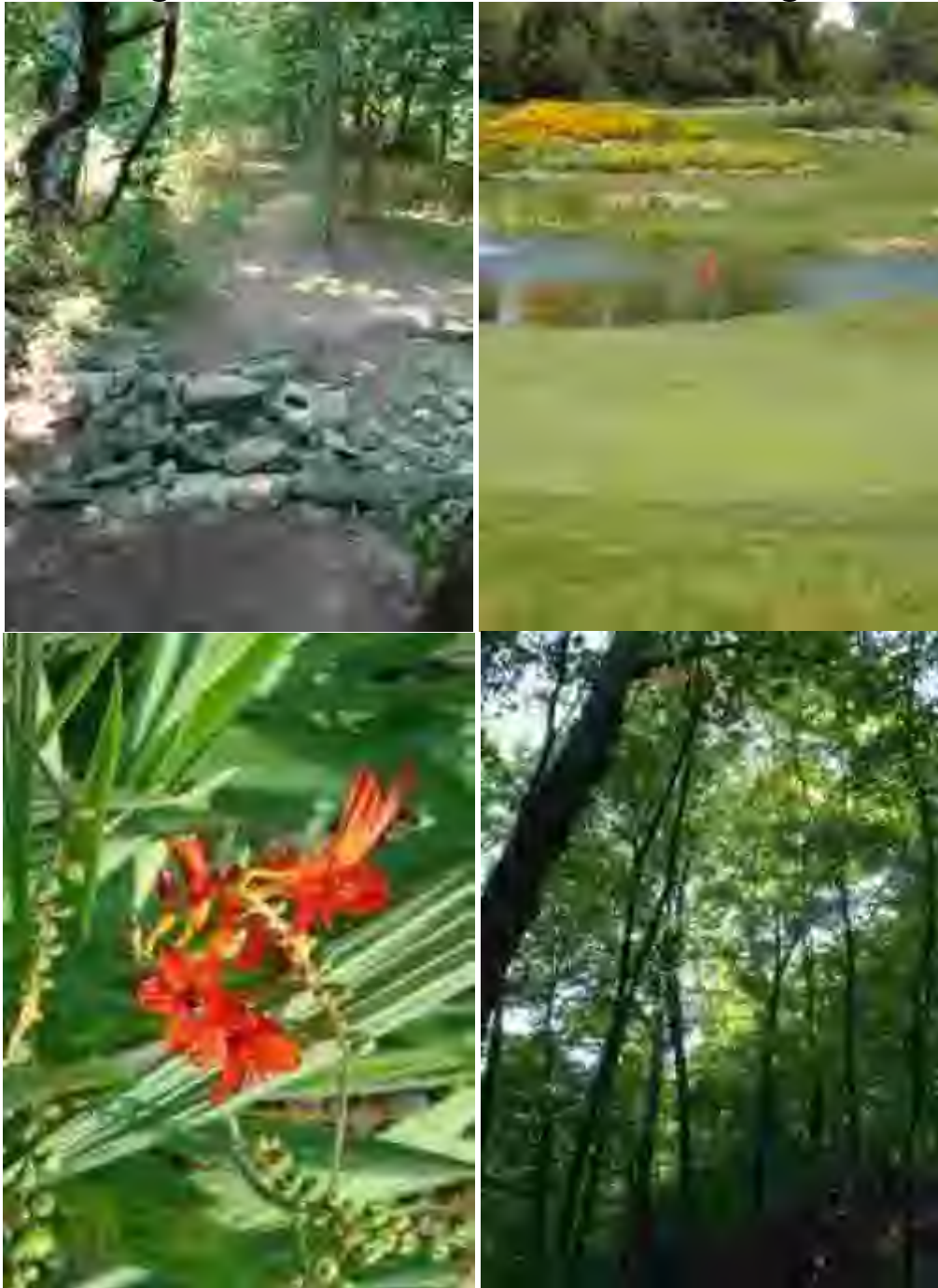


# DRAFT Environmental Land Management Plan for the Niagara Parks Commission: Stage 1



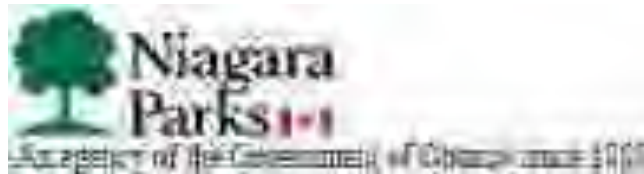
Prepared By:

Katelyn Vaughan  
John Middleton  
David Brown

Brock University  
Tourism and Environment  
St. Catharines, ON L2S 3A1

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Prepared For:



This Document has been reviewed by a steering committee but is presented in DRAFT form and will remain in draft until the approved by the Niagara Parks Commissioners.

The Niagara Parks Commission wishes to thank those who spent time reviewing its contents and providing us with feedback. A special thanks to:

Susan Cooper, Niagara Escarpment Advisor, Land Uses and Environmental Planning, Ministry of Natural Resources

Anne Marie Laurence, Ecological Monitoring Specialist, Niagara Escarpment Commission

Suzanne McInnes, Watershed Planning Coordinator, Niagara Peninsula Conservation Authority

Alan Gummo, Associate Director, Comprehensive Community Planning, Regional Municipality of Niagara

<b>1. INTRODUCTION &amp; PURPOSE</b> .....	<b>5</b>
<i>Figure 1.1: Species Hotspots Carolinian Life Zone</i> .....	6
<i>Figure 1.2 Overview of NPC Lands</i> .....	7
<b>2. ECOLOGICAL AND LAND DESIGNATIONS</b> .....	<b>8</b>
2.1 NIAGARA PARKS .....	8
2.2 NPC ENVIRONMENTALLY SENSITIVE AREAS .....	8
2.3 NATURAL HERITAGE SYSTEM .....	9
<i>Table 2.1 Relevant Ecological and Land Use Designations</i> .....	10
<i>Figure 2.1: NPC Environmentally Sensitive Areas, north section.</i> .....	16
<i>Figure 2.2: NPC Environmentally Sensitive Areas, central section.</i> .....	17
<i>Figure 2.3: NPC Environmentally Sensitive Areas, south section.</i> .....	18
<i>Table 2.2: Natural Heritage Component of the Provincial Policy Statement (OMAH, 2005).</i> .....	19
2.4 AREA OF NATURAL & SCIENTIFIC INTEREST (ANSI) .....	19
<i>Figure 2.4: NPC designated natural areas and features.</i> .....	20
2.5 WETLANDS .....	21
<i>Figure 2.5: Wetlands.</i> .....	22
2.6 NIAGARA ESCARPMENT PLAN (NEP) & UNESCO WORLD BIOSPHERE RESERVE .....	23
<i>Figure 2.6 Niagara Escarpment Parks and Open Space System (NEPOSS) Boundaries on NPC Lands</i> .....	25
2.7 GREENBELT.....	25
2.8 PLACES TO GROW ACT .....	25
2.9 NIAGARA RIVER (ONTARIO) AREA OF CONCERN.....	26
2.10 IMPORTANT BIRD AREA (IBA) .....	27
2.11 SPECIES AT RISK.....	27
2.12 CAROLINIAN LIFE ZONE.....	28
2.13 OLD GROWTH FOREST .....	28
2.15 RECOMMENDATION .....	29
<i>Table 2.3 Definitions of Protected Areas</i> .....	30
<b>3. BIODIVERSITY CONSERVATION</b> .....	<b>34</b>
3.1 ECOSYSTEM CONSERVATION.....	34
3.2 SPECIES AT RISK.....	35
3.3 CARBON SEQUESTRATION .....	35
3.4 FLORA AND FAUNA INVENTORIES.....	35
3.5 INVASIVE SPECIES MANAGEMENT .....	36
3.6 EROSION .....	37
3.7 RESTORATION .....	37
3.8 STORMWATER MANAGEMENT .....	38
3.9 RECOMMENDATIONS.....	38
<b>4. NATURE TRAILS MANAGEMENT</b> .....	<b>39</b>
<i>Figure 4.1: Sanctioned Trails.</i> .....	41
4.1 RECOMMENDATIONS.....	42
<b>5. SURFACE WATER QUALITY MANAGEMENT</b> .....	<b>43</b>
<i>Table 5.1: List of strategies for watershed management as outlined by the Niagara Peninsula Conservation Authority (Aquafor Beech Limited &amp; LURA Consulting Limited 2005).</i> .....	44
5.1 RECOMMENDATIONS.....	44
<b>6. DEVELOPED AND MAINTAINED PROPERTIES</b> .....	<b>45</b>
6.1 GOLF COURSES.....	45
6.2 GARDENS .....	46
6.3 OTHER MAINTAINED AREAS .....	47
6.4 INTEGRATED PEST MANAGEMENT .....	47
6.5 RECOMMENDATIONS.....	47
<b>7. SUMMARY OF PUBLIC CONSULTATION</b> .....	<b>49</b>

**8. SUMMARY OF RECOMMENDATIONS .....50**

**9. REFERENCES.....52**

**APPENDIX B: NPC’S ENVIRONMENTALLY SENSITIVE AREAS.....60**

**APPENDIX C: STATUS DESIGNATIONS FOR SPECIES AT RISK IN ONTARIO .....61**

**APPENDIX D: ALIEN INVASIVE PLANT SPECIES REPORTED ON NPC LANDS .....67**

**APPENDIX E: GLOBAL INVASIVE SPECIES PROGRAM OUTLINE.....72**

**APPENDIX F: LIST OF ACRONYMS.....73**

**APPENDIX G: LIST OF TABLES.....74**

**APPENDIX H: LIST OF FIGURES.....75**

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## Environmental Land Management Plan for the Niagara Parks Commission: Stage 1

The Niagara Parks Commission (NPC) is a financially independent agency of the government of Ontario. It has experience dealing with large numbers of visitors and a small but dedicated ecological staff. NPC aspires to develop an international reputation for excellence in ecological land management and biodiversity conservation that parallels its reputation in the field of horticulture.

### 1. INTRODUCTION & PURPOSE

Natural areas of the Niagara Parks Commission are of local, regional, provincial, national and international significance; roughly two thirds of the NPC lands (Figure 1.1) are hotspots of terrestrial or aquatic biodiversity (Kraus, Marriott, Hayes *et al.* 2007). The Ontario Ministry of Natural Resources (2005a) has identified pollution, habitat loss, invasive species, unsustainable use of land, and climate change as the biggest threats to biodiversity. The millions of visitors to the area each year have played a significant role in disturbing the natural ecological functions of natural areas. Protecting the integrity of ecologically sensitive areas within the Niagara Parks system has proven difficult given the development associated with tourism and the vast number of visitors. Environmental degradation and loss of biodiversity in many of the Park's more sensitive areas are the result.

The NPC's lands stretch continuously along the west bank of the Niagara River for 56 kilometres from Lake Erie northward to Lake Ontario (Figure 1.2). The total area of NPC land is 1720 hectares. The Niagara Parks land encompasses a number of natural features that are of ecological and geological significance including: the Niagara Gorge, the Niagara Escarpment, the Onondaga Escarpment, numerous wetlands and rivers, the whirlpool and whirlpool rapids, and the Niagara Falls. They also provide habitat for a wide variety of flora and fauna, including numerous Species at Risk. The NPC manages a number of environmentally sensitive areas, which they either own or lease (leased areas include a section of Paradise Grove). Many of these areas contain a trail system that is open to the public. The trails are used extensively by community members and tourists. For the purposes of this report, the Parks have been divided into three areas:

- Area 1 – North Niagara River Parkway, North of Rainbow Gardens to Navy Hall
- Area 2 – Queen Victoria Park (Rainbow Gardens to Dufferin Islands)
- Area 3 – South Niagara River Parkway, South of Dufferin Islands to Old Fort Erie

The goal of the NPC's current Environmental Mission Statement is to: "improve environmental quality and sustainable development throughout the Parks system for the benefit of visitors, employees and associates." At present, however, some environmental problems associated with the development surrounding the Niagara Parks' land have posed serious threats to the NPC's ability to achieve the goal set forth in its' mission.

The purpose of this report is: (1) to identify threats to biodiversity on NPC lands and, (2) to provide a framework of management strategies to deal with these threats. In order to achieve this goal, an analysis of current NPC practices and areas of concern, current research pertaining to the NPC and biodiversity conservation, government reports, laws, regulations, and current practices in biodiversity conservation are analyzed and incorporated into the findings and recommendations.

Figure 1.1: Species Hotspots *Carolinian Life Zone*

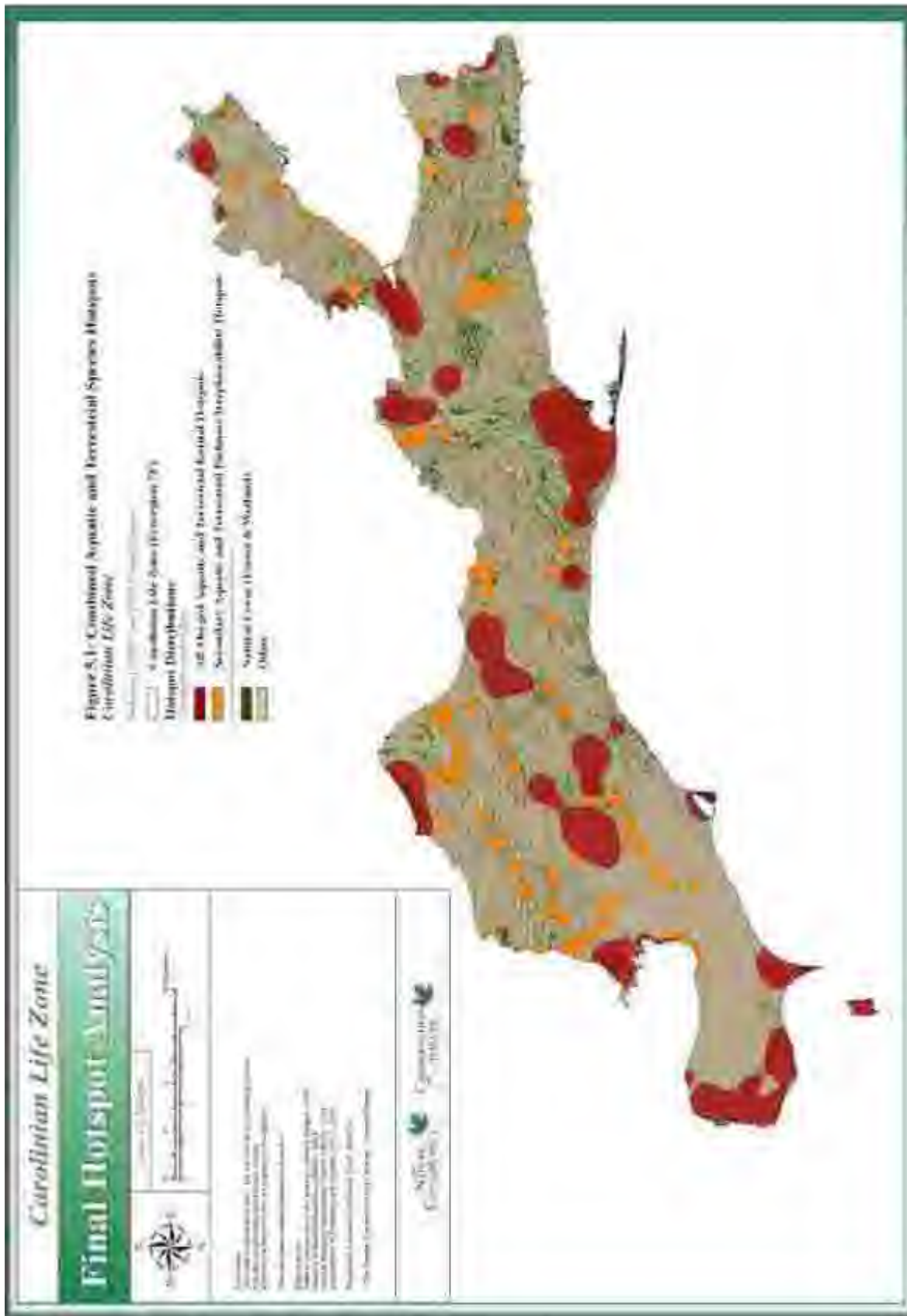




Figure 1.2 Overview of NPC Lands



## 2. ECOLOGICAL and LAND DESIGNATIONS

The NPC lands include a number of land use and ecological designations that were created to protect species and ecosystems. Many of these lands are protected by federal and provincial Acts and legislation (Table 2.1). R.A. Ritchie, Park Naturalist for the NPC, has also begun a detailed Biological Survey for the NPC lands, which is currently available in draft form (Appendix A; Oldham 2006). Numerous anecdotal reports and formal studies for the NPC have also been cited in Brown *et al.* (2006). These reports include: Annual Reports of the Commissioners for Queen Victoria Niagara Falls Park 1893-96, 1898-1902 [cited in Ritchie 2003]; Hamilton 1943; Cuddy *et al.* 1976; RMON 1985; Yaki 1986; Riley 1994; Varga 1992, 1993, 1995; NPC 2003a,b; OMNR 2003; Ritchie 2003. One difficulty with using these studies is the lack of consensus on terminology used. Future work must strive to adopt a common language to allow other disciplines easier use of the information.

### 2.1 Niagara Parks

In the Niagara Parks Act (1990) “Queen Victoria Park, Queenston Heights Park, Niagara River Parkway, and all other land heretofore or hereafter vested in or placed under the control of the Commission, including roads and boulevards and any interest in land and land covered with water” have all been classified as being under the control of the Niagara Parks Commission. It is therefore the Niagara Parks Commission’s duty, as set forth in this Act, to manage, control and develop the Parks and to achieve the objectives that have been established. NPC land holdings include approximately 600 separate pieces, some only metres across and others which are large and include entire golf courses.

### 2.2 NPC Environmentally Sensitive Areas

Different agencies have differing criteria for what constitutes an “environmentally sensitive area”. Table 2.2 provides a list of terms and definitions that are currently being used by various organizations relevant to the NPC. It is important to examine the various definitions in order to determine which definition is most suitable for the NPC. The Regional Municipality of Niagara (2004), in its Policy Plan, recognized the need for “added information on environmentally sensitive areas to assist with future environmental impact studies.” Working with a close partner to find a common definition with clearly defined criteria for designating environmentally sensitive areas would be appropriate for the NPC. Creating new definitions and classification criteria inevitably will lead to more confusion and less cohesion between partners.

