls Nature Club. Special Publication No.2. 42 pp.

Zander, R.A. and G.J. Pierce. 1979. Flora of the Niagara Frontier Region, second supplement and checklist. Bulletin of the Buffalo Society of Natural Sciences 16 (supplement 2).

Zenkert, C.A. 1934. The Flora of the Niagara Frontier Region. Ferns and Flowering Plants of Buffalo, N.Y., and Vicinity. Bulletin of the Buffalo Society of Natural Sciences 16. Buffalo, New York. 328 pp.

Zenkert, C.A. and R.A. Zander. 1975. Flora of the Niagara Frontier Region, Supplement. Bulletin of the Buffalo Society Natural Sciences 16 (supplement 1).

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