Due to a gap in biological information, the Niagara Peninsula Conservation Authority (NPCA) has undertaken a Natural Heritage Areas Inventory in collaboration with Region of Niagara, Peninsula Field Naturalists and others. The final report is due to be published in 2009 (NPCA 2007a). The goal is to provide up-to-date information on natural areas that builds on existing information, confirming the significance of known sites, and filling information gaps where inventory work is outdated or lacking. The NPC has also begun a site characterization for NPC lands, known as the Natural/Cultural Heritage Inventory, which is intended to be expanded to include all 600 individual land holdings of NPC. Currently, data is incomplete and does not make up a detailed biological inventory (Appendix B; R.A. Ritchie, personal communication, 2006 July 17). These preliminary designations are shown in Figures 2.1, 2.2, and 2.3 The NPC’s current working definition of Environmentally Sensitive Areas (ESA) comes from the British Columbia Ministry of Water, Land and Air Protection’s (2004) document entitled *Environmental Best Management Practices for Urban and Rural Land Development*. It states



that ESAs are “places that have special environmental attributes worthy of retention or special care. These areas are critical to the maintenance of productive and diverse plant and animal populations. Examples include rare ecosystems, habitats for Species at Risk and areas that are easily disturbed by human activities”. Ritchie (2006) has subdivided NPC ESAs into four categories:

- Undisturbed Areas – areas that host Species at Risk and other important ecological features and that will remain this way as long as there is minimal or no human interference.
- Unrestored Areas – areas that have been slated for (future) environmental restoration activities.
- Restoration Areas – areas that have undergone or are undergoing restoration activities.
- Disturbed Areas – “areas where natural vegetation and soils have been removed or disrupted “ (U.S. Forestry Service 2008)

The definition for ESAs currently in use by the NPC does not clearly match these established categories. Natural areas might better be categorized based on their rarity, sensitivity, or significance to the surrounding areas not simply on management initiatives.

### **2.3 Natural Heritage System**

The Natural Spaces Program has been developed by the Ontario Ministry of Natural Resources to conserve and reduce the loss of greenspace across southern Ontario by encouraging landowners to voluntarily restore and protect the natural areas of their properties. It is under this program that the Ministry of Natural Resources is leading the design and development of a natural heritage system for southern Ontario. The Provincial Policy Statement defines a natural heritage system as:

*"A system made up of core natural heritage features and areas, linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions and viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state." (OMNR 2006a).*

The Provincial Policy Statement further defines Natural Heritage components as:

*"features and areas, such as significant wetlands, fish habitat, significant woodlands south and east of the Canadian Shield, significant valleylands south and east of the Canadian Shield, significant portions of habitat of endangered and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area." (OMNR 2006a).*

Table 2.2 shows development policies for the Natural Heritage component of the Provincial Policy Statement. NPC lands that are part of this natural heritage system, such as ANSI's are shown in Figure 2.4.

Table 2.1 Relevant Ecological and Land Use Designations

Area of Scientific Interest (ASIs)	Event/Scientific	CMNR identified areas having provincially or regionally significant representative geological features	Major Rivers Bedford, George	Quaternary	
Great Trail Corridor	Life Science	CMNR identified areas having provincially or regionally significant representative ecological features	<ul style="list-style-type: none"> <li>• Niagara Gorge</li> <li>• Paradise Grove</li> <li>• Ousehoun</li> <li>• Escarpment</li> </ul>	<p>Trial begins on NRC property and it must continue to facilitate public access and provide support as required.</p>	<p>Qualify International (UNESCO)</p>
	Great Trail Corridor	A charitable organization committed to establishing a conservation corridor consisting a footprint along the Niagara Escarpment, in order to protect its natural ecosystems and to provide the environmentally responsible public access to this UNESCO World Biosphere Reserve.	<ul style="list-style-type: none"> <li>• Niagara</li> <li>• Escarpment</li> <li>• Niagara-on-the-Lake to Tonawanda</li> </ul>	<p>Candidate</p>	
Cascadia Life Zone	Life Science	Supports the most productive and endangered assemblage of plant and animal species in Canada. Species that may be common further south are at the northern limit of their distribution, meaning that a high proportion of naturally and productivity rare species are found here.	<ul style="list-style-type: none"> <li>• All Park Forests</li> </ul>		
		See Table 2.3 for details.			
Environmental Sensitive Area					

<p><b>Greenfield</b></p>	<p>A tract of permanently undeveloped land which produces agricultural and forest products and the agricultural and forest products and supports agriculture as the principal land use.</p> <p>Given permanent protection to the natural heritage and other biological systems that sustain ecological and human health and that form the environmental framework within which most life-sustaining activities (economic and social activities) compatible with such activities, recreation and resource uses.</p>	<p>• Regulates the future actions of FERC lands including up to the Queensland Clauses</p>	<p>Greenfield Act (2005: c. 1)</p>	<p>Protects environmentally sensitive and agricultural land from urban development and towns</p> <p>United States, Canada, and Ontario</p>
<p><b>Regulated Empty Acre</b></p>	<p>ERAs are critical sites for the conservation of plants and biodiversity. They have been selected because they are places of international importance.</p> <p>are practical targets for conservation actions.</p> <p>conform to the international recognized criteria.</p> <p>identify existing protected areas networks.</p> <p>are part of a wider approach to conservation.</p>	<p>• Regulate River Control</p>	<p>Magway Lands Conversion Act (1994: c. 22)</p>	<p>The Convention is a partnership between Canada and the United States that seeks to reduce the release of effluents into the Niagara River</p> <p>United States, Canada, and Ontario</p>

<p><b>Nature's Heritage System</b></p>	<p>"A system made up of core nature heritage features and areas, linked by natural corridors which are necessary to maintain biological and ecological diversity, natural functions and viable populations of indigenous species and ecosystems. These systems can include lands that have been restored and areas with the potential to be restored to a natural state."                  This area consists of land use designations with specific objectives and policies for development and permitted uses. The Plan Area comprises a system of publicly owned land and open spaces (called NEPQSS) which have been acquired to protect distinctive features and agricultural areas while providing opportunities for tourism, education and recreation."</p>	<ul style="list-style-type: none"> <li>All Parts Areas</li> </ul>	<p>Planning Act (1966, c. 16 (3))</p>	<p>When there are no specific regulations set out for lands that have been designated as part of the Natural Heritage System, the designation is of provincial significance and there is potential for future responsibility to be directed.</p>	<p>Ontario</p>
<p><b>Regional Escarpment Plan Areas &amp; the Regional Escarpment Plan and Open Space System (2006)</b></p>	<p>The Plan Area comprises a system of publicly owned land and open spaces (called NEPQSS) which have been acquired to protect distinctive features and agricultural areas while providing opportunities for tourism, education and recreation."</p>	<ul style="list-style-type: none"> <li>Queen's Heights</li> <li>Quincy</li> </ul>	<p>Regional Escarpment Planning and Development Act (REDA) (1991)</p>	<p>Management plans should be consistent with the policies set out in Part 5 of the Plan</p>	<p>Ontario</p>
<p><b>Missinaibi River Corridor Area of Cummerby (2002)</b></p>	<p>Geographic areas that fail to meet the general or specific objectives of the Canada-United States Great Lakes Water Quality Agreement where such failure has caused or is likely to cause impairment or beneficial use of the area's ability to support aquatic life will</p>	<ul style="list-style-type: none"> <li>Missinaibi River and surrounding interests</li> </ul>	<p>Canada-United States Great Lakes Water Quality Agreement (2002)                  Canada-Ontario Agreement (2002)</p>	<p>Established to restore and protect terrestrial sites of importance from human forms.                  The project provides agreement that supports the restoration and protection of the Great Lakes Basin Ecosystem.</p>	<p>Canada and United States (International Joint Commission)                  Ontario                  Ontario</p>

<p><b>Species at Risk (Canada)</b></p>	<p>Wild plants and animals that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and found to be at some risk of disappearing from the wild in Canada.</p>	<ul style="list-style-type: none"> <li>• Niagara Gorge</li> <li>• Quincannon</li> <li>• Hellgrits</li> <li>• Durham Islands</li> <li>• Paradise Grove</li> <li>• (ESA areas all contain species at risk)</li> </ul>	<p>Species at Risk Act (2002, c.29)</p> <p>Canada-Ontario Agreement (2002)</p>	<p>Prevents wildlife species from being extirpated or becoming subject, provides for the recovery of extirpated, endangered and threatened species, and manages species of special concern to prevent them from becoming endangered or threatened.</p> <p>The federal-provincial agreement that supports the restoration and protection of the Great Lakes Basin Ecosystem.</p>	<p>Canada</p>
<p><b>Species at Risk (Ontario)</b></p>	<p>Species that have been identified by the Committee on the Status of Species At Risk in Ontario (COSSARO) as being threatened, endangered, or extirpated.</p>	<ul style="list-style-type: none"> <li>• Black Creek</li> <li>• Frenchman's Creek</li> <li>• Miller's Creek</li> <li>• Welland River</li> </ul>	<p>Endangered Species Act (R.S.O. 1990, E.14)</p> <p>Act: On June 30, 2008 the Act was repealed by the Statutes of Ontario, 2007, chapter 6, section 50</p> <p>Provincial Policy Statement (2005, section 3.3.3)</p>	<p>Identifies species at risk based on the best available scientific information, protects species that are at risk and their habitats, and promotes the recovery of species that are at risk.</p>	<p>Ontario</p>
<p><b>Wetland</b></p>	<p>Any wetland that has been included by the OMHR using the Ontario Wetland Evaluation System (OWES) and is recognized as having ecological significance.</p>	<p>Wetlands receive indirect protection through Provincial and Federal legislation</p> <p>Provincial Planning and Development Act (R.S.O. 1994, c.23)</p> <p>Fish and Wildlife Conservation Act (S.O. 1907, c.45)</p> <p>Municipal Act (S.O. 2006, c.21)</p> <p>Endangered Species Act (R.S.O. 1990)</p> <p>Landfill/Drivers Improvement Act (R.S.O. 1990, c.1.3)</p> <p>Compensation Land Act</p>	<p>Wetlands receive indirect protection through Provincial and Federal legislation</p>	<p>MPC must work in accordance with various provincial and federal legislation. These Acts include that wetlands are protected and, where possible, restored to their natural state.</p>	<p>Ontario</p>

<p>Source Water Protection</p>	<p>Any area that has been designated within the Source Protection Zones (SPZ) for a municipal drinking water source</p>	<p>The IEC-1 extends Area 1 Niagara Falls water treatment plant from a distance of up to 1 km. The IEC-2 extends the IEC-1 a total of 8.2 km from the plant to the falls. The IEC-3 extends up the Niagara River and covers the Waterford Truss</p>	<p>Any area that has been designated within the Source Protection Zones (SPZ) for a municipal drinking water source</p>	<p>Act (R.S.O. 1990, c. L3) Conservation Land Act</p> <p>Conservation Authorities Act (R.S.O. 1990, c. C.27)</p> <p>Environmental Assessment Act (R.S.O. 1990, c.E.18)</p> <p>Ontario Water Resources Act (R.S.O. 1990, c. O.43)</p> <p>Federal/ Canada Wildlife Act (R.S. 1985, c.W-43)</p> <p>Freshwaters Act (R.S., 1985, c.F-14)</p> <p>Migratory Birds Convention Act (1994, c.22)</p> <p>Species at Risk Act (2002, c.29)</p> <p>Canadian Environmental Assessment Act (1999, c.33)</p> <p>Provincial Clean Water Act (S.O. 2006, c.22)</p>	<p>Identifies and protects municipal drinking water supplies by identifying potential risks and taking action to reduce or eliminate these risks</p>	<p>Ontario reorganized locally by the Niagara Municipalities Association (NMA) and a Source Protection Committee (SPC)</p>
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- 1. Ontario Ministry of Natural Resources (2005a).
- 2. Ontario Ministry of Natural Resources (2005b).
- 3. Service Trail Conservancy (2009).
- 4. Ministry of Municipal Affairs and Housing (2003).
- 5. Biddle International. (2006).
- 6. Ontario Ministry of Municipal Affairs and Housing (1993).
- 7. National Equipment Commission (1992).
- 8. Great Lakes Infiltration Network (2008).
- 9. Environment Canada. (2006).
- 10. Rainey, G. (2007).
- 11. Ontario Ministry of Natural Resources (2009a).
- 12. Ontario Ministry of the Environment (2000).

Figure 2.1: NPC Environmentally Sensitive Areas, north section.



Figure 2.2: NPC Environmentally Sensitive Areas, central section.

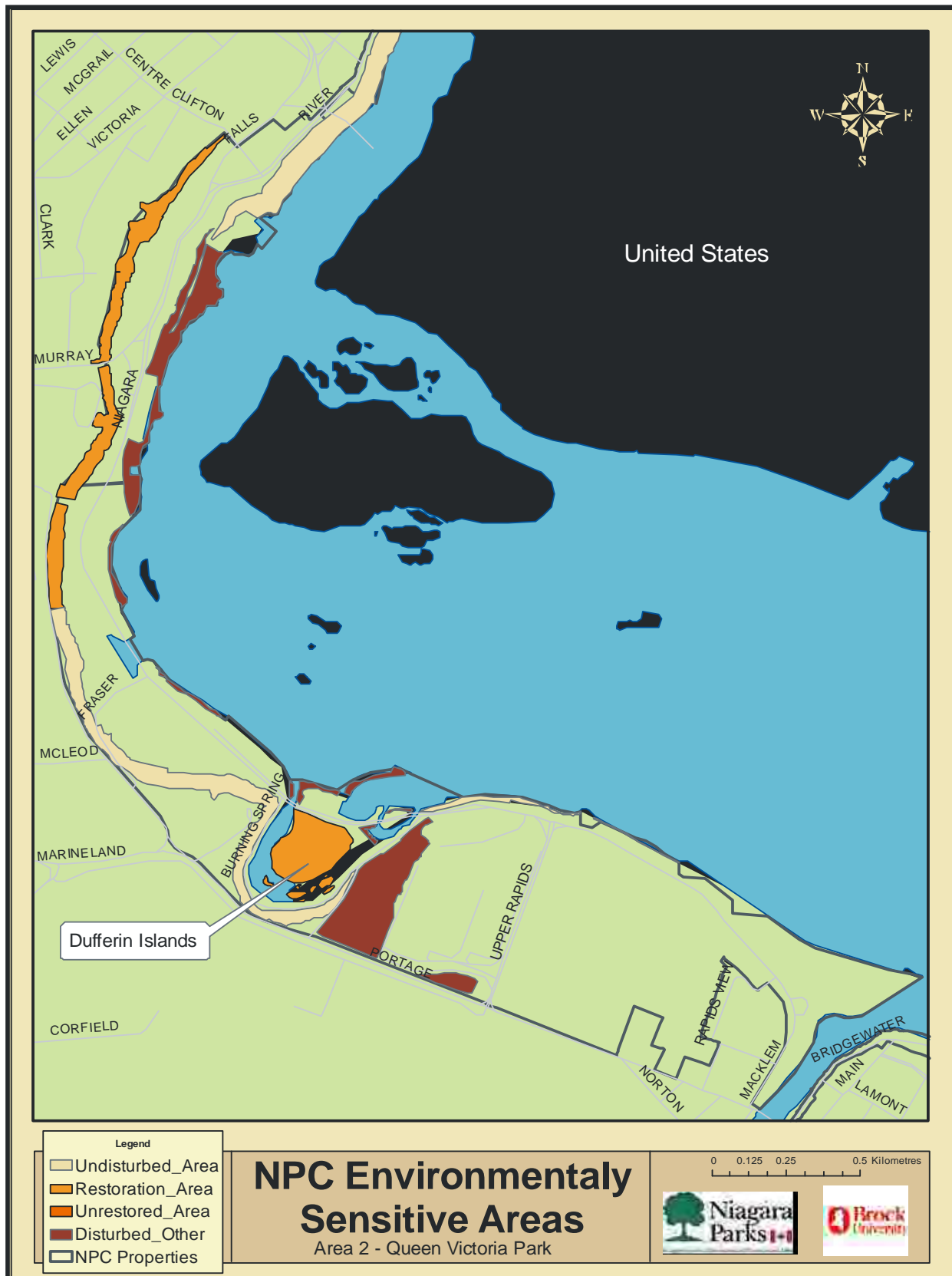




Figure 2.3: NPC Environmentally Sensitive Areas, south section.

**Table 2.2: Natural Heritage Component of the Provincial Policy Statement (OMAH, 2005).**

<p><i>2.3 Natural Heritage</i></p> <p><i>2.3.1 Natural heritage features and areas will be protected from incompatible development.</i></p> <p><i>a) Development and site alteration will not be permitted in:</i></p> <ul style="list-style-type: none"> <li><i>• significant wetlands south and east of the Canadian Shield; and</i></li> <li><i>• significant portions of the habitat of endangered and threatened species.</i></li> </ul> <p><i>b) Development and site alteration may be permitted in:</i></p> <ul style="list-style-type: none"> <li><i>• fish habitat;</i></li> <li><i>• significant wetlands in the Canadian Shield;</i></li> <li><i>• significant woodlands south and east of the Canadian Shield;</i></li> <li><i>• significant valleylands south and east of the Canadian Shield;</i></li> <li><i>• significant wildlife habitat; and</i></li> <li><i>• significant areas of natural and scientific interest</i></li> </ul> <p><i>if it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area is identified.</i></p> <p><i>2.3.2 Development and site alteration may be permitted on adjacent lands to a) and b) if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which the area is identified.</i></p> <p><i>2.3.3 The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible.</i></p>
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## **2.4 Area of Natural & Scientific Interest (ANSI)**

The Ontario Ministry of Natural Resources (OMNR) divides ANSI's into two categories: Life Science and Earth Science. The OMNR also distinguished between ANSI of provincial and regional significance. Earth Science ANSI's are those that have been identified as having provincially or regionally significant representations of geological features. The Niagara River Bedrock Gorge is the only site on the NPC lands that has been designated as a Provincial Earth Science ANSI (OMNR 2005b). Life Science ANSI's are those that have been identified as having provincially or regionally significant representations of ecological features. The following NPC sites are listed as Life Science ANSI (OMNR 2005b):

Provincial Life Science ANSI's:

- Niagara Gorge

Regional Life Science ANSI's

- Paradise Grove
- Queenston Escarpment



Figure 2.4: NPC designated natural areas and features.



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## **2.5 Wetlands**

Wetlands are one of the most productive habitats on earth, yet despite their significance to biodiversity; they have been drained for agriculture, filled for development, polluted by toxic runoff, invaded by exotic species, and damaged by artificial changes in water levels. Today, almost two-thirds of southern Ontario wetlands have been lost or severely degraded, while the health of those that remain continues to be threatened. (Environment Canada 2005c) A wetland that is designated as significant by the Ontario Ministry of Natural Resources (2005b) has been defined as: “any wetland that has been evaluated by the OMNR using the Ontario Wetland Evaluation System (OWES) and is recognized as having ecological significance.” The following wetland areas have been identified by OMNR (2005b) as being located on or in connection with the NPC lands (Figure 2.5):

- Black Creek
- Boyer’s Creek
- Frenchman’s Creek
- Miller’s Creek
- Welland River

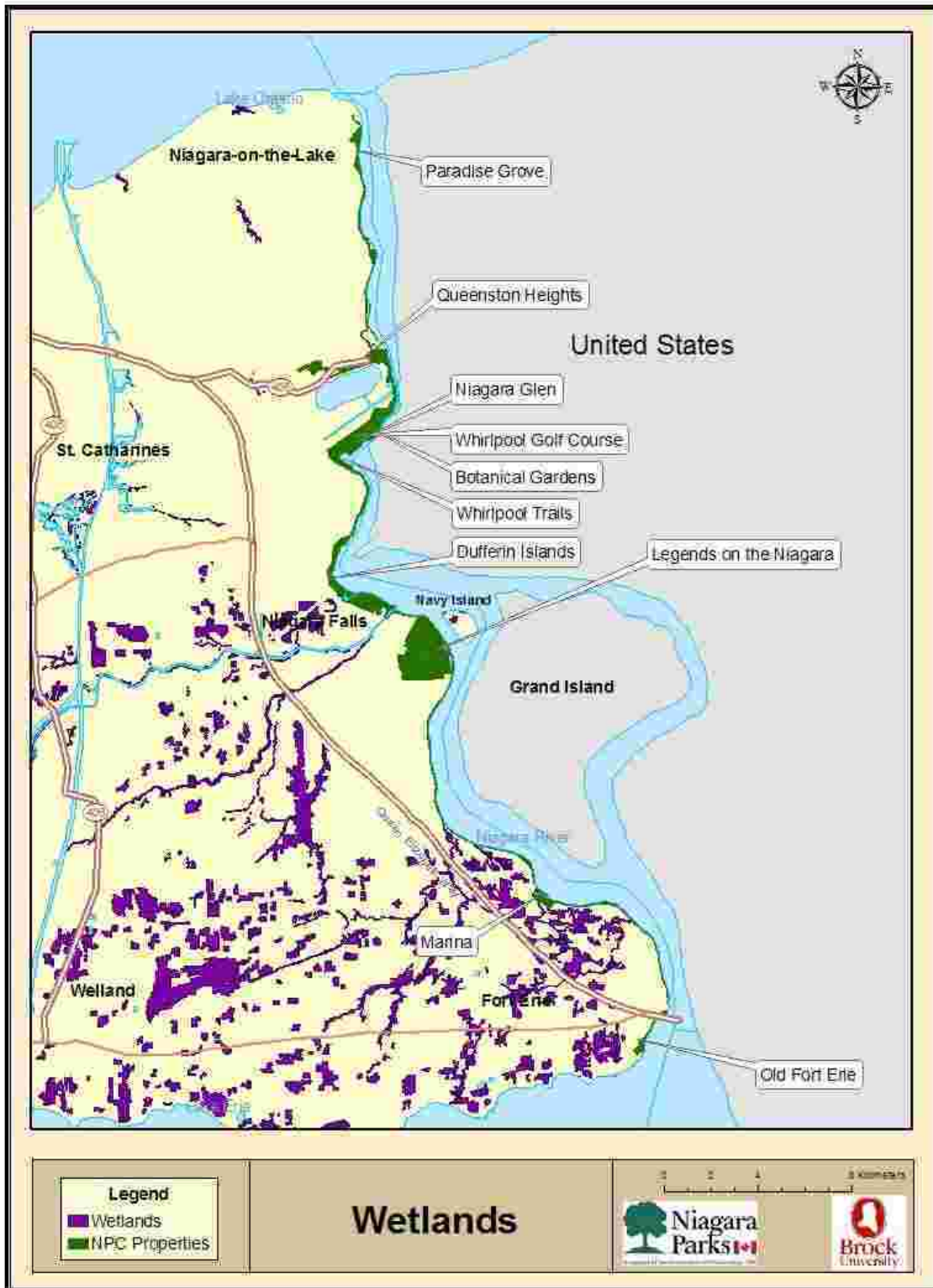


Figure 2.5: Wetlands

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## **2.6 Niagara Escarpment Plan (NEP) & UNESCO World Biosphere Reserve**

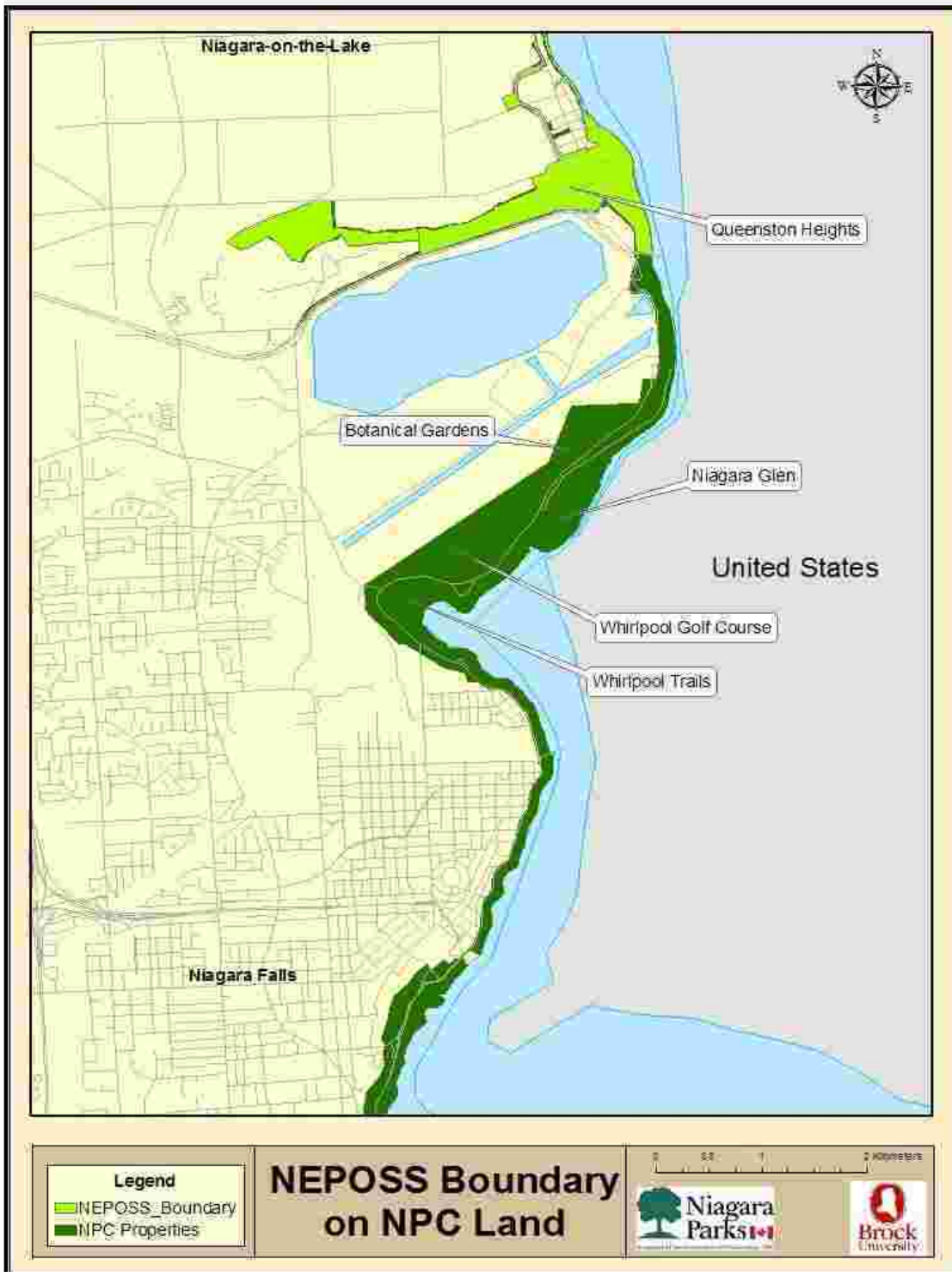
The NEP contains policies, land use designations and development criteria to guide both protection and development on the Escarpment. The purpose of the NEP, as stated in the *Niagara Escarpment Planning and Development Act*, is: "To provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment" (Niagara Escarpment Commission, 1990). The objectives of the NEP relevant to the NPC's land management plan are:

- to protect unique ecological and historic areas;
- to maintain and enhance the quality and character of natural streams and water supplies;
- to maintain and enhance open landscape character by providing such means as compatible farming or forestry and by preserving the natural scenery;
- to ensure that all new development is compatible with the purpose of the Plan; and,
- to provide for adequate public access to the Niagara Escarpment.

Part 3 of the Plan contains policies for the establishment and coordination of the Niagara Escarpment Parks and Open Space System (NEPOSS). NEPOSS is based on system of public lands connected by the Bruce Trail acquired to protect distinctive features and significant areas along the Escarpment while providing opportunities for outdoor recreation. The strength of NEPOSS is dependent on the cooperation of park management agencies, including the NPC. Management plans for parks within NEPOSS should be consistent with the NEP's objectives and policies and should recognize and support the Niagara Escarpment's designation as a United Nations Cultural and Scientific Organization (UNESCO) World Biosphere Reserve. NPC is considering applying for consideration as a UNESCO World Biosphere Reserve.

Two NPC areas, Queenston Heights Park and the lands adjacent to the Queenston Quarry, are part of NEPOSS. The areas contain the Niagara Escarpment Natural Area, Protection Area and Rural Area designations of the NEP. As stated in Part 3 of the NEP, management plans for these parks should follow the principles, guidelines and policies established in the "Niagara Escarpment Parks and Open Space System Manual" (OMNR, 1996). NPC staff is currently on the MNR committee which is reviewing the Niagara Escarpment Parks and Open Space System Manual (NEPOSS Planning Manual). The resulting document will be considered as NPC continues to develop this document.

It should be noted that areas in the vicinity outside of the Plan Area are natural extensions of the Escarpment with the same ecological significance and geological features. The NPC management plan should strive to manage these areas with the same protection in mind.



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## **Figure 2.6 Niagara Escarpment Parks and Open Space System (NEPOSS) Boundaries on NPC Lands**

### **2.7 Greenbelt**

NPC lands that fall under the Protected Countryside designation of the Greenbelt Act (2005) are located in Niagara-on-the-Lake. All Niagara Escarpment lands are also part of the Greenbelt. The objectives of the Greenbelt Plan are (Greenbelt Act 2005):

- To establish a network of countryside and open space areas which supports the Oak Ridges Moraine and the Niagara Escarpment;
- To sustain the countryside, rural and small towns and contribute to the economic viability of farming communities;
- To preserve agricultural land as a continuing commercial source of food and employment;
- To recognize the critical importance of the agriculture sector to the regional economy;
- To provide protection to the land base needed to maintain, restore and improve the ecological and hydrological functions of the Greenbelt Area;
- To promote connections between lakes and the Oak Ridges Moraine and Niagara Escarpment;
- To provide open space and recreational, tourism and cultural heritage opportunities to support the social needs of a rapidly expanding and increasingly urbanized population;
- To promote linkages between ecosystems and provincial parks or public lands;
- To control urbanization of the lands to which the Greenbelt Plan applies;
- To ensure that the development of transportation and infrastructure proceeds in an environmentally sensitive manner;
- To promote sustainable resource use;
- Any other prescribed objectives.

### **2.8 Places to Grow Act**

Another piece of Provincial legislation which affects NPC lands is the 2005 Places to Grow Act. Unlike the Greenbelt Legislation, the Places to Grow Act covers all land along the Niagara River Corridor. Lands in that area are designated as “Gateway Economic Zone”. As of the time of writing, the Ministry of Public Infrastructure Renewal has not yet defined what this will mean for land holders in the designated areas. In response to the designation The Regional Municipality of Niagara has issued an RFP for consulting services for the development of an action plan to implement the Niagara Gateway Economic Zone and Centre.

Although the mandate of the Places to Grow Act was not environmental it is important to include and consider any legislation which will place land use pressure on the NPC and other local land holders. Niagara Parks will always be a tourist destination. In the coming decades NPC natural areas will also play an ever increasing role in the lives of their neighbours and local communities. The green space it preserves will become important to human well being as well as the other flora and fauna as developable land becomes more scarce in the Niagara Region.

## **2.9 Niagara River (Ontario) Area of Concern**

The Niagara River Corridor has been designated as an Area of Concern (AOC) by the International Joint Commission (IJC). The IJC is an independent bi-national organization between Canada and the United States that was established in order to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the United States on related questions (IJC 2007). The Niagara River was deemed an AOC in 1987 because of its failure to meet various general and specific objectives of the Canada-United States Great Lakes Water Quality Agreement (Environment Canada 2005a). The failure of the Niagara River to meet these objectives was viewed to have caused and/or as likely causing impairment of beneficial use of the area's ability to support aquatic life (Environment Canada 2005a). Remedial Action Plans (RAPs) are being developed separately in Ontario and New York State. The Canadian Niagara River AOC includes the entire Welland River watershed and tributaries flowing directly into the Niagara River. The following is a list of the impaired beneficial uses in the Canadian portion of the AOC (Draft: Niagara River RAP Stage 2 Update Report, 2009):

1. Restrictions on Fish Consumption;
2. Degradation of Fish & Wildlife Populations;
3. Degradation of Benthos;
4. Eutrophication or Undesirable Algae;
5. Loss of Fish and Wildlife Habitat.

Due to lack of sufficient relevant scientific evidence, it was recommended that further assessments are required to determine the status and/or facilitate development of delisting criteria for the following:

1. Fish Tumours and Other Deformities;
2. Eutrophication or Undesirable Algae; and
3. Degradation of phyto/zooplankton populations

Based on current scientific data, 3 beneficial uses that were originally designated as impaired, i.e. Bird or Animal Deformities or Reproduction Problems; Restrictions on Dredging Activities; and Beach Closings, were changed to "Not Impaired". The wildlife component of Restrictions on Fish & Wildlife Consumption was also changed to "Not Impaired". (Draft: Niagara River RAP Stage 2 Update Report, 2009).

It is clear there is still work to be done to achieve delisting of the Niagara River (Ontario) AOC. The new RAP Work Plan has been prepared in collaboration with implementers (including the NPC) to address the following areas, in particular, where further work is required:

- Addressing sources of nutrients leading to eutrophication of the Welland River and its tributaries.
- Restoring and protecting fish and wildlife habitat, including unique habitats found rarely in other parts of the Great Lakes basin.
- Development and implementation of a management strategy for PCB-contaminated sediment at Lyon's Creek East.
- Complete assessments for beneficial use impairment status for Fish Tumours and Other Deformities and Degradation of Phytoplankton and Zooplankton Populations; and, implement appropriate actions for any deemed impaired.
- Development and implementation of an updated monitoring plan.



The AOC includes all of the NPC's lands. Through a grant program, the NPCA has provided incentives to local landowners within the Niagara-Welland River basin, including the NPC, in order to foster best management practices for agriculture, create habitat, and protect "ecologically sensitive" land (NPCA 2007a). The emphasis on non-point sources of pollution and the restoration of lands surrounding the watershed is an important aspect of the Niagara River Remedial Action Plan. This applies to the NPC by way of plans to restore natural areas and to reduce the amount of sediment and chemical runoff into the Niagara River and the surrounding watersheds. Strong partnerships with organizations like the NPCA will continue to help the NPC in achieving these goals.

## **2.10 Important Bird Area (IBA)**

The Niagara River annually supports one of the largest and most diverse concentrations of gulls in the world, with more than 100,000 individuals recorded during fall and early winter each year (IBA Canada 2004). As a result of the large numbers of gulls in the area, the entire River Corridor has been designated internationally as an Important Bird Area (IBA) since 1996. An IBA is a site providing essential habitat for one or more species of breeding or non-breeding birds. These sites may contain threatened species, endemic species, species representative of a biome, or highly exceptional concentrations of birds (IBA Canada 2004). Retention of natural habitats and environmental land use planning are important management strategies for the preservation of IBAs.

## **2.11 Species at Risk**

Species at Risk are species that have been designated as threatened, endangered or extirpated by a designated federal or provincial authority. In Ontario, the *Endangered Species Act* (1971, 1990) was amended in 2007 in order to establish greater protection measures for species at risk under the direction of the Committee on the Status of Species at Risk in Ontario (COSSARO). The federal legislation for Species at Risk is administered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is legislated through the *Species at Risk Act* (2002).

Compared to Ontario's previous Act, the new ESA 2007 provides:

- broader protection for species at risk and their habitats,
- greater support for volunteer stewardship efforts of private landowners, resource users, and conservation organizations,
- a stronger commitment to recovery of species,
- greater flexibility,
- increased fines, more effective enforcement, and
- greater accountability, including government reporting requirements.

A comprehensive inventory of sites that contain Species at Risk on all NPC lands is not yet complete. This information is necessary in order to create appropriate management strategies for protecting and enhancing the habitats of species that are at risk. Depending on which species are present, NPC will endeavour to consult with the appropriate Recovery Team for advice on recovery strategies, including critical habitat mapping for species protection. Appendix C features a list of official status designations assigned to native Ontario species by

the OMNR in consultation with COSEWIC. The species that have been documented on NPC lands by The Natural Heritage Information Center of OMNR will be the focus of any future projects on Species at Risk. (M.Oldham, et al 2006).

## **2.12 Carolinian Life Zone**

The Carolinian Life Zone is a natural region characterized by the dominance of deciduous trees that extends northward from the Carolinas to its northernmost point in southwestern Ontario (Parks Canada 2005). Even though the Carolinian Life Zone in Canada is small in comparison to other Canadian vegetation zones (making up only 1% of Canada's total land area) it has been recognized as the most diverse ecosystem in Canada based on the large diversity of flora and fauna species. It is estimated that some 2,200 species of herbaceous plants are found here, including 64 species of ferns, at least 110 species of grasses, 70 species of trees, and over 130 different sedge species (Carolinian Canada 2007). Over 400 species in the Carolinian Zone are considered rare by the NHIC (Carolinian 2008). All the NPC's lands are within the Carolinian Life Zone.

## **2.13 Old Growth Forest**

The section of the Chain Reserve (a former military reserve that is 20 metres in width) between Niagara-on-the-Lake and Queenston contains many large diameter trees, which has led naturalists to suspect that it is an old growth forest. The designation as "Old Growth Forest" is an "informal" designation; this area was included in the *Old Growth Forest Survey of Niagara* coordinated by the Bert Miller Nature Club in 2003-2004. The NPC has marked the area as environmentally sensitive within its ESA mapping (Figure 2.1; R.A. Ritchie, personal communication, 2007 July 6). Further research pertaining to the flora and fauna within the Chain Reserve would be valuable for discovering other significant features.

## **2.14 Source Water Protection**

In May 2000, seven people died and more than 2,300 became ill after deadly bacteria contaminated the drinking water system in Walkerton, Ontario. In the follow up enquiry, Justice O'Connor focused on five major safeguards - a "multi-barrier approach" to protecting municipal drinking water. The first of these safeguards was the protection and enhancement of drinking water sources.

In 2006 the provincial legislature passed the Clean Water Act, thus affirming its commitment to protecting municipal drinking water in Ontario. The purpose of the Clean Water Act (CWA) and Source Protection Program is to protect municipal drinking water supplies by identifying potential risks to existing and future sources of local drinking water and taking action to reduce or eliminate these risks.

The source protection program is administered locally by the Niagara Peninsula Conservation Authority (NPCA) and a Source Protection Committee (SPC), while the Niagara Region has been the lead for a number of source protection technical studies concerning its water treatment plants.

A surface water vulnerability study was recently completed for the Niagara Falls Water Treatment Plant (WTP), and this included the delineation of Primary and Secondary Intake Protection Zones (IPZ-1 and IPZ-2). The IPZ-1 extends from the WTP intake a distance of up to

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1 km. The IPZ-1 is considered the most vulnerable due to its proximity to the intake. The limits of the IPZ-2 are based on a 2 hour time of travel to the intake. The IPZ-2 extends up the Niagara River and partly down the Welland River. A threats assessment for the lands included in the IPZ-1 and IPZ-2 has not yet been finalized.

## **2.15 Recommendation**

**Recommendation 1:** *Work with partners, especially the Niagara Peninsula Conservation Authority, the Regional Municipality of Niagara and the Provincial government to: (1) create a common definition for Environmentally Sensitive Areas; and (2) generate a list of criteria for classifying areas as environmentally sensitive. This will ensure a clear direction for management and a common language, essential for the sustainability of partnerships.*

Table 2.3: Definitions of Protected Areas

Organization	Category	Definition
Ontario Power Generation (OPG)	Environmentally Sensitive Areas	Places that have special environmental attributes worthy of retention or special care. These areas are critical to the maintenance of productive and diverse land and animal populations. Examples include rare ecosystems, habitats for Species at Risk and areas that are easily disturbed by human activities.
	Environmentally Significant Areas	Natural areas, including Wetlands or Areas of Natural and Scientific Interest (ANSIs), which have been designated for protection by a national or local municipality.
	Critical Habitat	Fish Habitats which have high productive capacity, are rare, highly sensitive to Development, or have a critical role in sustaining fisheries (e.g. spawning and nursery areas for some species, and ground water discharge areas). The Authority requires that a minimum buffer of 30 m be maintained on both sides of a Watercourse that has been identified as Critical Habitat, although this may be adjusted upwards if indicated appropriate through fisheries assessments.
Niagara Power Generation Commission Authority (NPGCA)	Important Habitat	Fish Habitats which are moderately sensitive to Development and, although important to the fish population, are not considered critical (e.g. feeding areas, open water habitats of lakes). The Authority requires that a minimum buffer of 15 m be maintained on both sides of a Watercourse that has been identified as Important Habitat.
	Marginal Habitat	Fish Habitats which have low productive capacity or are highly degraded, and do not currently contribute directly to fish productivity. They often have the potential to be improved significantly (e.g. a portion of a waterbody, such as a Channelized stream, that has been highly altered physically). The Authority requires that a minimum buffer of 15 m be maintained on both sides of a Watercourse that has been identified as Marginal Habitat.
	Intake Protection Zones (IPZ's)	Intake Protection Zones (IPZ's) are the adjacent area of land, water or both around a surface water intake for drinking water supply.
Parks Canada	Culturally and Environmentally Sensitive Areas Heritage Area	Areas which may require special recognition or management not provided through zoning designation.
	Natural Areas of	A generic term used to signify those geographical areas which are included within the Parks Canada Program. These include National Parks, National Marine Conservation Areas, National Historic Sites and Historic Canals.
		A natural area which provides outstanding representation of the

Table 2.3 Definitions of Protected Areas

Organization	Title	Category	Notes
	Canadian Significance (NACS)	Natural Heritage	ecology, physiography, vegetation and wildlife that is characteristic of its larger natural region. A potential national park is selected from among NACS within a natural region not represented in the systems of national parks.
	Protected Heritage Areas	Parks Management Cultural Heritage	a) areas that have been accepted "protected" status, because of their cultural or cultural qualities, through acquisition or application of land-use controls; b) areas that have been recognized as having natural or cultural heritage value and which require some form of protected status in order to ensure their long term protection.
Environment Canada	Environmentally Sensitive Area	General Environmental Management	Areas designated by various Conservation Authorities, or sensitive areas identified by the Ontario Ministry of Natural Resources in series such as their Sensitive Area Reports (SAR). They have especially sensitive features which are identified in the 'Notes' column.
	Area of Natural and Scientific Interest	General Environmental Management	An Area of Natural and Scientific Interest (ANSI) is designated by the Ontario Ministry of Natural Resources in Canada or N.O.A. and Environmental Protection Agency (EPA) in the United States and is an "area of land and water containing natural landscapes or features which have been identified as having values related to protection, natural heritage appreciation, scientific study or education."
Ministry of Municipal Affairs and Housing (Greenbelt)	Protected Countryside	General Environmental Management	Areas that contain a Natural System that provides a continuous and permanent land base necessary to support human and ecological health in the Greenbelt and beyond. The Natural System policies protect areas of natural heritage, hydrologic and/or landform features, which are often functionally inter-related and which collectively support biodiversity and overall ecological integrity.
Regional Municipality of Niagara	Environmentally Sensitive Areas (See Also "Potential Recreation Areas and Fragile Biological Sites")	Environmental Management Natural Heritage	The areas identified as environmentally sensitive include the major watersheds throughout the Region, important plant and wildlife habitats, major forested areas and major landforms such as the Niagara Escarpment and the Short Hills which have an important scenic and natural value. More precise boundaries for environmentally sensitive areas will be established over time based on further study and individual environmental impact statements.
Ontario Ministry of Natural Resources	Natural Heritage Areas	Parks Management Natural Heritage	An area identified as having significant or unique natural heritage features. Natural Areas listed in the Natural Areas Database, may be identified by the Ministry of Natural Resources, Conservation Authorities, the International Biological Program (IBP) or by non-governmental organizations such as the Federation of Ontario Naturalists, the Nature Conservancy of Canada or Bird Studies Canada.

Designation	Terms	Category	Notes
Species at Risk Act	Life Science Site	Parks Management: Natural Heritage	Natural areas include evaluated wetlands, Areas of Natural and Scientific Interest (both life science and earth science), provincial and national parks, Conservation Areas, BFP Sites and nature reserves. An area recognized as having ecological features. Environmentally Sensitive Areas (ESA's) are areas identified by municipalities as being ecologically important; these areas are tracked by the Natural Heritage Information Centre (NHIC) as life science sites.
	Critical habitat	General Environmental Management	The habitat that is necessary for the survival or recovery of a listed species and that is identified as the species' critical habitat in a recovery strategy or action plan.
	Protected Areas	General Environmental Management	Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species available primarily for scientific research and/or environmental monitoring. Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
International Union for Conservation of Nature (IUCN)			Category II: National Park Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities; all of which must be environmentally and culturally congruent.
			Category III: Natural Monument Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
			Category IV: Habitat/Species Management Area Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
			Category V: Protected Area of land, with coast and sea as appropriate, where the interaction of people and nature over



		<p>Area has produced an array of distinct products with significant aesthetic, ecological and/or cultural value, and other with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the production, maintenance and evolution of such an area.</p>
Landscape/Scene	<p>Category VI Managed Resources Protected Area</p>	<p>Area containing traditionally identified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.</p>

- <sup>1</sup> Rizove, (personal communication, July 9, 2007)
- <sup>2</sup> The Regional Municipality of Niagara (2004)
- <sup>3</sup> Parks Canada (2006)
- <sup>4</sup> Environment Canada (2001)
- <sup>5</sup> Ministry of Municipal Affairs and Housing (2002)
- <sup>6</sup> The Regional Municipality of Niagara (2004)
- <sup>7</sup> Ontario Ministry of Natural Resources (2005a)
- <sup>8</sup> Ontario Ministry of Natural Resources (2005b)
- <sup>9</sup> Government of Canada (2007)
- <sup>10</sup> IUCN (1994)

### 3. BIODIVERSITY CONSERVATION

Since its inception in 1885, the Niagara Parks Commission has been the guardian of lands that include ecological features of local, regional, and international significance. Protecting these features for both their intrinsic and anthropogenic values is a top priority.

#### 3.1 Ecosystem Conservation

The conservation of biodiversity requires the protection of ecosystems and the flora and fauna that they contain (OMNR 2005a). In an urbanized area such as Niagara all ecosystems are significantly affected by human impacts including pollution, noise, light, fragmentation, loss of connectivity to other natural areas, and a long history of unsustainable resource use. The few relatively less disturbed areas are a top priority for protection. The current top priorities for conservation initiatives are:

1. Niagara Glen
2. Whirlpool Trails
3. Dufferin Islands
4. Queenston Heights/Niagara Escarpment
5. Paradise Grove

Employing an ecosystem approach to management based on accepted scientific principles and practices is a first step in biodiversity conservation. This approach to ecosystem management was recommended by Moriyama and Teshima Planners Limited (1988) in the 20 year plan for the NPC and has since been recommended by Brown *et al.* (2006) in their report on the management of Species at Risk. An ecosystem approach to management is best defined through a working definition as: “integrating scientific knowledge of ecological relationships within a complex socio-political and values framework toward the general goal of protecting native ecosystem integrity over the long-term.” (Grumbine 1994: 31) It is important to note the socio-political relationship that must be considered when developing strategies for achieving goals and objectives. Because the NPC lands include such diverse ecology and geology, and are in close proximity to residential and business communities and the United States border, there are many factors that need to be considered when determining the best management practice to undertake. The NPC must be considerate of its neighbours, yet at the same time they must be true to their management goals. The five main goals identified by Grumbine (1994) for achieving ecological integrity, based on the ecosystems approach, include:

1. Maintenance of viable populations of all native species *in situ*.
2. Representation, within protected areas, of all native ecosystem types across their natural range of variation.
3. Maintenance of evolutionary and ecological processes (i.e., disturbance regimes, hydrological processes, nutrient cycles, etc.)
4. Management over periods of time long enough to maintain the evolutionary potential of species and ecosystems.
5. Accommodation of human use and occupancy within these constraints.

The impact of development that minimizes natural areas and eliminates corridors between them can be as serious as species extinction (Fahrig 2003). Along the Niagara Parkway and throughout the Niagara Region this has been an increasing problem. As development surrounding natural areas continues, so too do the threats to species survival. The Greater

Niagara Circle Route and the Water Front Trail are examples of successful partnership initiatives between the NPC and the Region to connect trail systems. The initial goals of the project focused on increasing tourism in the area and promoting a healthy lifestyle. A re-evaluation of these trails from an ecological perspective may help to improve wildlife habitats. Any future assessments should include a cost/benefit analysis of the trails (and resulting spontaneous trails) from an ecological standpoint.

### **3.2 Species at Risk**

Of particular concern for the NPC are areas that provide habitat for Species at Risk. Any area that contains a known Species at Risk has been classified as an environmentally sensitive area by Ritchie (2006). At present there are 182 designated species at risk in Ontario (OMNR, 2006b; Appendix C). M. Buma (personal communication, 2009 Jan. 20) has pointed to approximately 40 documented sites for Species at Risk that can be found on the NPC lands. This large number reflects both the significance and sensitivities of the NPC lands and the degradation that is occurring at present

### **3.3 Carbon Sequestration**

Global climate change is one of the largest threats to biodiversity in Niagara as in most parts of the world. Carbon sequestration, the long-term storage of carbon in the form of growing trees and other forms of forest biomass, is a practicable and valuable response consistent with the NPC's land management strategy. The benefits of a carbon sequestration program are many, including (Eastern Ontario Model Forest 2004):

- Conservation of soil and water quality
- Air quality improvement
- Creation of natural spaces for wildlife habitat, maintenance of ecosystem integrity, recreational use, and visual aesthetics.

A secondary benefit of preserving and restoring natural areas is the payoffs that could be accumulated from a carbon sequestration program. For the NPC, this could mean receiving carbon offset credits for preserving and enhancing forested areas. The incentives for participating in a carbon sequestration program have not been established on a federal level; however studies are being conducted across Canada to develop this program (Natural Resources Canada 2007).

### **3.4 Flora and Fauna Inventories**

According to Brown, *et al.* (2006) the Niagara Glen and adjacent gorge regions have been the subject of numerous anecdotal reports and formal studies since their inception as part of the NPC parks system. There are also reports that were not cited in Brown, *et al.* (2006): the Environmental Land Management Plan for the Legends on the Niagara, Battle of Chippewa Site (NPC 2001), the Niagara to GTA Project Team's (2007) "Overview of Environmental Conditions and Constraints: Draft Consultation" and the Regional Municipality of Niagara's (1990) assessment of fish habitat at stream crossings along a proposed waste pipeline near Niagara-On-The-Lake. The sum of useful information in these reports does not provide a comprehensive inventory of the flora and fauna that exist in the Niagara Parks system. Also, it should be noted that many of these reports are dated. R.A. Ritchie (personal communication, 2007 July 6) has initiated a comprehensive flora and fauna inventory for the Parks. These inventories will be used to establish priority sites for management based on environmental sensitivity and potential for restoration or rehabilitation.

A comprehensive inventory of vascular plants in the gorge and Whirlpool regions has been contracted by NPC staff and is currently in progress (R.A. Ritchie, personal communication, 2007 July 6). This should be considered a first step toward a comprehensive inventory. The NPCA is also conducting an inventory within their jurisdictional watershed that will be published in 2009. (D. Lindblad, personal communication, 2008)

### **3.5 Invasive Species Management**

Ontario's Biodiversity Strategy defines alien species as "plants, animals, and micro-organisms that have been accidentally or deliberately introduced into habitats outside their normal range" (OMNR 2005a). Invasive Alien Species (IAS) are those "harmful alien species whose introduction or spread threatens the environment, the economy, and/or society, including human health" (OMNR 2005a). According to the World Conservation Union (IUCN 2004), IAS are the second most significant threat to biodiversity, after direct habitat loss. IAS can have long-term impacts on native ecosystems, habitats and species that are severe and often irreversible, including displacement of native flora and fauna and impairment of essential ecosystem functions like hydrology, nutrient cycling, contaminant absorption, natural fire regimes, and energy flows and cycles. (Environment Canada 2004)

The NPC lands are of particular concern because of the large number of IAS that currently inhabit the area. 72 of the top 128 invasive plant species (most aggressive, due to ideal growing conditions and no natural insects and diseases) have been reported in the Niagara River area (Appendix D; Catling and Mitrow 2005) This table does not necessarily represent a complete list because a comprehensive inventory of the flora and fauna that inhabit the area has not been completed to date.

Debate over how to manage alien and invasive alien species focuses on whether or not they are worth managing at all. Despite the seriousness of the consequences that have been identified, some researchers (Sagoff 2005) argue that invasive species are nearly impossible to deal with due to their rapid spread and the lack of feasible management technologies. Others (Walther *et al.* 2002) feel that climate change has contributed to the spread of alien species, and that there is little we can do to prevent these invasions from occurring. In many instances IAS are more a symptom than a cause of massively altered ecosystems. In all cases IAS management must be conducted in such a way as to ensure that the cure is not worse than the disease (Larsen, 2005).

The management goal that has been established by the NPC is to "arrest, mitigate and gain control of the spread of IAS within and adjacent to the NPC, especially those species which are a severe threat to the survival and sustainability of native plant and animal species within the NPC's natural and ESA areas" (NPC 2003a). The NPC is already undertaking measures to eradicate AIS from their lands. R.A. Ritchie has developed a list of priority sites for IAS removal, and has also prescribed and carried out burns as a method of control of IAS (personal communication, 2007 June 17). The Forestry section of the Niagara Parks Maintenance Manual states that "All non-native/invasive species shall be removed." (NPC 2006)

It is important to add prevention to the management goal because preventing A/S from infesting new areas is more cost-effective and efficient than trying to restore the ecosystem after it has been infested. The NPC should also incorporate a "first do no harm" criterion into its policies on IAS management to ensure in each case that its actions are not causing more harm than good. The Global Invasive Species Program (GISP) has created guidelines for managing IAS

(Appendix E). Work in these areas will be subject to NPC resources available and increasing opportunities to partner with other agencies, government and the private sector.

### **3.6 Erosion**

Erosion can be categorized into two types: geologic erosion and accelerated erosion. Geologic erosion or "natural" erosion is the wearing away of the earth's surface by water, ice, gravity, wind, or other natural agents under natural environmental conditions such as climate and vegetation, while accelerated erosion is the speeding up of erosion due to human activity (Agriculture and Agri-Foods Canada 1996). Landscapes along the Niagara River are susceptible to geologic erosion as a result of the speed and force of the river, the cold winter climates, and the steep slopes surrounding the river. Major causes of accelerated erosion on the NPC land include agriculture, urbanization, power generation activities, roadways, trails, and boat wakes (Beaton *et al.* 2006, Wang 2007). Maintenance practices at the NPC should also be added to this list as it has been observed that on occasion Niagara Parks staff will dump garden clippings, branches, twigs, etc. over the banks of the Niagara River (NPC, personal communication, 2007 July 9). These activities can upset the delicate balance between rainfall and runoff.

While erosion affects each ecosystem differently, there are a number of issues that are of concern for the Parks lands at present. These issues include habitat loss, loss of land use, safety, and pollution. Water quality associated with erosion is already a serious problem in the Niagara River. When vegetation is removed from riparian sites, water runoff increases its speed and force and pollutant runoff becomes more severe, leading to more serious contamination issues (Botkin, Keller, and Heathcote 2006; Marsh and Grossa 2002).

The best technique for dealing with these issues is to prevent them for occurring in the first place; however, in many instances the NPC cannot prevent or control the causes of accelerated erosion because they are a result of activities in the surrounding communities. If erosion continues without proper management, some Parks lands may become unusable because of the danger erosion poses to the safety of trails and roadways. The NPC in conjunction with a local engineering firm has completed an erosion study along the banks of the Niagara River (NPC, personal communication, 2007 July 9). This study identifies major sites of erosion and establishes a plan of action for dealing with bank instability. Smaller scale projects, such as in riparian zones along stream banks will also be significant for ecological restoration (see Section 5: Water Quality Management).

### **3.7 Restoration**

Once an ecosystem has been altered from its original state, management goals must be shifted from conservation to restoration. Restoration initiatives are those which seek to restore natural areas as closely as possible to their original condition. Two of the four categories for the NPC's Environmentally Sensitive Areas have been classified using restoration initiatives as a guideline (restored and unrestored areas). These sites have been identified in Appendix B and mapped in Figures 2.1, 2.2, and 2.3. Restoration initiatives should be viewed as a last resort, in terms of biodiversity conservation. Preventing disruptions to ecosystem functions through conservation remains a top priority.

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### **3.8 Stormwater Management**

Stormwater from lands west of Niagara Parks Commission lands are private, Regional or Municipal responsibilities. Many of the storm drains were in place prior to the NPC obtaining ownership of the Niagara River Corridor. In keeping with the principles of the Ontario Drainage Act, the NPC will allow these drains to be cleaned out, added to or altered provided the Region, the Municipality or private developer builds or improves the culvert, headway or outlet to NPC approval and provides new or updated legal easement agreement which covers the NPC's liability and specifies that the party will be responsible for maintenance and replacement.

The NPC is exempt from the Drainage Act and any works under this act are the responsibility of the neighbouring municipality.

### **3.9 Recommendations**

**Recommendation 2:** *Employ an ecosystem approach to management based on accepted scientific principles and practices.*

**Recommendation 3:** *Complete a detailed inventory of flora and fauna on all NPC lands. It is especially important to discover where Species at Risk are located as these areas will be a top priority for protection and management.*

**Recommendation 4:** *Follow the Global Invasive Species Program protocol for invasive species management.*

**Recommendation 5:** *Develop a carbon sequestration program.*

**Recommendation 6:** *Continue to monitor and repair sites of erosion.*

## 4. NATURE TRAILS MANAGEMENT

The management of nature trails has received considerable attention from researchers in recent years (Ayotte, Ferguson, & Tierney 2007; Brown, *et al.* 2006; NPC, 2003b). This attention is a result of the ecological significance of many of the nature trails that receive large numbers of visitors every year. The Niagara Glen has been a focus of these reports because of its exceptional ecological and geological features and the ever-increasing degradation that is taking place. The problems that exist within the trail system are largely a result of public access to and overuse of these areas (NPC 2003b). Figure 4.1 features the nature trails of the NPC. As the number of tourists increases in the area, so to does the human impact on the trails. The main areas of concern for the trail system include (Ayotte, *et al.* 2007; NPC 2003b):

- Erosion;
- Litter;
- Vandalism;
- Use of unsanctioned trails;
- Bouldering; and
- Geocaching

Trail erosion significantly affects ecological, social and managerial environments. From an ecological perspective erosion disrupts an entire ecosystem resulting in aquatic system disturbance, excessively muddy trails, widening of trails, tread incision, braided or multiple trails and the creation of undesired trails (Jewell & Hammitt 2000). From a management perspective unsanctioned trails may suggest that the NPC is not fulfilling its mandate to protect and preserve environmentally sensitive areas and Species at Risk.

Concerns regarding the staircase located at the Niagara Glen have been raised by researchers (Ayotte, 2007; NPC, 2003b). Close monitoring of the use at the Niagara Glen would enable the Parks to establish real numbers from which a discussion about carrying capacity can take place and enable NPC to have more control over the types of activities taking place (NPC 2007). This is also one step towards decreasing problems associated with vandalism, garbage, graffiti, and unsanctioned fire pits.

The lack of clearly marked trails throughout the NPC lands has been pointed to as one of the main causes of unsanctioned trails. In the Niagara Glen, for example, numerous spray paint designs have been used to mark trails. Visitors may become confused as to which trail they are following and end up walking through unsanctioned trails. The use of unsanctioned trails further disrupts the already heavily used natural areas and further threatens the biodiversity of the area. NPC has begun the process of remarking all trails and will be displaying a chart of trail symbols at the trail head. The deterioration of trails as a consequence of erosion has become a problem in the heavily used trails of the Niagara Parks (Section 3.6).

At present the Niagara Glen is being promoted as an ideal location for bouldering by various websites including rockclimbing.com, getbeta.com, and glenbouldering.com. However, these activities pose a serious threat to biodiversity within this already environmentally sensitive area. A study conducted on rock climbing in the Niagara Escarpment found that rock climbing causes considerable damage to vascular plants, bryophytes, and lichens and in some cases rare species are threatened by rock climbing activities (McMillan & Larson 2002). Until bouldering



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activities are controlled in the Niagara Glen, this ecosystem of international conservation significance will not be able to be restored completely.

The NPC has reviewing various aspects of trails management for quite some time. In 2003, the intent of The Niagara Glen Trail Management System (NGTMS) was to outline a proposal for a trail management system for Niagara Glen to address the needs of a deteriorating ecosystem, resulting from an increase in user-visitors to the site. Primary concerns and problems on site included soil erosion, destruction and/or removal of native flora and fauna, including Species at Risk (SAR), invasive plant species, vandalism, the creation and use of unsanctioned trails, garbage and litter, and other activities that are carried on in contravention of regulations under the Niagara Parks Act.

The document is suggested as a positive means to address, mitigate, alleviate, reverse and ultimately eliminate these concerns and problems, allowing visitors to the Glen to experience this unique natural environment while still deriving enjoyment, educational and recreational opportunities from their visit. Acceptable and unacceptable uses by the public of the Glen's resources must be laid out clearly for all to understand, and these will require enforcement so that this special and priceless natural heritage site is protected, in perpetuity. (NGTMS 2003)

Work with various user groups is ongoing and must be considered a priority for the NPC to allow the time sensitive issues to be dealt with through the work of NPC staff and interested partners.

R.A. Ritchie (personal communication, 2007 June 17) has developed a priority list for managing trails. This list has been prioritized based on the environmental significance of the area and the severity of the ecological damage:

- Niagara Glen /Whirlpool Trail
- Dufferin Islands
- Queenston Heights/Niagara Escarpment
- Paradise Grove
- Botanical Gardens (indicated trail within the Botanical Gardens)
- Niagara Parks Recreation Trail

It is important that users understand that it is a privilege to use these trails and that continued abuse is not sustainable. Graffiti, garbage, and fire pits have become abundant along the trails, threatening sensitive flora and fauna and diminishing the beautiful scenery.

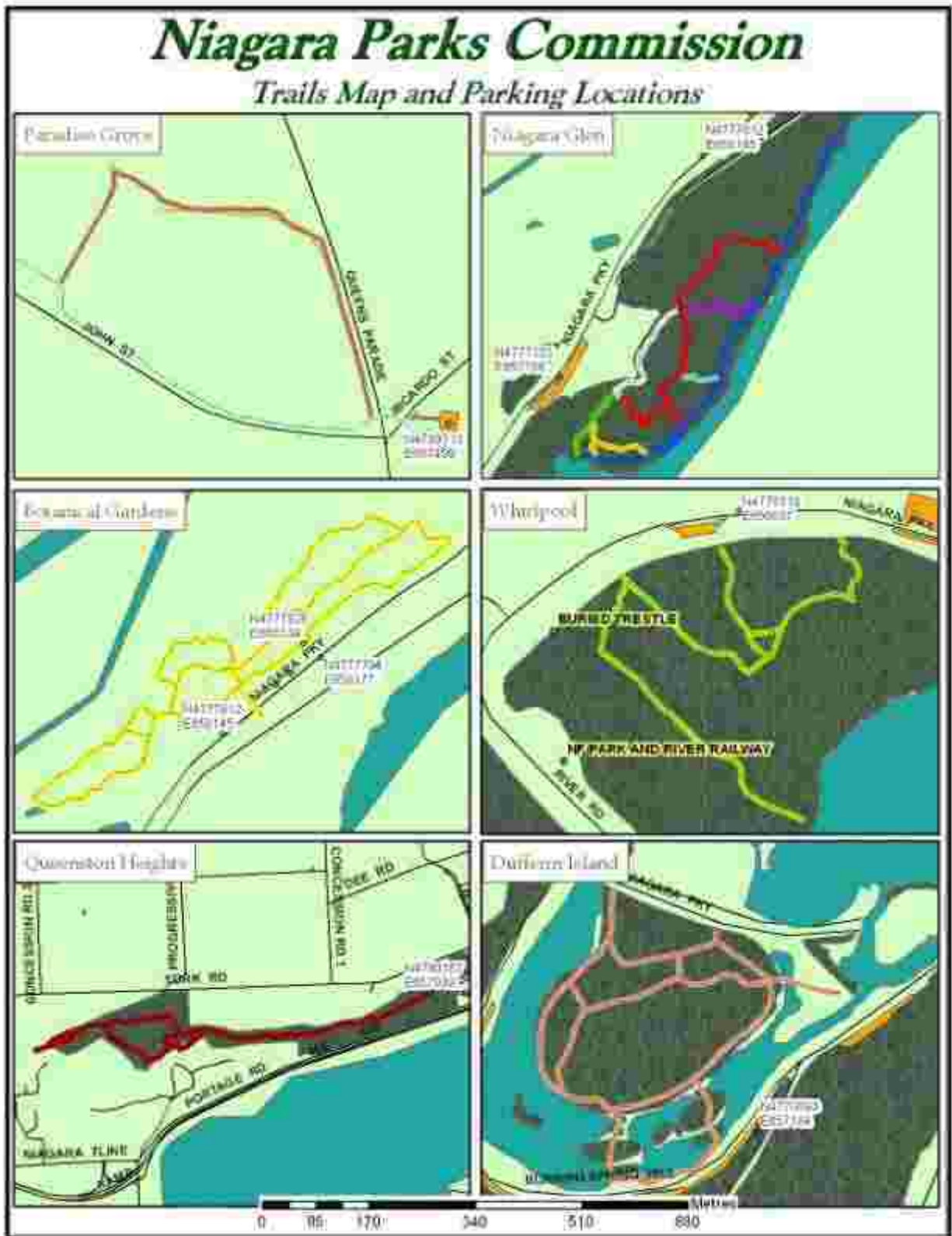


Figure 4.1: Sanctioned Trails.

## **4.1 Recommendations**

**Recommendation 7:** *Establish a continuous system of green and open spaces and improve the current trail system for the protection and enhancement of biodiversity.*

**Recommendation 8:** *More closely monitor use of the Niagara Glen in order to establish its' carrying capacity.*

**Recommendation 9:** *Increase monitoring of nature trails in order to discourage undesirable activities such as: graffiti, garbage, and fire pits on NPC lands.*

**Recommendation 10:** *Clearly mark sanctioned trails with signage and eliminate unsanctioned trails (e.g. block with logs or boulders to make the impassable).*

**Recommendation 11:** *Continue to work with the climbing community to develop a policy to permit bouldering to continue in the Niagara Glen. A climbing ban that would include bouldering has been considered for the Niagara Glen and was deemed unnecessary at this time. Following concerted efforts by the Ontario Access Coalition and others, continued access to the boulder fields has been secured in designated areas. A ban remains on topping out or any rope assisted climbing on Niagara Parks' properties.*

**Recommendation 12:** *Control the erosion of trails.*

**Recommendation 13:** *Examine the existing trail network in relation to the location of rare species and sensitive habitats. Consider re-routing trails to avoid these areas to reduce potential impacts*

## 5. SURFACE WATER QUALITY MANAGEMENT

The Niagara River is classified by the International Joint Commission (IJC) between Canada and the United States as an Area of Concern (AOC) because human activities are believed to have caused or are likely to cause impairment of beneficial uses or impairment of the area's ability to support aquatic life (IJC 2002). Most of the environmental issues on the Canadian side of the river are associated with non-point sources of pollution, such as excessive nutrients (phosphorus) and sedimentation (erosion) from agriculture activities as well as toxics from stormwater runoff (Environment Canada 2003; U.S. Environmental Protection Agency 2006).

The NPCA has conducted numerous watershed plans for the Niagara Peninsula. Reports relevant to the NPC include: One Mile Creek Watershed Plan (2005), Central Welland River Watershed Plan (2007a), Fort Erie Creeks Watershed Plan (2007b), Lake Erie Northshore Watershed Plan (2007c), Niagara-on-the-Lake Watershed Plan (2007e), and South Niagara Falls Watershed Plan (2007g). The Regional Municipality of Niagara (1990) has also completed an assessment of fish habitat at stream crossings along a proposed waste pipeline near Niagara-On-The-Lake.

The NPC, with funding and support from the Great Lakes Sustainability Fund (GLSF) and the NPCA, has been working to improve the quality of the water that flows through its lands (NPC 2004/2005). The NPC in conjunction with numerous partners and, with funding from GLSF has created a number of riparian buffer demonstration sites. These sites not only benefit water quality, they are also key habitat areas for numerous species of flora and fauna, including Species at Risk. These sites have been documented in detail in the Plummer, Fresque, Middleton, and Brown (2006) report on Riparian Area Management. When there are large quantities of contaminated materials, such as organic and non-organic fertilizers and pesticides, riparian zones act as interfaces between terrestrial and aquatic ecosystems and are critical for the water quality of the area (Gregory *et al.* 1991; Binford & Karty 2006; Naimen, Décamps, & Pollock 1993). Stream banks that lack riparian vegetation are often unstable and subject to mass erosion, which can widen the banks by several to tens of metres annually. Major bank erosion is 30 times more prevalent on non-vegetated banks exposed to currents compared to vegetated banks (Naimen & Décamps 1997).

Riparian zones also provide refuge for flora and fauna. The mixture of wet and dry lands, microclimate, and safe corridors allow for a variety of species, thus enhancing the biodiversity of a region. Because the NPC lands are surrounded so extensively by agricultural lands, it is essential that the NPC continue to maintain and enhance riparian zones on its lands and to encourage surrounding private landowners to do the same.

Future riparian management initiatives are important for improving water quality and wildlife habitats. The following sites have been identified as top priorities for management:

1. Frenchman's Lane
2. Detenbeck Creek
3. Brown's Point Creek
4. Upper Whirlpool Woodland
5. Chinguapin Oaks Savannah
6. Ussher's Creek Islands
7. Service Road 58
8. Switch Road Shoreline

Research related to the other waterways that pass through the NPC lands is still needed; however a study conducted by Niagara College students identified the following sites as requiring immediate attention (Beaton, Nunes, & Linton 2006):

- Niagara River 5 (Queenston),
- Niagara River 18, and
- Niagara River Shoreline (on a priority basis).

Water conservation is another opportunity for the NPC in terms of water quality management. Conserving water has economic, social, and environmental benefits. By reducing the amount of water consumed: (1) the NPC would be reducing its own expenditures on water resources; (2) the Municipality of Niagara would be reducing the amount of resources allocated to the treatment of wastewater; (3) the quality of water for drinking and recreational activities would improve, and (4) aquatic habitats would be more hospitable for wildlife.

Another area of focus for the NPC's water quality management strategy is the establishment of stronger partnerships, which will inevitably lead to greater levels of funding and support from outside organizations. Partnerships will also ensure that the work being done to restore water quality is consistent with current initiatives being undertaken throughout the region. The NPCA has identified a number of strategies that can be implemented by landowners, including the NPC (Table 5.1).

**Table 5.1: List of strategies for watershed management as outlined by the Niagara Peninsula Conservation Authority (Aquafor Beech Limited & LURA Consulting Limited 2005).**

<b>Strategy</b>	<b>Action</b>	<b>Benefits</b>	<b>Priority</b>
Stream Clean Up Program	Remove leaf litter and debris from stream	Decrease West Nile sites, improve stream flow	Short Term
In stream Habitat Enhancement	Remove barriers / channel constrictions; naturalized stream rehabilitation	Improved instream habitats, improved flow conveyance	Short and Medium Term
Streamside Habitat Enhancement	Tree/shrub plantings; reduced lawn maintenance along stream	Improved habitat, stream shading, water quality enhancement	Short and Medium Term

## **5.1 Recommendations**

**Recommendation 14:** Continue to maintain and enhance riparian habitat and encourage surrounding landowners to engage in stewardship activities to protect these important areas (e.g. through riparian plantings and stream bank stabilization projects).

**Recommendation 15:** Continue to establish and monitor riparian buffer demonstration sites.

**Recommendation 16:** *Work with binational partners to further enhance the impact that the NPC can have on water conservation in the area.*

**Recommendation 17:** *Incorporate the NPCA's recommendations for private landowners that have been or will be included in the completed watershed plans.*

**Recommendation 18:** Work with partners to reduce water consumption and incorporate water conservation throughout NPC operations.

## 6. DEVELOPED AND MAINTAINED PROPERTIES

Developed and maintained properties are those sites that have been altered from their natural state and are meticulously maintained by the NPC for aesthetic or recreational purposes.

### 6.1 Golf Courses

The total area of the Niagara Park's land that has been developed for golf activities is approximately 513 hectares (M. Buma, personal communication, 2007 July 19). This equates to approximately 39% of the total Niagara Parks land. Courses include the Legends on the Niagara (approximately 437 hectares), the Whirlpool Golf Course (approximately 70 hectares), and Oak Hall Golf Course (approximately 5.7 hectares). These courses range in age, size, and natural features (Figure 1.2). Golf courses both offer potential for wildlife conservation and pose a threat to ecosystem functions. For this reason golf course management is of great significance to the sustainability of The Niagara Parks Commission.

Management practices of golf courses are often detrimental to the wildlife and ecological function of the area. The impacts of fertilizers and herbicides can produce far-reaching, long-term effects. While the application of these treatments is typically focused on greens and tees, the impacts are typically found in fairways, semi-rough areas, drainage ditches, and in some instances, areas of rough. Impacts of these treatments can vary from simplifying the plant community to eliminating sources of food for wildlife or contaminating water sources. Altering natural drainage patterns and clearing out rough areas can also lead to a reduction of habitat and resources for flora and fauna (Green & Marshall 1986).

A number of researchers have identified wildlife conservation as a realistic goal for golf course maintenance (Blair, 1993; Cristol & Rodewal 2005; Gange, Lindsay, & Schofield 2003; Green & Marshall 1986; Terman 1997). A study of naturalistic golf courses (those with substantial amounts of native wildlife habitat) found that these courses can in fact support a significant number of birds, including many threatened species. The golf courses studied had the same total bird species richness, but the relative abundance of specific bird species was lower on the golf courses that had not been naturalized. The study concluded that naturalistic golf courses could compliment biological reserves, military reservations, greenbelts, parks, farms, backyards, and other units of the regional habitat mosaic. Large amounts of habitat on naturalistic golf courses also reduces water runoff, irrigation, and chemical outputs that are required to maintain the high standards that golfers have come to expect. A naturalistic golf course may also engage community members in habitat preservation issues and attract the golfing community to the flora and fauna sustained within the area (Terman 1997). Because there are already three golf courses operating on the Niagara Parks land, it is important to work to reduce the negative impacts that may be associated with their operations and to increase and enhance the existing habitats.

One opportunity available to the Niagara Parks Commission is through the Audubon Cooperative Sanctuary Program for Golf Courses (ACSP). The five management areas that ACSP's focus on are (Audubon International 2007):

1. Wildlife and Habitat Management
2. Chemical Use Reduction and Safety
3. Water Conservation
4. Water Quality Management
5. Outreach and Education

This program seeks to add value to golf facilities by improving (Audubon International 2007):

- Environmental Quality - Through the development of an environmental management plan, the NPC can work to organize management practices and set goals to improve the environmental quality of the area.
- Image and Reputation - Proven environmental performance can help the NPC golf courses to differentiate themselves from others and to add value by improving public relations and marketing opportunities that attract new golfers or club members.
- Customer Satisfaction - By enhancing the natural elements of a course, the NPC can enrich golfers' experiences of the game. Surveys show that golfers rank "being outside in nature" among their top reasons for playing golf.
- Financial Performance - An effective golf course environmental management plan can result in reduced insurance premiums, as well as reduced costs for energy, water, pesticides, fertilizers, equipment wear, and labour.
- Worker Safety and Reduced Liability - Best practices for chemical management reduce exposure and liability risks associated with storing, handling, and applying chemicals.
- Improved Efficiency - Proper environmental management cuts down on waste and promotes efficient operations.
- Preserves the *Nature of the Game* - Enhancing and protecting golf course natural areas preserves the outdoor experience that the game of golf provides.

While the NPC is part of the Audubon program, at present they are only attempting to follow the integrated pest management practices (see Section 7.3.1) and need to move forward with any other initiatives (T. Newton & B. Moore, personal communication, 2007 July 31). It would also be beneficial to look into some of the other certification programs that Audubon has to offer, such as:

- Audubon Classic Program – Assists organizations in maximizing opportunities to improve environmental efficiency and nature conservation when redeveloping or restoring facilities.
- Audubon Cooperative Sanctuary Program – Aids organizations in developing and implementing environmental management plans in order to improve environmental performance and promote conservation efforts.

## **6.2 Gardens**

The NPC is famous around the world for its gardens. Within the maintenance manual of the Niagara Parks, gardens have been given a top priority in terms of resources allocated to their maintenance. High maintenance parkland in Queen Victoria Park and the Botanical Gardens require fertilizers and pesticides because they consist mainly of non-native species that are not conditioned for the soil and climate of the area. Water necessary to maintain these areas is



primarily drawn directly from the Niagara River. One initiative that is currently being assessed by the NPC is the development of a native plant nursery (NPC, personal communication, 2007 July 9). This nursery would include only plant species native to the area and can be seen as a first step in developing more native plant initiatives throughout the Niagara Parks system. While the maintenance manual suggests planting more native species in order to reduce the need for fertilizers and pesticides, there are no clear targets for the development of this standard.

### **6.3 Other Maintained Areas**

The Maintenance Manual for the NPC (last updated in 2006) outlines the general maintenance operations that are undertaken by Niagara Parks employees. The basic structure of the manual is to outline the general maintenance activities including why the specific maintenance activity is required, who will carry it out, the frequency of maintenance required, and how many hours will be spent each time the maintenance activity is carried out.

The manual was developed to provide a baseline for work performed from an operations standpoint. Current practices encourage reduced mowing frequency. Environmental issues that are mentioned include erosion control, water contamination, and the use of native plants. Clearing of invasive plant species is being carried out on a limited basis along the river bank when possible. Developing management standards aligned with environmental criteria and incorporating them with documents including the Maintenance Manual would help the NPC to refocus its attention towards environmental stewardship. These programs also help the NPC to gain an understanding of where they need to be and how to get there in terms of environmental performance. Maintaining up to date standards will benefit the NPC in all future initiatives and in achieving sustainable operations.

### **6.4 Integrated Pest Management**

Over the past 15 years the NPC has been working to reduce pesticide use on its lands and to establish an Integrated Pest Management (IPM) program. IPM can be defined as “a decision support system for the selection and use of pest control tactics, singly or harmoniously coordinated into a management strategy, based on cost/benefit analyses that take into account the interests of and impacts on producers, society, and the environment” (Kogan 1998: 249). The IPM Accreditation Program (IPMAP) focuses on companies, park systems, golf clubs and their superintendents, and other interested institutions who demonstrate a knowledge of and commitment to the principles of Integrated Pest Management (IPM) through a process of certification, audit, and professional development (IPM-PHC Council of Ontario 2007). Certifications like IPM and Audubon highlight the Niagara Park’s commitment to environmental stewardship and market this image to the public. Certification does not necessarily mean greater expenses; the NPC may in fact benefit financially from this type of certification (section 6.1.).

### **6.5 Recommendations**

**Recommendation 19:** Encourage NPC golf courses to adopt a naturalistic approach and obtain certification for NPC golf courses from the Audubon Cooperative Sanctuary Program.

**Recommendation 20:** *Incorporate environmental considerations into all practice by setting standards to reduce maintenance requirements for pesticide and fertilizer use,*

*irrigation, and mowing based on alternative practices and technological advancements. Alternatives such as planting native plant species are mentioned within the maintenance manual as an objective for reducing weeds, maintenance, chemical use, and erosion (NPC 2006), but the NPC should establish priority areas for naturalization and set deadlines for these initiatives. The goals and targets for environmental stewardship should be incorporated into the maintenance manual for Parks staff.*

**Recommendation 21:** *Become Integrated Pest Management (IPM) certified through the IPM-PHC Council of Ontario.*

**Recommendation 22:** *In the tradition of NPC's international horticultural excellence, become an acknowledged leader in modern approaches to grounds maintenance as a tool for biodiversity conservation.*

## 7. SUMMARY OF PUBLIC CONSULTATION

Public consultation regarding this Environmental Land Management Plan began on September 12<sup>th</sup>, 2008 when NPC hosted a Round Table discussion at the pavilion at Niagara Glen. The goals were to publically launch the NPC Environmental Land Management Plan and to continue discussions on rehabilitation efforts for the Niagara Glen site specifically.

The function was attended by 90 people who heard from a variety of speakers on topics of importance from the current state of the Glen by retired Parks Naturalist, Robert Ritchie to experts on Species at Risk. The group was then led in discussions on 5 topics focusing on the Niagara Glen. The topics were: 1) access to the Glen; 2) a tree walk; 3) geo-caching activities; 4) bouldering activities; and 5) formation for Friends of Niagara Parks – Niagara Glen group.

During the event, NPC Chairman requested feedback from the public on the first draft of the Environmental Land Management Plan, penned by Brock University for the NPC. The document was made available on our NPC Nature website and in hard copy at three NPC locations.

The information collected by the session moderator was then summarized and presented to the NPC.

Since this forum public input has been collected by NPC staff. The majority of feedback came from those concerned with the possibility of having bouldering banned from the Niagara Glen. Of the comments received 260 were a form letter requesting the NPC engage the bouldering community to assist in creating a bouldering management plan, similar to the work completed to create a geo-caching policy for the Parks. Another 65 responses were received from this group which were not form letters. Many were from individuals offering their assistance to help in policy formation on this topic. An online petition was created also requesting NPC to create a bouldering management plan.

11 comments were received on non- bouldering topics. These included two requests to move the stairs, 5 comments to, in some way, limit access to the Niagara Glen. Nine were in favour of paying a fee to access the Niagara Glen and other sensitive sites if the fees were known to be going to rehabilitation efforts.

On November 13<sup>th</sup> the inaugural meeting of Friends of Niagara Parks – Niagara Glen was hosted by NPC at the Chapel in Queenston. This group has met monthly since that date to discuss the issues related to the start up of the group and the issues related to the Niagara Glen.

In addition, an Open House was held in April 2009 to allow the public the opportunity to discuss their concerns about a number of NPC initiatives including prescribed burns, invasive species removal, gypsy moth control.

There has been much interest in this Environmental Land Management Plan especially from partner organizations. A number of speaking engagements to outline the Plan are planned for the coming months.

## 8. SUMMARY OF RECOMMENDATIONS

### **NPC Environmentally Sensitive Areas:**

**Recommendation 1:** *Work with partners, especially the Niagara Peninsula Conservation Authority, the Regional Municipality of Niagara and the Provincial government to: (1) create a common definition for Environmentally Sensitive Areas; and (2) generate a list of criteria for classifying areas as environmentally sensitive. This will ensure a clear direction for management and a common language, essential for the sustainability of partnerships.*

### **Biodiversity Conservation:**

**Recommendation 2:** *Employ an ecosystem approach to management based on accepted scientific principles and practices.*

**Recommendation 3:** *Complete a detailed inventory of flora and fauna on all NPC lands. It is especially important to discover where species at risk are located as these areas will be a top priority for protection and management.*

**Recommendation 4:** *Follow the Global Invasive Species Program protocol for invasive species management.*

**Recommendation 5:** *Develop a carbon sequestration program.*

**Recommendation 6:** *Continue to monitor and repair sites of erosion.*

### **Nature Trails Management:**

**Recommendation 7:** *Establish a continuous system of green and open spaces and improve the current trail system for the protection and enhancement of biodiversity.*

**Recommendation 8:** *More closely monitor use of the Niagara Glen in order to establish its' carrying capacity.*

**Recommendation 9:** *Increase monitoring of nature trails in order to discourage graffiti, garbage, and fire pits on NPC lands.*

**Recommendation 10:** *Clearly mark sanctioned trails with signage and eliminate unsanctioned trails (e.g. block with logs or boulders to make them impassable).*

**Recommendation 11:** *Continue to work with the climbing community to develop a policy to permit bouldering to continue in the Niagara Glen. A climbing ban that would include bouldering has been considered for the Niagara Glen and was deemed unnecessary at this time. Following concerted efforts by the Ontario Access Coalition and others, continued access to the boulder fields has been secured in designated areas. A ban remains on topping out or any rope assisted climbing on Niagara Parks' properties.*

**Recommendation 12:** *Control the erosion of trails.*

**Recommendation 13:** *Examine the existing trail network in relation to the location of rare species and sensitive habitats. Consider re-routing trails to avoid these areas to reduce potential impacts*

**Surface Water Quality:**

**Recommendation 14:** Continue to maintain and enhance riparian habitat and encourage surrounding landowners to engage in stewardship activities to protect these important areas (e.g. through riparian plantings and stream bank stabilization projects).

**Recommendation 15:** Continue to establish and monitor riparian buffer demonstration sites.

**Recommendation 16:** *Work with binational partners to further enhance the impact that the NPC can have on water conservation in the area.*

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**Recommendation 18:** Work with partners to reduce water consumption and incorporate water conservation throughout NPC operations.

***Developed and Maintained Properties:***

**Recommendation 19:** Encourage NPC golf courses to adopt a naturalistic approach and obtain certification for NPC golf courses from the Audubon Cooperative Sanctuary Program.

**Recommendation 20:** *Incorporate environmental considerations into all practice by setting standards to reduce maintenance requirements for pesticide and fertilizer use, irrigation, and mowing based on alternative practices and technological advancements. Alternatives such as planting native plant species are mentioned within the maintenance manual as an objective for reducing weeds, maintenance, chemical use, and erosion (NPC 2006), but the NPC should establish priority areas for naturalization and set deadlines for these initiatives. The goals and targets for environmental stewardship should be incorporated into the maintenance manual for Parks staff.*

**Recommendation 21:** *Become Integrated Pest Management (IPM) certified through the IPM-PHC Council of Ontario.*

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## APPENDIX B: NPC's Environmentally Sensitive Areas

This chart is a working list of the NPC's ESAs as identified by R.A. Ritchie (personal communication, 2007 July 17). This table should be seen as a work in progress, rather than a comprehensive summary.

<b>South Niagara River Parkway</b>	<b>ESA Classification</b>
Memorial Grove	Restoration Area
Woodlot south of Old Fort Erie	Unrestored
Legends on the Niagara Golf Course	Disturbed
Shoreline	Disturbed
Ussher's Creek	Restoration Area
Niagara River (sporadic)	Restoration Area
<b>Queen Victoria Park</b>	
Moraine surrounding the Falls (south half)	Undisturbed
Moraine surrounding the Falls (north half)	Restoration Area
Rapids View Parking	Disturbed
Dufferin Islands	Restoration Area
Shoreline from Dufferin Islands to Maid of the Mist	Disturbed
Niagara River (sporadic)	Restoration Area
<b>North Niagara River Parkway</b>	
Shoreline from Maid of the Mist to North Whirlpool	Undisturbed
Whirlpool Trails	Restoration Area
Whirlpool Road to Great Wolf Lodge (on west side of Parkway)	Disturbed
Niagara Glen	Restoration Area
Lands surrounding the Hydro Access Road/shoreline	Undisturbed
Land across from the Butterfly Conservatory	Restoration Area
Shoreline from Queenston Village to Niagara-On-The-Lake (excluding Brown's Point)	Restoration Area
Ravine at McFarland Park	Restoration Area
Paradise Grove	Restoration Area
Niagara River (sporadic)	Restoration Area



## APPENDIX C: Status Designations for Species at Risk in Ontario

The following is a list of official status designations assigned to 186 native Ontario species by the OMNR (2007). Ontario status designations are based on a complementary review and assessment processes implemented at national and provincial levels. The national assessment process takes place under the support of COSEWIC.

The designations assigned to species on the following list are, in most cases, in agreement with those assigned by COSEWIC; however, OMNR has assigned certain species a status designation that differs from the national designation because of differing circumstances for the species in Ontario. For example, species whose Ontario status is of greater concern than the status elsewhere in Canada have been assigned a higher designation by OMNR. Species that can be found to be at risk on the NPC lands have been highlighted in orange (■) by R.A. Ritchie (personal communication, 2007 July 17). This, however, does not necessarily mean that species that have not been highlighted are irrelevant to the NPC.

<u>Taxonomy</u>	<u>Common Name</u>	<u>Scientific Name</u> ▲	<u>OMNR Status</u>
Fish	<a href="#">Lake Sturgeon</a>	<a href="#">Acipenser fulvescens</a>	SC
Amphibians	<a href="#">Northern Cricket Frog</a>	<a href="#">Acris crepitans</a>	END
Plants	<a href="#">Gattinger's Agalinis</a>	<a href="#">Agalinis gattingeri</a>	END
Plants	<a href="#">Skinner's Agalinis</a>	<a href="#">Agalinis skinneriana</a>	END
Plants	<a href="#">Colicroot</a>	<a href="#">Aletris farinosa</a>	THR
Amphibians	<a href="#">Jefferson Salamander</a> [PDF fact sheet]	<a href="#">Ambystoma jeffersonianum</a>	THR
Amphibians	<a href="#">Small-mouthed Salamander</a>	<a href="#">Ambystoma texanum</a>	END
Amphibians	<a href="#">Tiger Salamander</a>	<a href="#">Ambystoma tigrinum</a>	EXP
Plants	<a href="#">Scarlet Ammannia</a>	<a href="#">Ammannia robusta</a>	END
Fish	<a href="#">Eastern Sand Darter</a>	<a href="#">Ammocrypta pellucida</a>	THR
Birds	<a href="#">Henslow's Sparrow</a>	<a href="#">Ammodramus henslowii</a>	END
Fish	<a href="#">American Eel</a>	<a href="#">Anquilla rostrata</a>	END
Reptiles	<a href="#">Spiny Softshell</a>	<a href="#">Apalone spinifera</a>	THR
Birds	<a href="#">Golden Eagle</a>	<a href="#">Aquila chrysaetos</a>	END
Plants	<a href="#">Green Dragon</a>	<a href="#">Arisaema dracontium</a>	SC
Plants	<a href="#">Forked Three-awned Grass</a>	<a href="#">Aristida basiramea</a>	END
Plants	<a href="#">Tuberous Indian-plantain</a>	<a href="#">Arnoglossum plantagineum</a>	SC
Birds	<a href="#">Short-eared Owl</a>	<a href="#">Asio flammeus</a>	SC
Plants	<a href="#">American Hart's-tongue Fern</a>	<a href="#">Asplenium scolopendrium americanum</a>	SC
Plants	<a href="#">Branched Bartonnia</a>	<a href="#">Bartonia paniculata</a>	THR
Plants	<a href="#">Cherry Birch</a>	<a href="#">Betula lenta</a>	END

<b>Taxonomy</b>	<b>Common Name</b>	<b>Scientific Name ▲</b>	<b>OMNR Status</b>
Mosses	<a href="#">Spoon-leaved Moss</a>	<a href="#">Bryoandersonia illecebra</a>	END
Plants	<a href="#">Bluehearts</a>	<a href="#">Buchnera americana</a>	END
Amphibians	<a href="#">Fowler's Toad</a>	<a href="#">Bufo fowleri</a>	THR
Birds	<a href="#">Red Knot (<i>rufa</i> subspecies)</a>	<a href="#">Calidris canutus rufa</a>	END
Insects	<a href="#">Frosted Elfin</a>	<a href="#">Callophrys irus</a>	END
Plants	<a href="#">Wild Hyacinth</a>	<a href="#">Camassia scilloides</a>	THR
Mammals	<a href="#">Eastern Wolf</a>	<a href="#">Canis lupus lycaon</a>	SC
Plants	<a href="#">Juniper Sedge</a>	<a href="#">Carex juniperorum</a>	END
Plants	<a href="#">False Hop Sedge</a>	<a href="#">Carex lupuliformis</a>	END
Plants	<a href="#">American Chestnut</a>	<a href="#">Castanea dentata</a>	END
Plants	<a href="#">Dwarf Hackberry</a>	<a href="#">Celtis tenuifolia</a>	THR
Birds	<a href="#">Piping Plover</a>	<a href="#">Charadrius melodus</a>	END
Plants	<a href="#">Spotted Wintergreen</a>	<a href="#">Chimaphila maculata</a>	END
Birds	<a href="#">Black Tern</a>	<a href="#">Chlidonias niger</a>	SC
Plants	<a href="#">Hill's Thistle</a>	<a href="#">Cirsium hillii</a>	THR
Plants	<a href="#">Pitcher's Thistle</a>	<a href="#">Cirsium pitcheri</a>	END
Reptiles	<a href="#">Spotted Turtle</a>	<a href="#">Clemmys guttata</a>	END
Fish	<a href="#">Redside Dace</a>	<a href="#">Clinostomus elongatus</a>	END
Birds	<a href="#">Northern Bobwhite</a>	<a href="#">Colinus virginianus</a>	END
Plants	<a href="#">Spring Blue-eyed Mary</a>	<a href="#">Collinsia verna</a>	EXP
Reptiles	<a href="#">Blue Racer</a>	<a href="#">Coluber constrictor foxii</a>	END
Fish	<a href="#">Upper Great Lakes Kiyi</a>	<a href="#">Coregonus kiyi kiyi</a>	SC
Fish	<a href="#">Shortnose Cisco</a>	<a href="#">Coregonus reighardi</a>	END
Fish	<a href="#">Shortjaw Cisco</a>	<a href="#">Coregonus zenithicus</a>	THR
Plants	<a href="#">Eastern Flowering Dogwood</a>	<a href="#">Cornus florida</a>	END
Birds	<a href="#">Yellow Rail</a>	<a href="#">Coturnicops noveboracensis</a>	SC
Reptiles	<a href="#">Timber Rattlesnake</a>	<a href="#">Crotalus horridus</a>	EXP
Plants	<a href="#">Small White Lady's-slipper</a>	<a href="#">Cypripedium candidum</a>	END
Insects	<a href="#">Monarch</a>	<a href="#">Danaus plexippus</a>	SC
Mammals	<a href="#">Beluga</a>	<a href="#">Delphinapterus leucas</a>	SC
Birds	<a href="#">Cerulean Warbler</a>	<a href="#">Dendroica cerulea</a>	SC
Birds	<a href="#">Kirtland's Warbler</a>	<a href="#">Dendroica kirtlandii</a>	END
Plants	<a href="#">Illinois Tick-trefoil</a>	<a href="#">Desmodium illinoense</a>	EXP
Amphibians	<a href="#">Northern Dusky Salamander</a>	<a href="#">Desmognathus fuscus</a>	END
Amphibians	<a href="#">Allegheny Mountain Dusky Salamander</a>	<a href="#">Desmognathus ochrophaeus</a>	END
Reptiles	<a href="#">Eastern Foxsnake</a>	<a href="#">Elaphe gloydi</a>	THR
Reptiles	<a href="#">Eastern Ratsnake</a>	<a href="#">Elaphe obsoleta</a>	THR
Plants	<a href="#">Horsetail Spike-rush</a>	<a href="#">Eleocharis equisetoides</a>	END

<b>Taxonomy</b>	<b>Common Name</b>	<b>Scientific Name</b> ▲	<b>OMNR Status</b>
Birds	<a href="#">Acadian Flycatcher</a>	<a href="#">Empidonax virescens</a>	END
Reptiles	<a href="#">Blanding's Turtle</a>	<a href="#">Emydoidea blandingii</a>	THR
Plants	<a href="#">False Rue-anemone</a>	<a href="#">Enemion biternatum</a>	THR
Molluscs	<a href="#">Northern Riffleshell</a>	<a href="#">Epioblasma torulosa rangiana</a>	END
Molluscs	<a href="#">Snuffbox</a>	<a href="#">Epioblasma triquetra</a>	END
Fish	<a href="#">Gravel Chub</a>	<a href="#">Erimystax x-punctatus</a>	EXP
Fish	<a href="#">Lake Chubsucker</a>	<a href="#">Erimyzon sucetta</a>	THR
Insects	<a href="#">Eastern Persius Duskywing</a>	<a href="#">Erynnis persius persius</a>	EXP
Fish	<a href="#">Grass Pickerel</a>	<a href="#">Esox americanus vermiculatus</a>	SC
Reptiles	<a href="#">Five-lined Skink</a>	<a href="#">Eumeces fasciatus</a>	SC
Plants	<a href="#">White Wood Aster</a>	<a href="#">Eurybia divaricata</a>	THR
Fish	<a href="#">Cutlip Minnow</a>	<a href="#">Exoglossum maxillingua</a>	THR
Birds	<a href="#">Peregrine Falcon</a> [PDF fact sheet]	<a href="#">Falco peregrinus</a>	THR
Mosses	<a href="#">Pygmy Pocket Moss</a>	<a href="#">Fissidens exilis</a>	SC
Plants	<a href="#">American Columbo</a>	<a href="#">Frasera caroliniensis</a>	END
Plants	<a href="#">Blue Ash</a>	<a href="#">Fraxinus quadrangulata</a>	SC
Fish	<a href="#">Blackstripe Topminnow</a>	<a href="#">Fundulus notatus</a>	SC
Plants	<a href="#">White Prairie Gentian</a>	<a href="#">Gentiana alba</a>	END
Reptiles	<a href="#">Wood Turtle</a> [PDF fact sheet]	<a href="#">Glyptemys insculpta</a>	END
Reptiles	<a href="#">Northern Map Turtle</a>	<a href="#">Graptemys geographica</a>	SC
Mammals	<a href="#">Wolverine</a>	<a href="#">Gulo gulo</a>	THR
Plants	<a href="#">Kentucky Coffee-tree</a>	<a href="#">Gymnocladus dioicus</a>	THR
Amphibians	<a href="#">Spring Salamander</a>	<a href="#">Gyrinophilus porphyriticus</a>	EXP
Birds	<a href="#">Bald Eagle (north of the French and Mattawa Rivers)</a>	<a href="#">Haliaeetus leucocephalus</a>	SC
Birds	<a href="#">Bald Eagle (south of the French and Mattawa Rivers)</a>	<a href="#">Haliaeetus leucocephalus</a>	END
Reptiles	<a href="#">Eastern Hog-nosed Snake</a>	<a href="#">Heterodon platirhinos</a>	THR
Plants	<a href="#">Swamp Rose-mallow</a>	<a href="#">Hibiscus moscheutos</a>	SC
Plants	<a href="#">Goldenseal</a>	<a href="#">Hydrastis canadensis</a>	THR
Plants	<a href="#">Lakeside Daisy</a>	<a href="#">Hymenoxys herbacea</a>	THR
Fish	<a href="#">Northern Brook Lamprey</a>	<a href="#">Ichthyomyzon fossor</a>	SC
Birds	<a href="#">Yellow-breasted Chat</a>	<a href="#">Icteria virens</a>	SC
Fish	<a href="#">Bigmouth Buffalo</a>	<a href="#">Ictiobus cyprinellus</a>	SC
Plants	<a href="#">Dwarf Lake Iris</a>	<a href="#">Iris lacustris</a>	THR
Plants	<a href="#">Engelmann's Quillwort</a> [PDF fact sheet]	<a href="#">Isoetes engelmannii</a>	END
Plants	<a href="#">Small Whorled Pogonia</a>	<a href="#">Isotria medeoloides</a>	END
Plants	<a href="#">Large Whorled Pogonia</a>	<a href="#">Isotria verticillata</a>	END
Birds	<a href="#">Least Bittern</a>	<a href="#">Ixobrychus exilis</a>	THR

<b>Taxonomy</b>	<b>Common Name</b>	<b>Scientific Name</b> ▲	<b>OMNR Status</b>
Plants	<a href="#">Butternut</a>	<a href="#">Juglans cinerea</a>	END
Plants	<a href="#">American Water-willow</a>	<a href="#">Justicia americana</a>	THR
Reptiles	<a href="#">Milksnake</a>	<a href="#">Lampropeltis triangulum</a>	SC
Molluscs	<a href="#">Wavy-rayed Lampmussel</a>	<a href="#">Lampsilis fasciola</a>	END
Birds	<a href="#">Loggerhead Shrike</a>	<a href="#">Lanius ludovicianus</a>	END
Fish	<a href="#">Spotted Gar</a>	<a href="#">Lepisosteus oculatus</a>	THR
Fish	<a href="#">Warmouth</a>	<a href="#">Lepomis gulosus</a>	SC
Lichens	<a href="#">Flooded Jellyskin</a>	<a href="#">Leptogium rivulare</a>	THR
Plants	<a href="#">Slender Bush-clover (Tallgrass Prairie Heritage Park, Ojibway Park and Black Oak Heritage Park in the City of Windsor)</a>	<a href="#">Lespedeza virginica</a>	END
Plants	<a href="#">Dense Blazing Star</a>	<a href="#">Liatris spicata</a>	THR
Molluscs	<a href="#">Eastern Pondmussel</a>	<a href="#">Ligumia nasuta</a>	END
Plants	<a href="#">Purple Twayblade</a>	<a href="#">Liparis liliifolia</a>	END
Plants	<a href="#">Small-flowered Lipocarpha</a>	<a href="#">Lipocarpha micrantha</a>	THR
Insects	<a href="#">Karner Blue</a>	<a href="#">Lycaeides melissa samuelis</a>	EXP
Fish	<a href="#">Silver Chub</a>	<a href="#">Macrhybopsis storeriana</a>	SC
Plants	<a href="#">Cucumber Tree</a>	<a href="#">Magnolia acuminata</a>	END
Birds	<a href="#">Red-headed Woodpecker</a>	<a href="#">Melanerpes erythrocephalus</a>	SC
Mammals	<a href="#">Woodland Vole</a>	<a href="#">Microtus pinetorum</a>	SC
Fish	<a href="#">Spotted Sucker</a>	<a href="#">Minytrema melanops</a>	SC
Plants	<a href="#">Red Mulberry</a>	<a href="#">Morus rubra</a>	END
Fish	<a href="#">River Redhorse</a>	<a href="#">Moxostoma carinatum</a>	SC
Fish	<a href="#">Black Redhorse</a>	<a href="#">Moxostoma duquesnei</a>	THR
Reptiles	<a href="#">Lake Erie Watersnake</a>	<a href="#">Nerodia sipedon insularum</a>	END
Fish	<a href="#">Pugnose Shiner</a>	<a href="#">Notropis anogenus</a>	END
Fish	<a href="#">Bridle Shiner</a>	<a href="#">Notropis bifrenatus</a>	SC
Fish	<a href="#">Silver Shiner</a>	<a href="#">Notropis photogenis</a>	SC
Fish	<a href="#">Northern Madtom</a>	<a href="#">Noturus stigmosus</a>	END
Birds	<a href="#">Eskimo Curlew</a>	<a href="#">Numenius borealis</a>	END
Molluscs	<a href="#">Round Hickorynut</a>	<a href="#">Obovaria subrotunda</a>	END
Fish	<a href="#">Pugnose Minnow</a>	<a href="#">Opsopoeodus emiliae</a>	SC
Plants	<a href="#">Eastern Prickly Pear Cactus (Fish Point Provincial Nature Reserve on Pelee Island)</a>	<a href="#">Opuntia humifusa</a>	END
Plants	<a href="#">American Ginseng</a>	<a href="#">Panax quinquefolius</a>	END
Insects	<a href="#">Aweme Borer Moth</a>	<a href="#">Papaipema aweme</a>	END
Birds	<a href="#">American White Pelican</a>	<a href="#">Pelecanus erythrorhynchos</a>	THR
Fish	<a href="#">Channel Darter</a>	<a href="#">Percina copelandi</a>	THR
Plants	<a href="#">Broad Beech Fern</a>	<a href="#">Phegopteris hexagonoptera</a>	SC
Insects	<a href="#">West Virginia White</a>	<a href="#">Pieris virginiensis</a>	SC

<u>Taxonomy</u>	<u>Common Name</u>	<u>Scientific Name</u> ▲	<u>OMNR Status</u>
Plants	<a href="#">Heart-leaved Plantain</a>	<a href="#">Plantago cordata</a>	END
Plants	<a href="#">Eastern Prairie Fringed-orchid</a> [PDF fact sheet]	<a href="#">Platanthera leucophaea</a>	END
Molluscs	<a href="#">Round Pigtoe</a>	<a href="#">Pleurobema sintoxia</a>	END
Plants	<a href="#">Pink Milkwort</a>	<a href="#">Polygala incarnata</a>	END
Fish	<a href="#">Paddlefish</a>	<a href="#">Polyodon spathula</a>	EXP
Plants	<a href="#">Hill's Pondweed</a>	<a href="#">Potamogeton hillii</a>	SC
Plants	<a href="#">Ogden's Pondweed</a>	<a href="#">Potamogeton ogdenii</a>	END
Birds	<a href="#">Prothonotary Warbler</a>	<a href="#">Protonotaria citrea</a>	END
Plants	<a href="#">Common Hoptree</a>	<a href="#">Ptelea trifoliata</a>	THR
Molluscs	<a href="#">Kidneyshell</a>	<a href="#">Ptychobranchus fasciolaris</a>	END
Mosses	<a href="#">Incurved Grizzled Moss</a>	<a href="#">Ptychomitrium incurvum</a>	EXP
Mammals	<a href="#">Mountain Lion or Cougar</a>	<a href="#">Puma concolor</a>	END
Plants	<a href="#">Hoary Mountain-mint</a>	<a href="#">Pycnanthemum incanum</a>	END
Molluscs	<a href="#">Mapleleaf Mussel</a>	<a href="#">Quadrula quadrula</a>	THR
Plants	<a href="#">Shumard Oak</a>	<a href="#">Quercus shumardii</a>	SC
Birds	<a href="#">King Rail</a>	<a href="#">Rallus elegans</a>	END
Mammals	<a href="#">Woodland Caribou (Forest-dwelling boreal population)</a>	<a href="#">Rangifer tarandus caribou</a>	THR
Reptiles	<a href="#">Queen Snake</a>	<a href="#">Regina septemvittata</a>	THR
Plants	<a href="#">Climbing Prairie Rose</a>	<a href="#">Rosa setigera</a>	SC
Plants	<a href="#">Toothcup</a>	<a href="#">Rotala ramosior</a>	END
Fish	<a href="#">Atlantic Salmon (Great Lakes population)</a>	<a href="#">Salmo salar</a>	EXP
Fish	<a href="#">Aurora Trout</a>	<a href="#">Salvelinus fontinalis timagamiensis</a>	END
Mammals	<a href="#">Eastern Mole</a>	<a href="#">Scalopus aquaticus</a>	SC
Birds	<a href="#">Louisiana Waterthrush</a>	<a href="#">Seiurus motacilla</a>	SC
Molluscs	<a href="#">Mudpuppy Mussel</a>	<a href="#">Simpsonaias ambigua</a>	END
Reptiles	<a href="#">Massasauga</a>	<a href="#">Sistrurus catenatus</a>	THR
Plants	<a href="#">Round-leaved Greenbrier</a>	<a href="#">Smilax rotundifolia</a>	THR
Plants	<a href="#">Houghton's Goldenrod</a>	<a href="#">Solidago houghtonii</a>	THR
Plants	<a href="#">Riddell's Goldenrod</a>	<a href="#">Solidago riddellii</a>	SC
Plants	<a href="#">Showy Goldenrod</a>	<a href="#">Solidago speciosa</a>	END
Reptiles	<a href="#">Stinkpot</a>	<a href="#">Sternotherus odoratus</a>	THR
Plants	<a href="#">Wood-poppy</a>	<a href="#">Stylophorum diphyllum</a>	END
Plants	<a href="#">Willowleaf Aster</a>	<a href="#">Symphyotrichum praealtum</a>	THR
Plants	<a href="#">Crooked-stem Aster</a>	<a href="#">Symphyotrichum prenanthoides</a>	THR
Plants	<a href="#">Western Silvery Aster</a> [PDF fact sheet]	<a href="#">Symphyotrichum sericeum</a>	END
Mammals	<a href="#">American Badger</a> [PDF fact sheet]	<a href="#">Taxidea taxus</a>	END
Plants	<a href="#">Virginia Goat's-rue</a>	<a href="#">Tephrosia virginiana</a>	END

<u>Taxonomy</u>	<u>Common Name</u>	<u>Scientific Name</u> ▲	<u>OMNR Status</u>
Reptiles	<a href="#">Butler's Gartersnake</a>	<a href="#">Thamnophis butleri</a>	THR
Reptiles	<a href="#">Eastern Ribbonsnake</a>	<a href="#">Thamnophis sauritus</a>	SC
Plants	<a href="#">Few-flowered Club-rush or Bashful Bulrush (Pickering and Hamilton)</a> [PDF fact sheet]	Trichophorum planifolium	END
Plants	<a href="#">Drooping Trillium</a>	<a href="#">Trillium flexipes</a>	END
Plants	<a href="#">Nodding Pogonia</a>	<a href="#">Triphora trianthophora</a>	END
Birds	<a href="#">Greater Prairie-Chicken</a>	<a href="#">Typanuchus cupido</a>	EXP
Birds	<a href="#">Barn Owl</a> [PDF fact sheet]	<a href="#">Tyto alba</a>	END
Mammals	<a href="#">Grey Fox</a>	<a href="#">Urocyon cinereoargenteus</a>	THR
Mammals	<a href="#">Polar Bear</a>	<a href="#">Ursus maritimus</a>	SC
Plants	<a href="#">Deerberry</a>	<a href="#">Vaccinium stamineum</a>	THR
Birds	<a href="#">Golden-winged Warbler</a>	<a href="#">Vermivora chrysoptera</a>	SC
Molluscs	<a href="#">Rayed Bean</a>	<a href="#">Villosa fabalis</a>	END
Molluscs	<a href="#">Rainbow Mussel</a>	<a href="#">Villosa iris</a>	THR
Plants	<a href="#">Bird's-foot Violet</a>	<a href="#">Viola pedata</a>	END
Birds	<a href="#">Hooded Warbler</a>	<a href="#">Wilsonia citrina</a>	THR
Plants	<a href="#">Blunt-lobed Woodsia</a>	<a href="#">Woodsia obtusa</a>	END

## APPENDIX D: Alien invasive plant species reported on NPC lands

The following table is from a draft report being prepared for The Niagara Parks Commission by Oldham (2006) from the OMNR's Natural Heritage Information Centre. This table outlines the top invasive species that have been found on the NPC lands and the areas where they are located.

F = species known from NHIC fieldwork in 2006

L = species known from literature references

S = species known from collected specimens preserved in a variety of herbaria

Scientific Name	Common Name	invasive rank	Niagara River	first report	Glen - Whirlpool	Paradise Grove	Queenston	Dufferin Is
<i>Phragmites australis</i> (Cav.) Trin. ex Steudel	Common Reed	1	F L S	1987	F L S		L	F
<i>Lythrum salicaria</i> L.	Purple Loosestrife	2	F L S	1895	F L S	F		F L
<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	Garlic Mustard	4	F L S	1952	F L	F	L	L S
<i>Pinus sylvestris</i> L.	Scots Pine	5	F L S	1918	F S			
<i>Rhamnus frangula</i> L.	Glossy Buckthorn	7	F L S	1996	F			
<i>Bromus inermis</i> Leysser subsp. <i>inermis</i>	Smooth Brome	8	L S	1998				
<i>Phalaris arundinacea</i> L.	Reed Canary Grass	9	F L S	1890		F	L S	
<i>Lonicera tatarica</i> L.	Tartarian Honeysuckle	12	F L S	1890	F L S	F	L S	L S
<i>Elaeagnus umbellata</i> Thunb.	Autumn-olive	16	F S	2006		F		
<i>Myriophyllum spicatum</i> L.	European Water-milfoil	17	L S	1890				L
<i>Cynanchum rossicum</i> (Kleopov) Borh.	Swallow-wort	18	F S	2006		F		
<i>Acer pseudoplatanus</i> L.	Sycamore Maple	20	F L S	1987	F S	F L S		
<i>Potamogeton crispus</i> L.	Curly-leaved Pondweed	22	L S	1897				

Scientific Name	Common Name	invasive rank	Niagara River	first report	Glen - Whirlpool	Paradise Grove	Queenston	Dufferin Is
<i>Alnus glutinosa</i> (L.) Gaertner	Black Alder	23	F L S	1983	F			
<i>Centaurea maculosa</i> Lam.	Spotted Knapweed	24	L S	1943	L S			
<i>Butomus umbellatus</i> L.	Flowering-rush	25	F L S	1998				F
<i>Rhamnus cathartica</i> L.	Common Buckthorn	26	F L S	1896	F L S	F	L S	
<i>Aegopodium podagraria</i> L.	Goutweed	27	F	2006		F		
<i>Elymus repens</i> (L.) Gould	Quack Grass	30	F L	1888		F	L	
<i>Hypericum perforatum</i> L.	Common St. John's-wort	31	F L S	1890	F L S	F	L	
<i>Robinia pseudo-acacia</i> L.	Black Locust	32	F L S	1888	F L S		L	
<i>Origanum vulgare</i> L.	Wild Marjoram	33	F S	2006				
<i>Hedera helix</i> L.	English Ivy	35	F S	2004			F S	
<i>Populus alba</i> L.	White Poplar	36	F L S	1895	L			F L
<i>Bromus tectorum</i> L.	Downy Chess	37	F L S	1901	F L		L S	
<i>Lysimachia nummularia</i> L.	Moneywort	38	F L S	1890		F		L S
<i>Syringa vulgaris</i> L.	Common Lilac	39	F L	1888	F			L S
<i>Medicago sativa</i> L. subsp. <i>sativa</i>	Alfalfa	41	L S	1879				
<i>Morus alba</i> L.	White Mulberry	42	F L S	1884	F L	F	L S	L S
<i>Acer negundo</i> L.	Manitoba Maple	43	F L S	1888	F L S	F	L	L S
<i>Tussilago farfara</i> L.	Coltsfoot	44	F L S	1895	F L S			L S
<i>Cirsium arvense</i> (L.) Scop.	Canada Thistle	45	F L S	1895	F	F		
<i>Poa compressa</i> L.	Canada Blue Grass	46	F L S	1890	F			F
<i>Linaria vulgaris</i> Miller	Butter-and-eggs	47	F L S	1895	F L			F
<i>Avena fatua</i> L.	Wild Oats	48	L	1890				
<i>Rumex acetosella</i> L.	Sheep Sorrel	50	F L S	1888		F		
<i>Ranunculus repens</i> L.	Creeping Buttercup	51	F L S	1890	F			
<i>Chelidonium majus</i> L.	Celandine	52	F L S	1888	F L S	L S	L S	



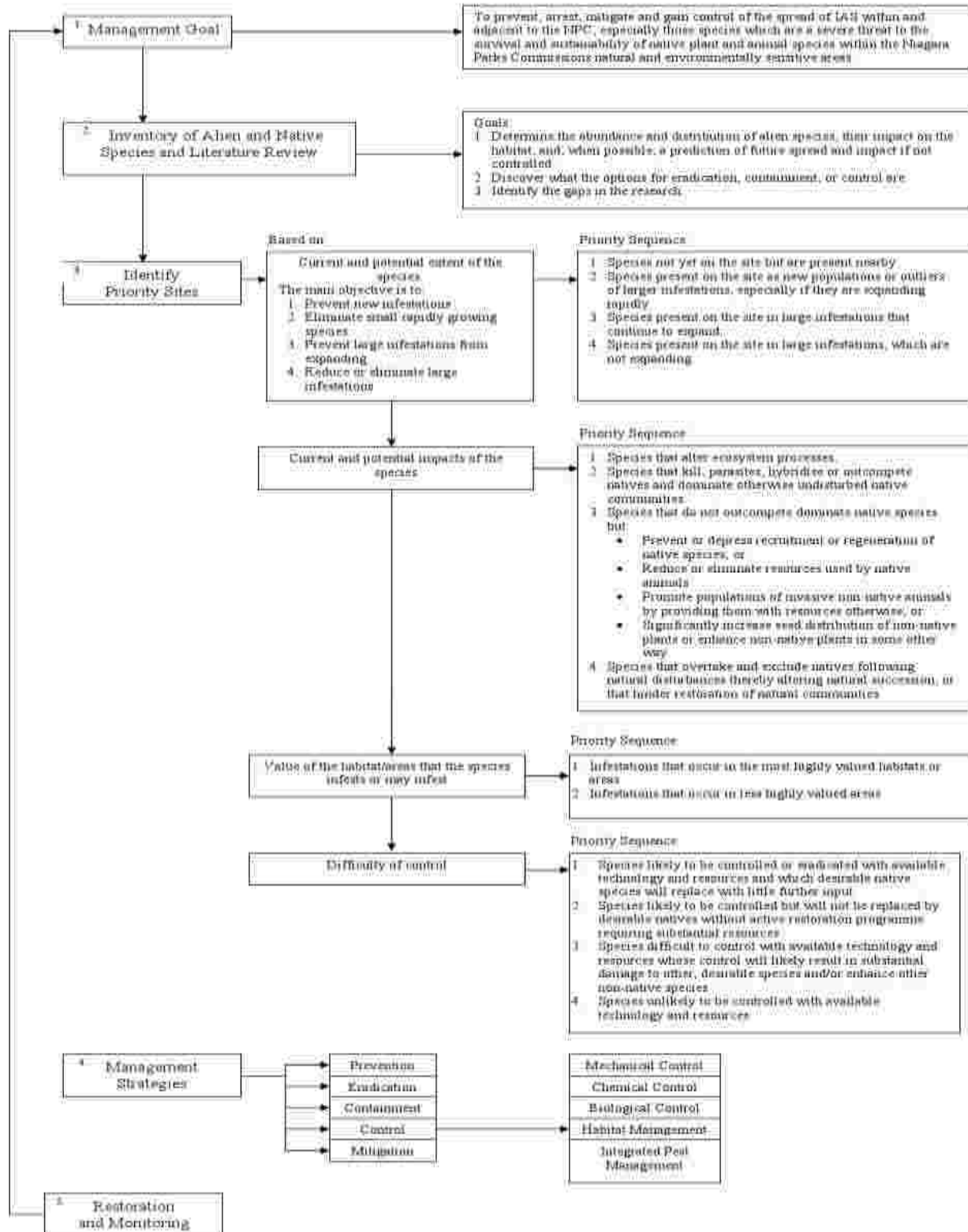
Scientific Name	Common Name	invasive rank	Niagara River	first report	Glen - Whirlpool	Paradise Grove	Queenston	Dufferin Is
<i>Melilotus alba Medicus</i>	White Sweet-clover	55	F L S	1890	F L S			
<i>Chrysanthemum leucanthemum L.</i>	Ox-eye Daisy	58	F L S	1890	F L S	F	L	LS
<i>Geum urbanum L.</i>	Herb Bennett	59	F S	2006	F	F S		
<i>Polygonum cuspidatum Siebold &amp; Zucc.</i>	Japanese Knotweed	60	F L S	1903	F			
<i>Galium mollugo L.</i>	Wild Madder	61	L S	1962		L S		
<i>Robinia viscosa Vent. ex Vauq.</i>	Clammy Locust	62	L	1895	L		L	
<i>Ambrosia artemisiifolia L.</i>	Common Ragweed	64	F L S	1890	F	F		
<i>Vinca minor L.</i>	Common Periwinkle	66	F L S	1890	F L S		LS	
<i>Verbascum thapsus L.</i>	Common Mullein	67	FL	1890	F			
<i>Silene latifolia Poiret</i>	White Cockle	69	L S	1890			LS	
<i>Potentilla recta L.</i>	Rough-fruited Cinquefoil	70	F L S	1882	F L S	F	L	
<i>Rosa multiflora Thunb. ex Murray</i>	Multiflora Rose	74	F L S	1996	F S	F	L	
<i>Poa pratensis L. subsp. pratensis</i>	Kentucky Blue Grass	76	F L S	1890	F	F S	L	
<i>Iris pseudacorus L.</i>	Yellow-flag	77	F	2006	F			
<i>Dipsacus fullonum L. subsp. sylvestris (Hudson) Clapham</i>	Common Teasel	80	F L S	1890	FL	F	LS	
<i>Hesperis matronalis L.</i>	Dame's Rocket	81	F L S	1895	F L S	F	L	LS
<i>Cirsium vulgare (Savi) Tenore</i>	Bull Thistle	Y	F L S	1890	F	F	L	L
<i>Tragopogon dubius Scop.</i>	Goat's-beard	Y	F	2006	F	F		
<i>Glechoma hederacea L.</i>	Gill-over-the-ground	Y	F L S	1894	F	F	LS	LS
<i>Ranunculus</i>	Common	Y	F L S	1890	F	F	LS	

Scientific Name	Common Name	invasive rank	Niagara River	first report	Glen - Whirlpool	Paradise Grove	Queenston	Dufferin Is
<i>acris L.</i>	Buttercup							
<i>Daucus carota L.</i>	Wild Carrot	Y	F L S	1888	F L	F		
<i>Galium aparine L.</i>	Cleavers	Y	F L S	1890	F L	F	L	
<i>Medicago lupulina L.</i>	Black Medick	Y	F L S	1890	F L S	F	L	L S
<i>Barbarea vulgaris R. Br.</i>	Winter Cress	Y	F L S	1883	F L S		L	L S
<i>Ligustrum vulgare L.</i>	Privet	Y	F L S	1882	F L S	F	L	
<i>Berberis thunbergii DC.</i>	Japanese Barberry	Y	F L S	1970	F L S	F		L S
<i>Echium vulgare L.</i>	Viper's-bugloss	Y	F L S	1890	F L S			
<i>Celastrus orbiculatus Thunb.</i>	Oriental Bittersweet	Y	F L S	1967	F S			L S
<i>Hordeum jubatum L. subsp. jubatum</i>	Foxtail Barley	Y	F L S	1895	F S			
<i>Euonymus alata (Thunb.) Siebold</i>	Winged Euonymus	Y	F S	1996	F S			
<i>Viburnum opulus L. var. opulus</i>	European Highbush-cranberry	Y	F L S	1970	L	F	L	L S
<i>Cynoglossum officinale L.</i>	Hound's-tongue	Y	L	1890	L			
<i>Euonymus europaea L.</i>	Spindle-tree	Y	F L S	1971		F		
<i>Urtica dioica L. subsp. dioica</i>	European Stinging Nettle	Y	F L S	1943				L
<i>Artemisia absinthium L.</i>	Absinth	Y	L	1895				
<i>Datura stramonium L.</i>	Jimsonweed	Y	L	1895			L	
<i>Ipomoea purpurea (L.) Roth</i>	Common Morning-glory	Y	L	1888				
<i>Malva neglecta Wallr.</i>	Common Mallow	Y	L	1890				
<i>Matricaria maritima L. subsp. maritima</i>	Scentless Chamomile	Y	L	1943				

Scientific Name	Common Name	invasive rank	Niagara River	first report	Glen - Whirlpool	Paradise Grove	Queenston	Dufferin Is
<i>Echinocystis lobata</i> (Michaux) Torrey & A. Gray	Wild Cucumber	Y	L	1890				
<i>Carum carvi L.</i>	Caraway	Y	L	1890				
<i>Erucastrum gallicum</i> (Willd.) O.E. Schulz	Dog Mustard	Y	L S	1963				
<i>Lotus corniculatus L.</i>	Birdfoot Trefoil	Y	L S	1908			L	
<i>Senecio jacobaea L.</i>	Stinking Willie	Y	L S	1903				
<i>Tanacetum vulgare L.</i>	Tansy	Y	L S	1888				
<i>Cyperus esculentus L.</i>	Yellow Nut Sedge	Y	L S	1895			L	

# APPENDIX E: Global Invasive Species Program Outline

## APPENDIX E: Global Invasive Species Program Outline



## **APPENDIX F: List of Acronyms**

ACSP – Audubon Cooperative Sanctuary Program for Golf Courses  
ANSI – Area of Natural and Scientific Interest  
AOC – Area of Concern  
CCEA - Council on Ecological Areas  
COSEWIC - Committee on the Status of Endangered Wildlife in Canada  
COSSARO - Committee on the Status of Species Act Risk in Ontario  
EMAN - Ecological Monitoring Assessment Network  
ESA – Environmentally Sensitive Area  
GISP - Global Invasive Species Program  
GLSF - Great Lakes Sustainability Fund  
IAS – Invasive Alien Species  
IBA- Important Bird Area  
IJC- International Joint Commission  
IPMAP - The IPM Accreditation Program  
NEC- Niagara Escarpment Commission  
NEP – Niagara Escarpment Plan  
NEPOSS – Niagara Escarpment Parks and Open Spaces System  
NPC - Niagara Parks Commission  
NPCA - Niagara Peninsula Conservation Authority  
OMNR – Ontario Ministry of Natural Resources  
OWES - Ontario Wetland Evaluation System  
RAP – Remedial Action Plan  
SARA – Species At Risk Act  
UNESCO - United Nations Educational, Scientific and Cultural Organization

## **APPENDIX G: List of Tables**

Table 2.1	Relevant Land Use Designations
Table 2.2	Natural Heritage Component of the Provincial Policy Statement
Table 2.3	Definitions of Protected Areas
Table 5.1	List of strategies for watershed management as outlined by NPCA

## **APPENDIX H: List of Figures**

Fig. 1.1	Combined Aquatic and Terrestrial Hotspots Carolinian Life Zone
Fig. 1.2	Overview of NPC Lands
Fig. 2.1	NPC Environmentally Sensitive Areas, north section
Fig. 2.2	NPC Environmentally Sensitive Areas, central section
Fig. 2.3	NPC Environmentally Sensitive Lands, south section
Fig. 2.4	NPC designated natural areas and features
Fig. 2.5	Wetlands
Fig. 2.6	NEPOSS Boundaries on NPC Lands
Fig. 4.1	Sanctioned Trails